

South East Queensland  
Climate Adaptation Research Initiative (SEQ CARI)

# Adaptation Options for Human Settlements in South East Queensland

## *Supplementary Report*

A report for the South East Queensland Climate Adaptation Research  
Initiative

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This report, *Adaptation Options for Human Settlements in South East Queensland*, is part of the South East Queensland Climate Adaptation Research Initiative (SEQ CARI), a partnership between the Queensland and Australian Governments, the CSIRO Climate Adaptation National Research Flagship, Griffith University, University of the Sunshine Coast and The University of Queensland.



Australian Government

South East Queensland (SEQ) is particularly vulnerable to climate change because of its growing population and coastal location. Human settlements, infrastructure, unique ecosystems, and primary industries all face threats from more extreme weather events, increased temperatures and altered rainfall patterns as a result of increased greenhouse gas emissions. Despite these risks and challenges, climate change may also bring some economic and social opportunities.

SEQ CARI aims to provide research knowledge to enable the region to adapt and prepare for the impacts of climate change. It will develop practical and cost-effective adaptation strategies to assist decision makers in government, industry and the community. The initiative is the first comprehensive regional study on climate change adaptation undertaken in Australia and one of only a few worldwide. It is exploring both vulnerabilities and adaptation options in response to climate change so that our prosperous regional economy, environment and lifestyles can be maintained into the future.

For more information about this and other projects in the South East Queensland Climate Adaptation Research Initiative (SEQ CARI) visit:

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## **INTRODUCTION**

This report documents the full suite of Adaptation Options for the Human Settlements component of the South East Queensland Climate Adaptation Research Initiative (SEQ CARI). It accompanies the Main Report for the final phase of Human Settlements research<sup>1</sup>.

The following Sections contain the specific adaptation options for the Human Settlements principal sectors of inquiry, namely: urban planning and management; coastal management; physical infrastructure related to local government; emergency management; and human health.

Each sector is introduced by its respective Adaptation Options Framework diagram which serves as a logic diagram and illustrates the suite of policies and their associated programs and actions. Set within the context of an overarching goal for the sector, each section contains a summary of each policy with its respective suite of programs and action statements prior to a set of very detailed tables which unpack each program and action and implementation details by way of recommended monitoring and evaluation activities.

‘Programs’ have been developed in terms of:

- Principal implementation mechanisms (e.g. regulatory, educational, incentive etc.);
- Primary responsibility (and associated responsibility/ies) for the implementation of the program;
- Area or location where the program is applicable (ie policy relevance);
- Type of implementation response (e.g. one-off; ongoing; episodic);
- Timing of implementation (e.g. immediate; deferred) ;
- Program linkages with other sector’s programs (coupling); and
- Source/s (evidence) for the program.

Each ‘action’ in turn is defined by:

- Principal implementation mechanisms (e.g. regulatory, educational, incentive etc.);
- Primary responsibility (and associated responsibility/ies) for the implementation of the action;

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<sup>1</sup> See: Darryl Low Choy, Silvia Serrao-Neumann, Florence Crick, Gemma Schuch, Marcello Sanò, Rudi van Staden, Oz Sahin, Ben Harman and Scott Baum, 2012, *Adaptation Options for Human Settlements in South East Queensland - Main Report*, unpublished report for the South East Queensland Climate Adaptation Research Initiative, Griffith University.

- Type of implementation response (e.g. one-off; ongoing; episodic);
- Action linkages with other programs and/or actions within and across sectors (coupling); and
- Source/s (evidence) for the action.

The monitoring and evaluation for each action is distinguished by:

- A set of key performance indicators;
- Opportunities for monitoring and evaluation (e.g. existing review cycles); and
- Primary (and associated) responsibility/ies for monitoring and evaluation.

Each sectoral section concludes with a reference List which provides the details of sources from where the proposed programs and actions have been drawn, fully, in part, modified, or adapted.

An evaluation of each policy and program has been completed by each sector author and included:

- A. an initial assessment in terms of four 'What If' questions, namely:
  1. What is the likelihood that it will have negative impacts on society?
  2. To what extent does it represent 'value for money' (cost effectiveness)?
  3. What is its likelihood of success (achieving aims)?
  4. To what degree does it promote rather than inhibit resilience<sup>2</sup>?
- B. A comprehensive assessment using a set of adaptation appraisal criteria for Human Settlements. The criteria included: flexibility; robustness; equity; coherence/alignment (synergy) in terms of alignment and enhancement; acceptability (i.e. political, community, bureaucratic, and private sector acceptability); and then avoidance of maladaptation in terms of low

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<sup>2</sup> Resilience was defined for participants as follows:

- *"Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."* (Walker & Salt 2006:31);
- *"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."* (Adger et al 2005:1036)

greenhouse gas emissions; less vulnerable populations; low opportunity costs; adaptation incentives; and low path dependency (see Main Report for full detail).

Each policy and program was assessed in terms of how well it met each of these eleven appraisal criteria, i.e. either 'high' or 'low', where 'high' was considered favourable and 'low' unfavourable.



## **SECTION 1: URBAN PLANNING AND MANAGEMENT ADAPTATION OPTIONS**





**Legend:**

Statutory planning



Non-statutory planning



Non-statutory and/or statutory planning

**Policy 1. The statutory and non-statutory planning processes must seek to minimise the vulnerability of coastal landscapes to storm tide and sea level rise inundation, coastal erosion, cyclones and severe winds, severe storms and hail, and flooding.**

**Program 1.1 Consolidation of urban development:** Urban development is consolidated by favouring infill and redevelopment of existing urban areas to minimise the extent of development occurring in highly vulnerable coastal areas.

**Action 1.1.1:** Assess the vulnerability, socially and physically, to coastal hazards of areas designated to accommodate future population growth, including transit oriented developments (TODs).

**Action 1.1.2:** Identify and monitor areas that require special protection and/or defence.

**Action 1.1.3:** Establish special zoning and performance criteria for building structures located in areas at risk to withstand coastal hazards.

**Action 1.1.4:** Define zones within new development that should have limited density and intensity determined by their level of risk and ensure structures are designed or retrofitted to be more resilient to flood impacts.

**Action 1.1.5:** Identify areas for land use conversion that incorporate projected coastal hazards threats in the next 50 to 100 years.

**Action 1.1.6:** Define developers' responsibilities in land use development of areas subject to coastal hazards in the next 50 to 100 years. (e.g. fee to cover the costs of potential emergency response, future armouring, to mitigate impacts to natural habitats from future armouring, or to improve flood resilience of infrastructure that services the new development (developer must design the new development and its supporting infrastructure to be more resilient to flood impacts. For example, permits could require that roads be elevated and that sewer lines be more resilient to floods.)

**Action 1.1.7:** Define landowners' responsibilities in locations subject to coastal hazards in the next 50 to 100 years (e.g. landowner agrees to remove structures when they become inundated due to encroachment. As the seas rise, the boundary between private lands and public beaches (the tide line) will be pushed inland. This type of condition allows landowners to develop property but with the expectation that development will eventually have to cede to the rising seas; landowner dedicates an easement to preserve natural buffers, floodways, or to provide public access).

**Action 1.1.8:** Ensure siting of essential public assets outside areas at risk and/ or in vulnerable areas with low risk of flooding whilst avoiding the isolation of communities.

**Action 1.1.9:** Ensure essential infrastructure is decentralised and/or are equipped with redundancy and back-up systems.

**Action 1.1.10:** Ensure infill and redevelopment of existing urban areas take into account the provision of evacuation routes and shelters to minimise the vulnerability of communities to coastal hazards, including storm tides, coastal inundation and flooding.

**Program 1.2 Infrastructure sites:** Essential infrastructure sites and corridors are identified, protected and managed from climate change impacts.

**Action 1.2.1:** Conduct inventory to identify the vulnerability of essential infrastructure sites and corridors to coastal hazards.

**Action 1.2.2:** Define protection zones, i.e. areas with essential public assets that permit coastal armouring and/or being elevated.

**Action 1.2.3:** Ensure proposed essential infrastructure sites and corridors are sited outside coastal risk areas.

**Program 1.3 Community planning:** Residential accommodation, which is designed and located to integrate with the surrounding community, is provided to meet the specific needs of youth, the aged, people with disabilities and other disadvantaged groups to minimise their vulnerability to coastal hazards.

**Action 1.3.1:** Conduct an inventory in partnership with health and emergency management agencies to identify areas within the community that have a high concentration



of vulnerable groups.

**Action 1.3.2:** Calculate and allocate funds to assist vulnerable groups to retrofit their residences to be more resilient to coastal hazards.

**Action 1.3.3:** Determine, based on inventory, as to whether localities require the establishment of shelters, including public cool spaces, to protect community from extreme weather events.

**Action 1.3.4:** Ensure new development provide adequate number of residential accommodation that caters for the needs of vulnerable groups, including the assessment of the need for shelters for extreme weather events.

**Action 1.3.5:** Ensure residents are familiar with evacuation procedures in case of extreme weather events.

**Program 1.4 Building code design criteria:** Building codes are reviewed to incorporate design criteria for buildings to resist future loads that may result from the impact of climate change-exacerbated hazards during a minimum service life of 50 years.

**Action 1.4.1:** Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located along canals and waterways provide for setbacks from the waterway and have 500mm freeboard measurement above a projected site-specific flood level.

**Action 1.4.2:** Require special foundations that are more resilient to erosion and wave impacts and use of flood-resilient construction materials.

**Action 1.4.3:** Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to coastal hazards damage.

**Program 1.5 Retrofitting of residential properties:** A program to assist households to retrofit high risk homes is created to reduce or eliminate damage caused by flooding as a result of sea level rise and coastal storm surge events.

**Action 1.5.1:** Conduct a comprehensive inventory to determine the physical number and nature of buildings (residential and commercial) threatened by coastal inundation due to rising sea levels and storm surge to estimate cost of retrofitting properties.

**Action 1.5.2:** Define areas that require priority actions, including retrofitting of properties at risk.

**Action 1.5.3:** Establish funding mechanisms to support retrofitting of properties and buy back schemes, e.g. federal and state government and private sector.

**Action 1.5.4:** Create household funding metrics based on households' vulnerability (e.g. high risk properties and socio-economic disadvantage).

**Action 1.5.5:** Create an inspection services scheme for homeowners in high risk areas to help them identify ways in which they could retrofit their homes to make them more resilient to coastal hazards.

**Action 1.5.6:** Create incentives/rebates packages to property owners for the retrofitting of properties threatened by coastal hazards and/or ear-marked for planned retreat.

**Action 1.5.7:** Provide financial assistance to local governments to retrofit homes that have been repetitively damaged by coastal hazards, demolish damaged homes, elevate essential public assets, and move essential public assets.

**Action 1.5.8:** Establish partnership with insurance companies to map properties at risk of coastal hazards and establish thresholds to guide insurance premiums.

**Action 1.5.9:** Identify barriers and opportunities for retrofitting program based on household tenure (e.g. rental properties, first home, second home).

**Program 1.6 Planned retreat:** Building structures, infrastructure and public facilities in areas adjacent to receding shorelines are sited landward and/ or relocated.

**Action 1.6.1:** Assess the vulnerability of existing urban areas to rising sea levels and storm surges.

**Action 1.6.2:** Establish a staging process to implement planned retreat of vulnerable areas whilst minimising adverse social impacts.

**Action 1.6.3:** Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, voluntary buy-back schemes, rolling easements, transfer of development rights, purchase of development rights, tighter rules for setbacks and/or tax incentives.

**Action 1.6.4:** Limit or prohibit rebuilding of damaged structures in defined retreat areas.

**Action 1.6.5:** Identify suitable areas to accommodate the relocation of coastal communities/population at risk whilst ensuring emergency and health services and facilities continue to be provided to communities/population at risk.

**Action 1.6.6:** Establish an engagement and communication strategy to consult with coastal communities at risk.

**Action 1.6.7:** Encourage land owners to relocate structures through tax benefits, voluntary land acquisitions, or conservation easements schemes.

**Action 1.6.8:** Develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.

**Action 1.6.9:** Ensure the restoration and rehabilitation of areas post-retreat.

**Program 1.7 Strategic relocation and upgrade of essential emergency and health services:** Emergency and health services departments (e.g. disaster management warehouses, disaster coordination centres, evacuation centres, hospitals, aged care facilities) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks so they can continue to operate during emergencies. This should consider threats to communications, transport and water infrastructure.

**Action 1.7.1:** Assess the vulnerability of essential emergency and health services to coastal hazards and conduct an inventory to determine which ones require upgrade and/or strategic relocation.

**Action 1.7.2:** Calculate and allocate funds for relocation and upgrading of essential emergency and health services.

**Action 1.7.3:** Establish a staging process to implement relocation and upgrade of essential emergency and health services.

**Action 1.7.4:** Consult with communities to strategically relocate and/or upgrade essential emergency and health services to ensure communities do not become disadvantaged in the process.

**Action 1.7.5:** Investigate feasibility of decentralisation of essential emergency and health services and facilities as a retreat option.

**Action 1.7.6:** Ensure strategic relocation and upgrade of essential emergency and health services are aligned with strategies forecasted for transportation and communication systems.

**Program 1.8 Coastal defence:** Coastal defence mechanisms are implemented to provide continuing flood and erosion risk management due to storm tides and sea level rise.

**Action 1.8.1:** Assess the vulnerability of existing urban areas to rising sea levels and storm surges.

**Action 1.8.2:** Undertake comprehensive research and analysis to determine alternative solutions to defence mechanisms by assessing the engineering, economic, social and environmental aspects of whether or not selected sections of the coasts can or should be protected.

**Action 1.8.3:** Identify and define protection zones, i.e. areas with dense urban development that permit coastal armouring.

**Action 1.8.4:** Investigate the feasibility of different mechanisms used to implement and manage coastal defence, including soft and/or hard armouring techniques.

**Action 1.8.5:** Allocate funding to enable the construction and management of coastal defence structures.

**Action 1.8.6:** Establish a staging process for the implementation of coastal defence structures to protect identified areas at risk.

**Action 1.8.7:** Conduct a review of legislative frameworks to identify and conduct necessary amendments to enable implementation of coastal defence mechanisms.

**Program 1.9 Hazards full disclosure clause:** A Coastal Hazards Full Disclosure Law is implemented to alert buyers of coastal properties about current and future climate related risks such as erosion rates, storm history, inundation and sea level rise.

**Action 1.9.1:** Establish State laws to require sellers of real estate to disclose information to coastal property buyers either before or at the point of contract about risks related to coastal hazards, such as location in a known inundation hazard area, current erosion rate, and/or setback and building restrictions.

**Action 1.9.2:** Ensure insurance companies adequately inform their customers about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.

**Action 1.9.3:** Establish stronger rules for real estate disclosure to provide coastal property buyers information of the potential perils associated with developing or purchasing property seaward of the [state's] oceanfront setback line.

**Action 1.9.4:** Develop and update a coastal hazards website to provide information to the public and government, including maps and data.

**Action 1.9.5:** Conduct a review of legislative frameworks to identify and establish necessary amendments to enable enforcement of full hazards disclosure clause.

**Action 1.9.6:** Consult with community to improve communication about future climate related risks on private properties.

**Program 1.10 Redundancy and back-up for essential services and buildings:** High priority buildings and services, such as Local Disaster Coordination Centres; hospitals; essential council buildings and evacuation centres; alternative access routes; communication; and supplies of power, fuel and water are decentralised and/or equipped with back-up systems.

**Action 1.10.1:** Assess the vulnerability of high priority services and buildings to coastal hazards and conduct an inventory to determine which ones require decentralisation and back-up.

**Action 1.10.2:** Calculate and allocate funds for construction and implementation of additional high priority services and buildings in low risk areas.

**Action 1.10.3:** Encourage the decentralisation of essential services and buildings.

**Action 1.10.4:** Encourage the establishment of back-up systems to provide spare capacity for essential services and buildings.

**Action 1.10.5:** Establish a staging process to implement decentralisation and back-up schemes for high priority services and buildings.

**Action 1.10.6:** Align the staging process for decentralisation and back-up schemes for high priority services and buildings with staging process for strategic relocation and upgrade of essential emergency and health services.

**Action 1.10.7:** Promote the establishment of decentralised and back-up systems of essential services and buildings in new developments.

**Program 1.11 Innovative design for coastal areas:** Innovative engineering and design solutions are employed to manage coastal hazards in low risk areas.

**Action 1.11.1:** Encourage residential structures in areas subject to coastal inundation to have the lowest habitable floor raised or above the highest flood level by 500 mm.

**Action 1.11.2:** Encourage built areas below the flood level of residential structures subject to coastal inundation to be designed to allow flood waters to exit (e.g. walls must be designed to break away in storm events without causing loss of structural integrity).

**Action 1.11.3:** Encourage buildings to be anchored to the foundation to prevent movement of the structure during coastal inundation events.

**Action 1.11.4:** Encourage residential structures subject to coastal inundation to have their mechanical, electrical, and plumbing devices elevated above flood level.

**Action 1.11.5:** Encourage buildings structures subject to coastal inundation to be designed to be more resilient to flooding by using special coatings and sealings to make the walls impermeable to floodwater.

**Action 1.11.6:** Encourage essential infrastructure subject to coastal inundation to be either elevated or built to be more resilient to floods.

**Action 1.11.7:** Encourage building structures and essential infrastructure in areas subjected to damaging coastal wave action to be built and/or elevated above the base flood elevation, including storm surges. Building structures and essential infrastructure must also be specially anchored to withstand wind and wave action.

**Program 1.12 Flood immunity:** Flood immunity for essential infrastructure and buildings is achieved through water sensitive movement and detention infrastructure that minimises alterations to natural flow regimes, including floodplain connectivity.

**Action 1.12.1:** Investigate the feasibility of raising the height of land and existing development.

**Action 1.12.2:** Investigate the feasibility of constructing structures that float on the surface of the water, or may be floated occasionally during a flood, making them largely invulnerable to changing tides.

**Action 1.12.3:** Investigate the feasibility of constructing structures that are designed to withstand flooding or to retain storm water.

**Action 1.12.4:** Encourage the retention of living shorelines or wetlands to absorb flood, slow erosion and provide habitat.

**Action 1.12.5:** Ensure emergency and health services and facilities continue to be accessible and operational during and after extreme weather events.

**Program 1.13 Protection of coastal habitats:** Areas that provide for the landward retreat of coastal habitats and species at risk from predicted sea level rise are identified and protected.

**Action 1.13.1:** Improve knowledge and understanding of the vulnerability of ecosystems to climate change impacts.

**Action 1.13.2:** Integrate an agreed biodiversity mapping approach and conduct an inventory of priority conservation areas to be affected by climate change impacts.

**Action 1.13.3:** Increase ecosystem resilience by restoring tidal wetlands, living shoreline and related habitats, and establish habitat corridors.

**Action 1.13.4:** Maintain upland buffer areas around tidal wetlands.

**Action 1.13.5:** Manage sediment for marsh accretion and natural flood protection.

**Action 1.13.6:** Establish rolling easements regulations to prohibited private landowners to erect bulkheads and any other structures that interfere with naturally migrating shores.

**Program 1.14 Long-term (strategic) planning:** Planning and decision-making consider the potential implications of climate change over the life of long-term assets (100 year planning horizon).

**Action 1.14.1:** Develop a 'worst-case scenario' state-level planning document that establishes general policies and guidelines for identifying areas and infrastructure that may no longer be supported through public funds.

**Action 1.14.2:** Discourage expenditure of public funds on infrastructure in areas highly vulnerable to climate change impacts, especially sea level rise and increased risk of flooding from intense rainfall events.

**Program 1.15 Coordinated response to sea level rise:** A coordinated response to sea-level rise is initiated to develop measures related to coastal defence, accommodation and planned retreat.

**Action 1.15.1:** Encourage state and local governments to establish policies and funding to facilitate easements to (a) relocate developments further inland, (b) remove development as hazards encroach into developed areas, or (c) facilitate landward movement of coastal ecosystems subject to dislocation by sea level rise and other climate change impacts.

**Action 1.15.2:** Encourage state government to establish an oceanfront setback line to restrict further urban development in areas at risk from sea level rise.

**Action 1.15.3:** Encourage state and local governments (or private land trusts or non-profit organisations) to acquire undeveloped property at risk from sea level rise in order to conserve environmental assets, such as wetlands and beaches, provide upland migration corridors, preserve habitat, or provide flood buffers for existing development.

**Action 1.15.4:** Encourage state and local governments to prioritize developed properties at risk of sea level rise by purchasing conservation easements in areas identified to have significant value for habitat conservation, natural buffers and/or floodplain restoration, or where ecosystems can migrate inland as the seas rise.

**Program 1.16 Land use conversion:** Scenarios for land use conversion are defined to accommodate future population growth and incorporate future projected climate change threats over the next 50 to 100 years.

**Action 1.16.1:** Reduce pressure on systems or areas at risk of coastal hazards by restricting and discouraging further development.

**Action 1.16.2:** Introduce multiple land use strategies that account for coastal hazards due to climate change impacts. This includes raised buildings with less critical functions (e.g. parking, parkland) at ground level in flood prone areas, natural conservation areas that double as flood management areas, etc.

**Action 1.16.3:** Implement state legislation to afford protection from legal liability for local councils where they provide advice or make a decision in good faith relating to coastal planning and the impact of climate change.

**Program 1.17 Coastal erosion risk minimisation:** A coastal erosion preparedness and awareness scheme is initiated to minimise risks from coastal erosion, including climate change projections, in vulnerable areas.

**Action 1.17.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to coastal erosion, including climate change projections that could exacerbate coastal erosion risks.

**Action 1.17.2:** Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).

**Action 1.17.3:** Create an inspection services scheme for homeowners in coastal erosion prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to coastal erosion.

**Action 1.17.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to coastal erosion.

**Action 1.17.5:** Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to coastal erosion and already identified for land use conversion.

**Action 1.17.6:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to coastal erosion.

**Action 1.17.7:** Encourage residents of areas highly vulnerable to coastal erosion to develop and maintain emergency plans, including evacuation procedures.

**Action 1.17.8:** Ensure emergency and health services and facilities located in areas highly vulnerable to coastal erosion continue to be operational during and after extreme weather events.

**Program 1.18 Coastal inundation risk minimisation:** A coastal inundation preparedness and awareness scheme is initiated to minimise coastal inundation risks, including climate change projections, in vulnerable areas.

**Action 1.18.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to coastal inundation, including climate change projections that could exacerbate coastal inundation risks.

**Action 1.18.2:** Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).

**Action 1.18.3:** Create an inspection services scheme for homeowners in coastal inundation prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.

**Action 1.18.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to coastal inundation.

**Action 1.18.5:** Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to coastal inundation and already identified for land use conversion.

**Action 1.18.6:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to coastal inundation.

**Action 1.18.7:** Encourage residents of areas highly vulnerable to coastal inundation to develop and maintain emergency plans, including evacuation procedures.

**Action 1.18.8:** Ensure emergency and health services and facilities located in areas highly vulnerable to coastal inundation continue to be operational during and after extreme weather events.

**Program 1.19 Urban parks and open spaces:** Urban parks and open spaces are protected, enhanced and restored to protect and strengthen community wellbeing under a changing climate.

**Action 1.19.1:** Enhance existing parklands and acquire new parkland where feasible to improve availability of green spaces and reduce risks from future urban heat island effects (UHIE).

**Action 1.19.2:** Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure.

**Action 1.19.3:** Provide appropriate space and design for recreational needs, including forms of productive recreation such as community gardening, city farms and farmers markets.

**Action 1.19.4:** Protect, enhance and restore the health and integrity of natural ecosystems such as urban forests and waterways.

## **Policy 2. The statutory and non-statutory planning processes must seek to minimise the vulnerability of inland landscapes to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.**

**Program 2.1 Consolidation of urban development:** Infill development is consolidated in existing urban areas while avoiding areas with high exposure to flooding and bushfire.

**Action 2.1.1:** Assess the vulnerability, socially and physically, to flooding and bushfire of areas designated to accommodate future population growth, including transit oriented developments (TODs). (NSW sea level rise policy)

**Action 2.1.2:** Identify and monitor areas that require special protection, i.e. areas that have been flooded 3 or more times in the last 10 years, including retrofitting of properties at risk and implementation of buy back schemes of areas subject to recurrent flooding.

**Action 2.1.3:** Establish special zoning and performance criteria to trigger more stringent building codes and design standards for building structures located in areas at risk from flooding and bushfire.

**Action 2.1.4:** Define zones within new development that should have limited density and intensity determined by their level of risk and ensure structures are designed or retrofitted to be more resilient to flood impacts.

**Action 2.1.5:** Identify areas for land use conversion that incorporate climate change projections likely to exacerbate the risk of floods and bushfires in the next 50 to 100 years.

**Action 2.1.6:** Define developers' responsibilities in land use development of areas subject to flooding and bushfire in the next 50 to 100 years. (e.g. fee to cover the costs of potential emergency response or to improve flood resilience of infrastructure that services the new development. Developers must design the new development and its supporting infrastructure to be more resilient to flood impacts. For example, permits could require that roads be elevated and that sewer lines be more resilient to floods).

**Action 2.1.7:** Define landowners' responsibilities in locations subject to flooding and bushfire in the next 50 to 100 years (e.g. landowner agrees to build and/or rebuild structures based on more stringent building codes and design standards, and have evacuation plans).

**Action 2.1.8:** Ensure siting of essential public assets outside areas at risk and/ or in vulnerable areas with low risk of flooding whilst avoiding the isolation of communities.

**Action 2.1.9:** Ensure essential infrastructure is decentralised and/or are equipped with redundancy and back-up systems.

**Action 2.1.10:** Ensure infill and redevelopment of existing urban areas take into account the provision of evacuation routes and shelters to minimise the vulnerability of communities to flooding and bushfire.



**Program 2.2 Infrastructure sites:** Essential infrastructure sites and corridors are identified, protected and managed from climate change impacts.

**Action 2.2.1:** Conduct inventory to identify the vulnerability of essential infrastructure sites and corridors to flooding and bushfires.

**Action 2.2.2:** Define protection zones, i.e. areas with essential infrastructure that permit elevation/retrofitting to withstand flooding, and retrofitting to withstand bushfires.

**Action 2.2.3:** Ensure proposed essential infrastructure assets and corridors are sited outside risk areas and/ or in vulnerable areas with low risk of flooding and bushfire.

**Program 2.3 Community planning:** Residential accommodation, which is designed and located to integrate with the surrounding community, is provided to meet the specific needs of youth, the aged, people with disabilities and other disadvantaged groups to minimise their vulnerability to climate change impacts.

**Action 2.3.1:** Conduct an inventory in partnership with health and emergency management agencies to identify areas within the community that have a high concentration of vulnerable groups.

**Action 2.3.2:** Calculate and allocate funds to assist vulnerable groups to retrofit their residences to be more resilient to climate change impacts, including flooding, bushfire and heatwaves.

**Action 2.3.3:** Determine, based on inventory, as to whether localities require the establishment of shelters, including public cool spaces, to protect community from extreme weather events.

**Action 2.3.4:** Ensure new development provide adequate number of residential accommodation that caters for the needs of vulnerable groups, including the assessment of the need for shelters for extreme weather events

**Action 2.3.5:** Ensure residents are familiar with evacuation procedures in case of extreme weather events.

**Program 2.4 Building code design criteria for floods:** Building codes are reviewed to ensure building structures withstand projected site-specific flood levels.

**Action 2.4.1:** Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located along floodplains provide for setbacks from the waterway and have 500mm freeboard measurement above a projected site-specific flood level.

**Action 2.4.2:** Require special foundations that are more resilient to flood impacts and use of flood-resilient construction materials.

**Action 2.4.3:** Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.

**Program 2.5 Building code design criteria for bushfire:** Building codes are reviewed to ensure building structures are more resilient to bushfires.

**Action 2.5.1:** Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located in bushfire prone areas provide for setbacks and buffers to be more resilient to bushfires.

**Action 2.5.2:** Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located in bushfire prone areas utilise building material which are more fire retardant and/or resistant.

**Action 2.5.3:** Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to bushfire.

**Program 2.6 Retrofitting of residential properties:** A program to assist households to retrofit high risk homes is created to improve adaptation to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.

**Action 2.6.1:** Conduct a comprehensive inventory to determine the number and nature of buildings and properties (residential or commercial) threatened by heatwaves

and high temperatures, flooding, severe storms and hail, and bushfires to estimate cost of retrofitting properties.

**Action 2.6.2:** Define areas that require priority actions, including retrofitting of properties at risk.

**Action 2.6.3:** Establish funding mechanisms to support retrofitting of properties and buy back schemes, e.g. federal and state government and private sector.

**Action 2.6.4:** Create household funding metrics based on households' vulnerability (e.g. high risk properties and socio-economic disadvantage).

**Action 2.6.5:** Create an inspection services scheme for homeowners in high risk areas to help them identify ways in which they could retrofit their homes to make them more resilient to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.

**Action 2.6.6:** Create incentives/rebates package for the retrofitting of households threatened by heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.

**Action 2.6.7:** Provide financial assistance to local governments to retrofit homes that have been repetitively damaged by floods, severe storms and hail, and bushfires, demolish damaged homes, elevate essential public assets, and move essential public assets.

**Action 2.6.8:** Establish partnership with insurance companies to map properties at risk of heatwaves and high temperatures, flooding, severe storms and hail, and bushfires and establish thresholds to guide insurance premiums.

**Action 2.6.9:** Identify barriers and opportunities for retrofitting program based on household tenure (e.g. rental properties, first home, second home).

**Program 2.7 Planned retreat:** Building structures, infrastructure and public facilities in areas adjacent to floodplains are sited landward and/ or relocated.

**Action 2.7.1:** Assess the vulnerability of existing urban areas to flood events.

**Action 2.7.2:** Establish a staging process to implement planned retreat of vulnerable areas whilst minimising adverse social impacts.

**Action 2.7.3:** Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, conservation easements, transfer of development rights, purchase of development rights, tighter rules setbacks and/or tax incentives.

**Action 2.7.4:** Limit or prohibit rebuilding of damaged structures in defined retreat areas.

**Action 2.7.5:** Identify suitable areas to accommodate the relocation of flooded communities/population at risk whilst ensuring emergency and health services and facilities continue to be provided to communities/population at risk.

**Action 2.7.6:** Establish an engagement and communication strategy to consult with communities at risk.

**Action 2.7.7:** Encourage land owners to relocate structures through tax benefits, voluntary land acquisitions, or conservation easements schemes.

**Action 2.7.8:** Develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.

**Action 2.7.9:** Ensure the restoration and rehabilitation of areas post-retreat.

**Program 2.8 Strategic relocation and upgrade of essential emergency and health services:** Emergency and health services departments (e.g. disaster management warehouses, disaster coordination centres, evacuation centres, hospitals, aged care facilities) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks so they can continue to operate during emergencies. This should consider threats to communications, transport and water infrastructure.

**Action 2.8.1:** Assess the vulnerability of essential emergency and health services to flood and bushfires and conduct an inventory to determine which ones require upgrade and/or strategic relocation.

**Action 2.8.2:** Calculate and allocate funds for construction and implementation of additional essential services and buildings.

**Action 2.8.3:** Establish a staging process to implement relocation and back-up schemes for essential emergency and health services.

**Action 2.8.4:** Consult with communities to strategically relocate and/or upgrade essential emergency and health services to ensure communities do not become disadvantaged in the process.



**Action 2.8.5:** Investigate feasibility of decentralisation of essential emergency and health services and facilities as a retreat option.

**Action 2.8.6:** Ensure strategic relocation and upgrade of essential emergency and health services are aligned with strategies forecasted for transportation and communication systems.

**Program 2.9 Hazards full disclosure clause:** A Hazards Full Disclosure Law is implemented to alert buyers of properties about current and future climate related risks associated with flooding, including riverine and flash floods, and bushfire.

**Action 2.9.1:** Establish State laws to require sellers of real estate to disclose information to property buyers either before or at the point of contract about risks related to flooding, including riverine and flash floods, bushfire, such as location in a known inundation hazard area and/or setback and building restrictions.

**Action 2.9.2:** Ensure insurance companies adequately inform their customers about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.

**Action 2.9.3:** Develop and update a hazards website to provide information to the public and government, including maps and data related to flooding, including riverine and flash floods, bushfire.

**Action 2.9.4:** Conduct a review of legislative frameworks to identify and establish necessary amendments to enable enforcement of full hazards disclosure clause.

**Action 2.9.5:** Consult with community to improve communication about future climate related risks on private properties.

**Program 2.10 Redundancy and back-up for essential services and buildings:** High priority buildings and services, such as Local Disaster Coordination Centres; hospitals; essential council buildings and evacuation centres; alternative access routes; communication; and supplies of power, fuel and water are decentralised and/ or equipped with back-up systems.

**Action 2.10.1:** Assess the vulnerability of high priority services and buildings to flooding and bushfires and conduct an inventory to determine which ones require decentralisation and back-up.

**Action 2.10.2:** Calculate and allocate funds for construction and implementation of additional high priority services and buildings in low risk areas.

**Action 2.10.3:** Encourage the decentralisation of essential services and buildings.

**Action 2.10.4:** Encourage the establishment of back-up systems to provide spare capacity for essential services and buildings.

**Action 2.10.5:** Establish a staging process to implement decentralisation and back-up schemes for high priority services and buildings.

**Action 2.10.6:** Align the staging process for decentralisation and back-up schemes for high priority services and buildings with staging process for strategic relocation and upgrade of essential emergency and health services.

**Action 2.10.7:** Promote the establishment of decentralised and back-up systems of essential services and buildings in new developments.

**Program 2.11 Innovative designs for floods:** Innovative engineering and design solutions are employed to minimise vulnerability to flooding in low risk areas.

**Action 2.11.1:** Encourage residential structures in areas at risk of flooding to have the lowest habitable floor raised or above the highest flood level by 500 mm.

**Action 2.11.2:** Encourage built areas below the flood level of residential structures subject to flood risk to be designed to allow flood waters to exit (e.g. walls must be designed to break away in storm events without causing loss of structural integrity).

**Action 2.11.3:** Encourage buildings to be anchored to the foundation to prevent movement of the structure during flood events.

**Action 2.11.4:** Encourage residential structures at risk of flooding to have their mechanical, electrical, and plumbing devices elevated above flood level.

**Action 2.11.5:** Encourage buildings structures subject to flood risk to be designed to be more resilient to flooding by using special coatings and sealings to make the walls impermeable to floodwater.

**Action 2.11.6:** Encourage essential infrastructure at risk of flooding to be either elevated or built to be more resilient to floods.

**Program 2.12 Flood immunity:** Flood immunity for essential infrastructure and buildings is achieved through water sensitive movement and detention infrastructure that minimises alterations to natural flow regimes, including floodplain connectivity.

**Action 2.12.1:** Investigate the feasibility of raising the height of land and existing development.

**Action 2.12.2:** Investigate the feasibility of constructing structures that float on the surface of the water, or may be floated occasionally during a flood event, making them largely invulnerable to changing flood levels. (SPUR)

**Action 2.12.3:** Investigate the feasibility of constructing structures that are designed to withstand flooding or to retain storm water.

**Action 2.12.4:** Encourage the retention of wetlands to absorb flood, slow erosion and provide habitat.

**Action 2.12.5:** Ensure emergency and health services and facilities continue to be accessible and operational during and after extreme flood events.

**Program 2.13 Mapping of flood vulnerable areas:** A program is created to map and catalogue developed building sites that are flooded three or more times over a 10 year-period.

**Action 2.13.1:** Ensure local authorities keep and maintain a database of currently developed building sites that have been flooded three or more times within the last 10 years.

**Action 2.13.2:** Ensure information from database is shared and consistent across local authorities, particularly for emergency services.

**Action 2.13.3:** Target those sites for future land use conversion to reduce the risks to population and to potential property damage.

**Action 2.13.4:** Investigate funding options for both voluntary and compulsory land acquisition programs of areas identified to be highly vulnerable to floods.

**Program 2.14 Land use conversion:** Scenarios for land use conversion are defined to accommodate future population growth and incorporate future projected climate change threats over the next 50 to 100 years.

**Action 2.14.1:** Reduce pressure on systems or areas at risk of flooding by restricting and discouraging further development.

**Action 2.14.2:** Introduce multiple land use strategies that account for flood hazards due to climate change impacts. This includes raised buildings with less critical functions (e.g. parking, parkland) at ground level in flood prone areas, natural conservation areas that double as flood management areas, etc.

**Action 2.14.3:** Implement state legislation to afford protection from legal liability for local councils where they provide advice or make a decision in good faith relating to planning along floodplains and the impact of climate change.

**Program 2.15 Flood risk minimisation:** A flood preparedness and awareness scheme is initiated to minimise both flash flood and riverine flood risks, including climate change projections, in flood prone areas.

**Action 2.15.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to flooding, including climate change projections that could exacerbate flood risks.

**Action 2.15.2:** Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).

**Action 2.15.3:** Create an inspection services scheme for homeowners in flood prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.

**Action 2.15.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to flooding.

**Action 2.15.5:** Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to flooding and already identified for land use conversion.

**Action 2.15.6:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to

flooding.

**Action 2.15.7:** Encourage residents of areas highly vulnerable to flooding to develop and maintain emergency plans, including evacuation procedures.

**Action 2.15.8:** Ensure emergency and health services and facilities located in areas highly vulnerable to flooding continue to be operational during and after extreme flood events.

**Program 2.16 Bushfire risk minimisation:** A bushfire preparedness and awareness scheme is initiated to minimise bushfire risks, including climate change projections, in bushfire prone areas.

**Action 2.16.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to bushfire, including climate change projections that could exacerbate bushfire risks.

**Action 2.16.2:** Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).

**Action 2.16.3:** Create an inspection services scheme for homeowners in bushfire prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to bushfire.

**Action 2.16.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to bushfires.

**Action 2.16.5:** Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to bushfire and already identified for land use conversion.

**Action 2.16.6:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to bushfire.

**Action 2.16.7:** Encourage residents of bushfire prone areas to develop and maintain emergency plans, including evacuation procedures.

**Action 2.16.8:** Ensure residents of bushfire prone areas continue to have access to emergency and health services and facilities during and after extreme bushfire events.

**Program 2.17 Heatwave risk minimisation:** A heatwave preparedness and awareness scheme is initiated to minimise heatwave risks, including climate change projections, in heatwave prone areas.

**Action 2.17.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to heatwaves, including climate change projections that could exacerbate heatwave risks.

**Action 2.17.2:** Identify areas for priority action (e.g. retrofitting; provision of public cool spaces).

**Action 2.17.3:** Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to heatwaves.

**Action 2.17.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to heatwaves.

**Action 2.17.5:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to heatwaves.

**Action 2.17.6:** Encourage residents of areas highly vulnerable to heatwaves to develop and maintain emergency plans, including how to access public cool spaces.

**Action 2.17.7:** Ensure residents continue to have access to emergency and health services and facilities during heatwave events.

**Program 2.18 Urban parks and open spaces:** Urban parks and open spaces are protected, enhanced and restored to protect and strengthen community wellbeing under a changing climate.

**Action 2.18.1:** Enhance existing parklands and acquire new parkland where feasible to improve availability of green spaces and reduce risks from future urban heat island effects (UHIE).

**Action 2.18.2:** Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure.

**Action 2.18.3:** Provide appropriate space and design for recreational needs, including forms of productive recreation such as community gardening, city farms and farmers markets.

**Action 2.18.4:** Protect, enhance and restore the health and integrity of natural ecosystems such as urban forests and waterways.

### Policy 3. SEQ's planning processes must have strong adaptive capacity to improve decision-making to adapt to climate change.

**Program 3.1 Leadership development:** Leadership must be developed by encouraging strong partnerships across government, business and the community in order to improve communication of climate change risks to decision-makers and wider community.

**Action 3.1.1:** Establish a regional consortium for climate change adaptation facilitated through SEQ's Council of Mayors to define priorities for research, priority state climate adaptation research and monitoring needs, proposed resources and timeframes to implement actions and programs, and strategic planning, including regional policy statements to promote and/or improve adaptation to climate change impacts.

**Action 3.1.2:** Establish a working group within SEQ's Council of Mayors to improve collaboration across agencies and governments, including local government, state and federal agencies, for the implementation of climate change adaptation strategies.

**Action 3.1.3:** Ensure partnering agencies adopt a policy collaboration scheme to optimise the implementation of cross-border and cross-agency climate change adaptation strategies.

**Action 3.1.4:** Initiate a public education campaign to raise awareness and inform business and the community about climate change risks.

**Action 3.1.5:** Identify and support climate change champions.

**Program 3.2 Capacity building:** Local governments' capacity must continue to be built through improved knowledge and skills about climate change.

**Action 3.2.1:** Establish partnerships with research agencies to ensure the best available science informs climate adaptation decision-making.

**Action 3.2.2:** Compile and disseminate strategies, tools and information generated through partnerships for use by local governments when updating their local and general plans and to inform public discussion on climate change risks.

**Action 3.2.3:** Establish institutional collaboration between larger and smaller local authorities within the region to provide mentoring programs for staff focused on climate change adaptation.

**Action 3.2.4:** Implement training and individual development programs for staff focused on identifying and evaluating climate risks.

**Action 3.2.5:** Implement an adaptive management cycle focused on a monitoring, evaluation and report (MER) approach to enable decision-makers to learn from successes and failures when developing and implementing climate change adaptation initiatives/strategies.

**Program 3.3 Risk communication on climate change:** Communication of climate change risks to decision-makers and wider community (flooding, storm surge, heatwave and sea level rise) must be improved.

**Action 3.3.1:** Establish a partnership between pertinent federal and state agencies and the research community to develop a database of information related to climate change risks to be used by decision-makers to reduce climate change impacts.

**Action 3.3.2:** Develop and implement a communication and engagement strategy with vulnerable communities to examine adaptive strategies available to state and local agencies to prepare for potential climate change impacts.

**Program 3.4 Risk allocation mechanisms:** Climate change risks must be incorporated into decision-making processes.

**Action 3.4.1:** Implement a hazard avoidance policy adopting the most risk-averse approach for minimizing the adverse effects of climate change to carefully consider new development within areas vulnerable to climate change impacts, and to consider prohibiting development of undeveloped, vulnerable areas containing critical habitat or opportunities for habitat creation.

**Action 3.4.2:** Integrate climate risk and adaptation assessments into business and community planning.

**Action 3.4.3:** Integrate climate risks and adaptation into existing and emerging policy and planning frameworks and strategies in key socio-economical and environmental areas.

**Action 3.4.4:** Accept losses where there are no other acceptable or feasible options. Losses could be related to habitats and/or ecosystems; individuals' property and financial losses following extreme weather events; public assets; insurance companies' losses as part of their business.

**Action 3.4.5:** Define responsibilities for losses or risks across governments, private sector and insurance companies.

**Action 3.4.6:** Provide incentives that promote risk adverse behaviour when purchasing and developing properties. This would include linking financial terms and conditions to climate risk and subsidising technologies that are consistent with contributing to avoiding or reducing climate risks.

**Action 3.4.7:** Define developers' responsibilities in development located in vulnerable areas in the next 50 years (e.g. fee to cover the costs of potential emergency response, or to improve resilience of infrastructure that services the new development to natural hazards; developer must design the new development and its supporting infrastructure to be more resilient to natural hazards).

**Action 3.4.8:** Define landowners' responsibilities in locations subject to natural hazards in the next 50 (e.g. landowner agrees to retrofit properties, undertake measures to reduce impacts from natural hazards).

**Action 3.4.9:** Develop regulatory policies for insurance companies to guide private insurers in dealing with properties located in areas vulnerable to climate change impacts, including natural hazards.

**Action 3.4.10:** Investigate the feasibility of establishing partnerships between government and insurance companies to determine conditions to guide insurance of private and public assets based on improved risk mitigation mechanisms (e.g. flood mitigation plans are developed and implemented to reduce the risk of recurrent floods in low-lying areas).

**Program 3.5 Professional and sub-professional education and training:** A mandatory training program is created to educate professionals and sub-professionals in relevant fields (e.g. planning, architecture, surveying, building certification, real estate agents, engineering, and construction management) on the need to incorporate adaptation to climate change and natural hazards as a basis for establishing design criteria for new infrastructure and housing estates.

**Action 3.5.1:** Encourage universities, vocational training and TAFE colleges in SEQ to develop educational programs for building design and construction professionals, planners, and those in other pertinent fields such as real estate agents, focusing on vulnerability to climate change and adaptation methodologies.

**Action 3.5.2:** Include compulsory training on climate change as part of professional and sub-professional membership accreditation and certification (e.g. PIA, EIANZ, AILA).

**Action 3.5.3:** Implement continued professional development programs for professionals and sub-professional focused on identifying and evaluating climate risks.

**Action 3.5.4:** Promote climate change awareness through education and training (formal and informal), including integration into curriculum and targeted programs or activities.

**Program 3.6 Anticipatory planning response:** The vulnerability of existing settlements in SEQ to climate change-exacerbated hazards, including natural hazards must be reduced through pro-active action.

**Action 3.6.1:** Assess the vulnerability, socially and physically, of existing settlements in SEQ to climate change impacts, including natural hazards.

**Action 3.6.2:** Reduce vulnerability of identified areas by encouraging the retrofitting of private properties at low and medium risk from climate change impacts, including natural hazards.

**Action 3.6.3:** Reduce vulnerability of identified areas by encouraging the relocation of building structures and infrastructure at high risk from climate change impacts, including natural hazards, whilst ensuring communities continue to have access to emergency and health services and facilities.

**Action 3.6.4:** Reduce vulnerability of identified areas by acquiring high risk properties through voluntary land acquisition, rolling easements, transfer of development rights, and/or purchase of development rights.

**Action 3.6.5:** Establish partnerships with the private sector (development industry, insurance companies, real estate agencies) to increase leadership capacity of local governments to undertake anticipatory planning responses to address climate change impacts, including natural hazards.

**Action 3.6.6:** Establish an engagement and communication strategy to consult with communities at risk.

**Action 3.6.7:** Implement state legislation to afford protection from legal liability to local councils where they provide advice or make a decision in good faith relating to anticipatory planning response to address climate change impacts, including natural hazards.

**Action 3.6.8:** Ensure state and local governments develop a long term post-disaster recovery plan. This plan should identify policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of a community after a disaster.

**Action 3.6.9:** Integrate long term post-disaster recovery considerations into pre-disaster plans of government agencies leading recovery processes.

**UPM POLICY 1.** The statutory and non-statutory planning processes must seek to minimise the vulnerability of coastal landscapes to storm tide and sea level rise inundation, coastal erosion, cyclones and severe winds, severe storms and hail, and flooding.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well the Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc.)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (Policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - statutory planning	<b>State government</b> , local government, private sector (developers)	Coastal settlements	Current and future coastal communities and assets will be protected from the risks of coastal hazards in the future under rising sea levels and changing storm patterns. Reduced costs linked to damage to public and private assets.	Difficulty in identifying low-risk areas for future growth. Encroaching of rural/agricultural and conservation areas to accommodate future urban and population growth.	Department of Infrastructure and Planning (2009), <i>South East Queensland Regional Plan 2009-2031</i> , the State of Queensland.



**PROGRAM 1.1 CONSOLIDATION OF URBAN DEVELOPMENT:** Urban development is consolidated by favouring infill and redevelopment of existing urban areas to minimise the extent of development occurring in highly vulnerable coastal areas.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	Medium

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	Low	Low	High	High	High	Low	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc.)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - through statutory planning	<b>State government</b> , local governments, private sector	Coastal settlements	Ongoing	Immediate	EM 2.1, 2.2, 2.3, 4.1 PI 1.1, 1.2, 2.1, 2.2  UPM 1.1, 1.2, 1.6, 1.7, 1.8, 1.9, 1.10, 1.14, 1.16, 1.17, 1.18, 2.2, 2.7, 2.8, 2.9, 2.10, 2.14	SPP for Coastal Protection (QLD); National Coastal Adaptation Agenda (DCCEE 2010)

**Action 1.1.1:** Assess the vulnerability, socially and physically, to coastal hazards of areas designated to accommodate future population growth, including transit oriented developments (TODs).

**Action 1.1.2:** Identify and monitor areas that require special protection and/or defence.

**Action 1.1.3:** Establish special zoning and performance criteria for building structures located in areas at risk to withstand coastal hazards.

**Action 1.1.4:** Define zones within new development that should have limited density and intensity determined by their level of risk and ensure structures are designed or retrofitted to be more resilient to flood impacts.

**Action 1.1.5:** Identify areas for land use conversion that incorporate projected coastal hazards threats in the next 50 to 100 years.

**Action 1.1.6:** Define developers' responsibilities in land use development of areas subject to coastal hazards in the next 50 to 100 years. (e.g. fee to cover the costs of potential emergency response, future armouring, to mitigate impacts to natural habitats from future armouring, or to improve flood resilience of infrastructure that services the new development (developer must design the new development and its supporting infrastructure to be more resilient to flood impacts. For example, permits could require that roads be elevated and that sewer lines be more resilient to floods.)

**Action 1.1.7:** Define landowners' responsibilities in locations subject to coastal hazards in the next 50 to 100 years (e.g. landowner agrees to remove structures when they become inundated due to encroachment. As the seas rise, the boundary between private lands and public beaches (the tide line) will be pushed inland. This type of condition allows landowners to develop property but with the expectation that development will eventually have to cede to the rising seas; landowner dedicates an easement to preserve natural buffers, floodways, or to provide public access).

**Action 1.1.8:** Ensure siting of essential public assets outside areas at risk and/ or in vulnerable areas with low risk of flooding whilst avoiding the isolation of communities.

**Action 1.1.9:** Ensure essential infrastructure is decentralised and/or are equipped with redundancy and back-up systems.

**Action 1.1.10:** Ensure infill and redevelopment of existing urban areas take into account the provision of evacuation routes and shelters to minimise the vulnerability of communities to coastal hazards, including storm tides, coastal inundation and flooding.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.1 Consolidation of urban development:</b> Urban development is consolidated by favouring infill and redevelopment of existing urban areas to minimise the extent of development occurring in highly vulnerable coastal areas.					
<b>Action Implementation</b>					
<b>Action 1.1.1:</b> Assess the vulnerability, socially and physically, to coastal hazards of areas designated to accommodate future population growth, including transit oriented developments (TODs).	Advice - Cross-agency working group to guide identification of indicators and mapping	<b>State government</b> (planning, environment, communities, community & disability services), local governments	Ongoing	UPM 1.2.1, 1.3.1, 1.6.1, 1.6.4, 1.7.1, 1.8.1, 1.10.1, 1.16, 1.18.1, 2.1.1, 2.2.1, 2.3.1, 2.7.1, 2.8.1, 2.10.1, 2.13	NSW Department of Planning (2010) <i>NSW Coastal Planning Guidelines: Adapting to Sea level Rise</i> , NSW Government.
<b>Action 1.1.2:</b> Identify and monitor areas that require special protection and/or defence.	Policy - Regional level statute established under the advice of cross-agency working group	<b>State government</b> (planning and environment), local governments	Episodic	UPM 2.1.2, 1.8.3, 2.2.2	
<b>Action 1.1.3:</b> Establish special zoning and performance criteria for building structures located in areas at risk to withstand coastal hazards.	Regulation - Statutory through inclusion in planning schemes	<b>Local government</b>	Ongoing	UPM 1.4, 1.5, 1.11, 1.12, 2.1.3, 2.4, 2.5, 2.11, 2.12, 2.4, 2.5	
<b>Action 1.1.4:</b> Define zones within new development that should have limited density and intensity determined by their level of risk and ensure structures are designed or retrofitted to be more resilient to flood impacts.	Regulation - Statutory through inclusion in planning schemes	<b>Local government</b>	Ongoing	UPM 1.5, 1.11, 1.12, 2.1.4, 2.6, 2.11, 2.12	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center.
<b>Action 1.1.5:</b> Identify areas for land use conversion that incorporate projected coastal hazards threats in the next 50 to 100 years.	Regulation - Statutory through inclusion in planning schemes	<b>State government</b> (planning and environment), local governments, developers	Ongoing	UPM 1.16, 2.1.5, 2.15, 2.14	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.1.6:</b> Define developers' responsibilities in land use development of areas subject to coastal hazards in the next 50 to 100 years. (e.g. fee to cover the costs of potential emergency response, future armouring, to mitigate impacts to natural habitats from future armouring, or to improve flood resilience of infrastructure that services the new development (developer must design the new development and its supporting infrastructure to be more resilient to flood impacts. For example, permits could require that roads be elevated and that sewer lines be more resilient to floods.)	Regulation - Statutory through inclusion in SPA and SPPs (potential funding contribution to compensate costs through infrastructure charges)	<b>State government</b> , developers	Ongoing	UPM 2.1.6, 3.4	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center.
<b>Action 1.1.7:</b> Define landowners' responsibilities in locations subject to coastal hazards in the next 50 to 100 years (e.g. landowner agrees to remove structures when they become inundated due to encroachment. As the seas rise, the boundary between private lands and public beaches (the tide line) will be pushed inland. This type of condition allows landowners to develop property but with the expectation that development will eventually have to cede to the rising seas; landowner dedicates an easement to preserve natural buffers, floodways, or to provide public access).	Regulation - Statutory through inclusion in SPA and SPPs in combination with incentives such as rebate schemes	<b>State government</b> , local governments, developers, landowners	Ongoing	UPM 1.18.7, 2.1.7, 2.15.7, 2.16.7, 2.17.6, 3.4	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.1.8:</b> Ensure siting of essential public assets outside areas at risk and/ or in vulnerable areas with low risk of flooding whilst avoiding the isolation of communities.	Regulation - Statutory through inclusion in planning schemes	<b>Local governments</b> , state government, private sector	Ongoing	UPM 1.2, 2.2, 2.1.8,	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 1.1.9:</b> Ensure essential infrastructure is decentralised and/or are equipped with redundancy and back-up systems.	Regulation - Statutory through inclusion of conditions into planning schemes	<b>State government</b> (planning), local governments, private sector	Ongoing	UPM 1.1.9, 1.10, 2.2, 2.8, 2.10, 2.10	Committee on Climate Change and U.S. Transportation (2008) <i>Potential impacts of climate change on U.S. transportation</i> , Committee on Climate Change and U.S. Transportation, Transportation Research Board and Division on Earth and Life Studies, National Research Council of the National Academies

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.1.10:</b> Ensure infill and redevelopment of existing urban areas take into account the provision of evacuation routes and shelters to minimise the vulnerability of communities to coastal hazards, including storm tides, coastal inundation and flooding.	Policy - Statutory through inclusion of conditions into planning schemes	<b>Local governments</b>	Ongoing	UPM 1.7, 1.10, 2.1.10, 2.8	

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.1.1:</b> Assess the vulnerability, socially and physically, to coastal hazards of areas designated to accommodate future population growth, including transit oriented developments (TODs).	Vulnerability assessment completed and periodically reviewed	Planning Schemes, SEQ Regional Plan and SPP reviews	<b>State government</b> , local governments,
<b>Action 1.1.2:</b> Identify and monitor areas that require special protection and/or defence.	Areas identified for protection receive appropriate defence mechanisms	Planning Schemes, SEQ Regional Plan reviews	<b>State government</b> , local governments,
<b>Action 1.1.3:</b> Establish special zoning and performance criteria for building structures located in areas at risk to withstand coastal hazards.	Development in identified areas are implemented according to updated zoning and performance criteria	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government,
<b>Action 1.1.4:</b> Define zones within new development that should have limited density and intensity determined by their level of risk and ensure structures are designed or retrofitted to be more resilient to flood impacts.	Developments follow criteria and diversify density and intensity based on their degree of vulnerability	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government, developers
<b>Action 1.1.5:</b> Identify areas for land use conversion that incorporate projected coastal hazards threats in the next 50 to 100 years.	Areas for land use conversion are identified and communicated to stakeholders	Planning Schemes, SEQ Regional Plan reviews	<b>State government</b> , local governments, developers

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.1.6:</b> Define developers' responsibilities in land use development of areas subject to coastal hazards in the next 50 to 100 years. (e.g. fee to cover the costs of potential emergency response, future armouring, to mitigate impacts to natural habitats from future armouring, or to improve flood resilience of infrastructure that services the new development (developer must design the new development and its supporting infrastructure to be more resilient to flood impacts. For example, permits could require that roads be elevated and that sewer lines be more resilient to floods.)	Developers' responsibilities are clearly identified and regulated by state legislation	SPA review	<b>State government</b> , local governments, developers
<b>Action 1.1.7:</b> Define landowners' responsibilities in locations subject to coastal hazards in the next 50 to 100 years (e.g. landowner agrees to remove structures when they become inundated due to encroachment. As the seas rise, the boundary between private lands and public beaches (the tide line) will be pushed inland. This type of condition allows landowners to develop property but with the expectation that development will eventually have to cede to the rising seas; landowner dedicates an easement to preserve natural buffers, floodways, or to provide public access).	Landowners' responsibilities are clearly identified and regulated by state legislation	SPA review	<b>State government</b> , local governments, landowners
<b>Action 1.1.8:</b> Ensure siting of essential public assets outside areas at risk and/ or in vulnerable areas with low risk of flooding whilst avoiding the isolation of communities.	Essential infrastructure are sited outside areas at risk	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government, private sector
<b>Action 1.1.9:</b> Ensure essential infrastructure is decentralised and/or are equipped with redundancy and back-up systems.	Number of decentralise services and systems	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government, private sector
<b>Action 1.1.10:</b> Ensure infill and redevelopment of existing urban areas take into account the provision of evacuation routes and shelters to minimise the vulnerability of communities to coastal hazards, including storm tides, coastal inundation and flooding.	Number of evacuation routes and shelters established	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government, private sector

**PROGRAM 1.2 INFRASTRUCTURE SITES:** Essential infrastructure sites and corridors are identified, protected and managed from climate change impacts.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	High	High	High	Low	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - statutory planning	<b>State government</b> , local governments, private sector	All settlements	Ongoing	Immediate	EM 2.1, 2.2, 2.3 CM 1.1.1, 1.1.2, 1.1.3, 1.2.1, 1.2.2, 1.2.3; PI 1.1, 1.2, 2.1, 2.2 UPM 1.6, 1.7, 1.8, 1.14, 1.16, 1.18, 2.2, 2.7, 2.8, 2.10, 2.14,	SEQ Regional Plan; QLD Infrastructure Plan; Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.

**Action 1.2.1:** Conduct inventory to identify the vulnerability of essential infrastructure sites and corridors to coastal hazards.

**Action 1.2.2:** Define protection zones, i.e. areas with essential public assets that permit coastal armouring and/or being elevated.

**Action 1.2.3:** Ensure proposed essential infrastructure sites and corridors are sited outside coastal risk areas.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (e.g. one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.2. Infrastructure sites:</b> Essential infrastructure sites and corridors are identified, protected and managed from climate change impacts.					
<b>Action Implementation</b>					
<b>Action 1.2.1:</b> Conduct inventory to identify the vulnerability of essential infrastructure sites and corridors to coastal hazards.	Advice - State-led working group in collaboration with local governments and private sector	<b>State government</b> (planning), local government, private sector (infrastructure owners)	Episodic	UPM 1.1.1, 1.6.1, 1.7.1, 1.10.1, 1.14, 1.17.1, 1.18.1, 2.1.1, 2.2.1, 2.7.1, 2.8.1, 2.10.1, 2.12, 2.13, 2.14, 2.15.1, 2.16.1, 2.17.1	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 1.2.2:</b> Define protection zones, i.e. areas with essential public assets that permit coastal armouring and/or being elevated.	Regulation - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>State government</b> (planning), local government, private sector (infrastructure owners)	Episodic	UPM 1.1.2, 1.8, 1.17, 1.18.2, 2.1.2, 2.2.2, 2.15.2, 2.16.2	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center; San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 1.2.3:</b> Ensure proposed essential infrastructure sites and corridors are sited outside coastal risk areas.	Policy - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>State government</b> (planning), local government, private sector (infrastructure owners)	Ongoing	UPM 1.1, 1.7, 1.10, 1.14, 2.1, 2.2.3, 2.8, 2.10	NSW Department of Planning (2010) <i>NSW Coastal Planning Guidelines: Adapting to Sea level Rise</i> , NSW Government.

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.2.1:</b> Conduct inventory to identify the vulnerability of essential infrastructure sites and corridors to coastal hazards.	Inventory accomplished	Planning schemes and regional plan reviews	<b>State government</b> local government, private sector (infrastructure owners and providers)
<b>Action 1.2.2:</b> Define protection zones, i.e. areas with essential public assets that permit coastal armouring and/or being elevated.	Protection zones identified	Planning schemes and regional plan reviews	<b>State government</b> local government, private sector (infrastructure owners and providers)
<b>Action 1.2.3:</b> Ensure proposed essential infrastructure sites and corridors are sited outside coastal risk areas.	Sites area assessed against defined risks	Planning schemes and regional plan reviews	<b>State government</b> local government, private sector (infrastructure owners and providers)

**PROGRAM 1.3 COMMUNITY PLANNING:** Residential accommodation, which is designed and located to integrate with the surrounding community, is provided to meet the specific needs of youth, the aged, people with disabilities and other disadvantaged groups to minimise their vulnerability to coastal hazards.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - statutory planning	<b>Local government</b> , state government, private sector	All settlements	ongoing	Immediate	EM 2.1, 2.2, 2.3, 4.1; HH 2.1  UPM 1.5, 1.6, 1.7, 1.10, 1.18, 2.3, 2.6, 2.7, 2.8, 2.10, 2.15, 2.16, 2.17  PI 1.1, 2.1	Gold Coast City Council Planning Scheme

**Action 1.3.1:** Conduct an inventory in partnership with health and emergency management agencies to identify areas within the community that have a high concentration of vulnerable groups.

**Action 1.3.2:** Calculate and allocate funds to assist vulnerable groups to retrofit their residences to be more resilient to coastal hazards.

**Action 1.3.3:** Determine, based on inventory, as to whether localities require the establishment of shelters, including public cool spaces, to protect community from extreme weather events.

**Action 1.3.4:** Ensure new development provide adequate number of residential accommodation that caters for the needs of vulnerable groups, including the assessment of the need for shelters for extreme weather events.

**Action 1.3.5:** Ensure residents are familiar with evacuation procedures in case of extreme weather events.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.3 Community planning:</b> Residential accommodation, which is designed and located to integrate with the surrounding community, must be provided to meet the specific needs of youth, the aged, people with disabilities and other disadvantaged groups to minimise their vulnerability to coastal hazards.					
<b>Action Implementation</b>					
<b>Action 1.3.1:</b> Conduct an inventory in partnership with health and emergency management agencies to identify areas within the community that have a high concentration of vulnerable groups.	Advice - Cross-agency/ government working group in collaboration with NGOs	<b>Local government (LGAQ)</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)	Ongoing	UPM 2.3.1	
<b>Action 1.3.2:</b> Calculate and allocate funds to assist vulnerable groups to retrofit their residences to be more resilient to coastal hazards.	Incentives funded by private sector and government contributions (rates, levies, state government contributions)	<b>Local government</b> , state government	Episodic	UPM 1.5.3, 2.3.2, 2.6.3, 2.15.4, 2.16.4, 2.17.4	
<b>Action 1.3.3:</b> Determine, based on inventory, as to whether localities require the establishment of shelters, including public cool spaces, to protect community from extreme weather events.	Advice - Cross-agency/ government working group in collaboration with NGOs	<b>Local government (LGAQ)</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)	Ongoing	UPM 2.3.3	
<b>Action 1.3.4:</b> Ensure new development provide adequate number of residential accommodation that caters for the needs of vulnerable groups, including the assessment of the need for shelters for extreme weather events.	Policy - Statutory through inclusion in planning schemes	<b>Local government</b> , state government, private sector (developers)	Episodic	UPM 1.1; 2.1, 2.3.4; HH 2.2	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or “original” (incl. modified)
<b>Action 1.3.5:</b> Ensure residents are familiar with evacuation procedures in case of extreme weather events.	Guideline - Educational and awareness campaign	<b>Local government</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)	Ongoing	UPM 1.18.8, 2.3.5, 2.15.7, 2.16.7, 2.17.6	

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.3.1:</b> Conduct an inventory in partnership with health and emergency management agencies to identify areas within the community that have a high concentration of vulnerable groups.	Completion of inventory	In parallel with planning scheme review periods	<b>Local government</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)
<b>Action 1.3.2:</b> Calculate and allocate funds to assist vulnerable groups to retrofit their residences to be more resilient to coastal hazards.	Increase in funding allocation due to increased political / community awareness of the benefits of retrofitting; Number of households / residences engaged in retrofitting		<b>Local government</b> , state government
<b>Action 1.3.3:</b> Determine, based on inventory, as to whether localities require the establishment of shelters, including public cool spaces, to protect community from extreme weather events.	Reduced vulnerability of disadvantaged social groups in	M&E based on extreme weather events	<b>Local government</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)
<b>Action 1.3.4:</b> Ensure new development provide adequate number of residential accommodation that caters for the needs of vulnerable groups, including the assessment of the need for shelters for extreme weather events.	Improved social cohesion and equity within local community – less social polarisation;  Decrease in proportion / number of vulnerable groups at risk from climate change impacts or reduced vulnerability of disadvantaged social groups	In parallel with planning scheme review periods	<b>Local government</b> , state government, private sector

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.3.5:</b> Ensure residents are familiar with evacuation procedures in case of extreme weather events.	Awareness and educational campaigns are implemented;  Percentage of households aware of evacuation procedures		<b>Local government</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)

**PROGRAM 1.4 BUILDING CODE DESIGN CRITERIA:** Building codes are reviewed to incorporate design criteria for buildings to resist future loads that may result from the impact of climate change-exacerbated hazards during a minimum service life of 50 years.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	Low	Low	High	High	High	High	Low	High	Low	Low



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through review and amendment of Building Code of Australia	<b>Building Regulations Advisory Committee</b> , local government, state government, developers	All settlements	Episodic	Immediate	UPM 1.5, 2.4, 2.5, 2.6 PI 2.2	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

**Action 1.4.1:** Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located along canals and waterways provide for setbacks from the waterway and have 500mm freeboard measurement above a projected site-specific flood level.

**Action 1.4.2:** Require special foundations that are more resilient to erosion and wave impacts and use of flood-resilient construction materials.

**Action 1.4.3:** Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to coastal hazards damage.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.4 Building code design criteria:</b> Building codes are reviewed to incorporate design criteria for buildings to resist future loads that may result from the impact of climate change-exacerbated hazards during a minimum service life of 50 years.					
<b>Action Implementation</b>					
<b>Action 1.4.1:</b> Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located along canals and waterways provide for setbacks from the waterway and have 500mm freeboard measurement above a projected site-specific flood level.	Code - Statutory through inclusion into planning schemes	<b>Local government (LGAQ)</b> , developers, landowners	Ongoing	UPM 1.1, 1.11, 1.12, 1.5, 2.5	Gold Coast City Council Planning Scheme
<b>Action 1.4.2:</b> Require special foundations that are more resilient to erosion and wave impacts and use of flood-resilient construction materials.	Code - Statutory through inclusion into planning schemes	<b>Local government (LGAQ)</b> , developers, landowners	Ongoing	UPM 2.11, 2.12	Maryland Commission on Climate Change Adaptation and Response Working Group (2008), <i>Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change Phase I: Sea-level Rise and Coastal Storms</i> , ch. 5
<b>Action 1.4.3:</b> Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to coastal hazards damage.	Incentives for homeowners funded by private sector and government contributions (rates, levies)	<b>Local government</b> , state government, developers, Building Authorities	Ongoing	UPM 1.5.5, 1.17, 1.18, 2.4.3, 2.5.3, 2.6.5, 2.15.3, 2.16.3, 2.17.3	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.4.1:</b> Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located along canals and waterways provide for setbacks from the waterway and have 500mm freeboard measurement above a projected site-specific flood level.	Number of buildings adhering to regulations	Planning scheme reviews	<b>Local government</b> , developers, landowners
<b>Action 1.4.2:</b> Require special foundations that are more resilient to erosion and wave impacts and use of flood-resilient construction materials.	Number o constructions adhering to regulations	Planning schemes reviews	<b>Local government</b> , developers, landowners
<b>Action 1.4.3:</b> Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to coastal hazards damage.	Number of households using scheme		<b>Local government</b> , developers, landowners

**PROGRAM 1.5 RETROFITTING OF RESIDENTIAL PROPERTIES:** A program to assist households to retrofit high risk homes is created to reduce or eliminate damage caused by flooding as a result of sea level rise and coastal storm surge events.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy - Statutory	<b>State government</b> , local government	Coastal settlements	Ongoing	Immediate	CM 4.2 PI 1.1, 2.1 UPM 2.6	UK adaptation Sub-Committee; Stakeholder feedback

**Action 1.5.1:** Conduct a comprehensive inventory to determine the physical number and nature of buildings (residential and commercial) threatened by coastal inundation due to rising sea levels and storm surge to estimate cost of retrofitting properties.

**Action 1.5.2:** Define areas that require priority actions, including retrofitting of properties at risk.

**Action 1.5.3:** Establish funding mechanisms to support retrofitting of properties and buy back schemes, e.g. federal and state government and private sector.

**Action 1.5.4:** Create household funding metrics based on households' vulnerability (e.g. high risk properties and socio-economic disadvantage).

**Action 1.5.5:** Create an inspection services scheme for homeowners in high risk areas to help them identify ways in which they could retrofit their homes to make them more resilient to coastal hazards.

**Action 1.5.6:** Create incentives/rebates packages to property owners for the retrofitting of properties threatened by coastal hazards and/or ear-marked for planned retreat.

**Action 1.5.7:** Provide financial assistance to local governments to retrofit homes that have been repetitively damaged by coastal hazards, demolish damaged homes, elevate essential public assets, and move essential public assets. (FEMA)

**Action 1.5.8:** Establish partnership with insurance companies to map properties at risk of coastal hazards and establish thresholds to guide insurance premiums.

**Action 1.5.9:** Identify barriers and opportunities for retrofitting program based on household tenure (e.g. rental properties, first home, second home).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.5 Retrofitting of residential properties:</b> A program to assist households to retrofit high risk homes is created to reduce or eliminate damage caused by flooding as a result of sea level rise and coastal storm surge events.					
<b>Action Implementation</b>					
<b>Action 1.5.1:</b> Conduct a comprehensive inventory to determine the physical number and nature of buildings (residential and commercial) threatened by coastal inundation due to rising sea levels and storm surge to estimate cost of retrofitting properties.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> (planning, environment, communities), local government, private sector (developers and insurance companies)	Episodic	UPM 1.1.1, 1.3.1, 1.17.1, 1.18.1, 2.1.1, 2.3.1, 2.15.1, 2.16.1, 2.17.1	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i> ; Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 1.5.2:</b> Define areas that require priority actions, including retrofitting of properties at risk.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> (planning), local government	Ongoing	UPM 1.1.2, 1.1.4, 1.17.2, 1.18.2, 2.1.2, 2.2.4, 2.15.2, 2.16.2, 2.17.2	
<b>Action 1.5.3:</b> Establish funding mechanisms to support retrofitting of properties and buy back schemes, e.g. federal and state government and private sector.	Incentives funded by private sector and government contributions (rates, competitive grants and/or levies)	<b>State government</b> , Federal government, local government and private sector	Episodic	UPM 1.17.4, 1.18.4, 2.6.3, 2.15.4, 2.16.4, 2.17.4	
<b>Action 1.5.4:</b> Create household funding metrics based on households' vulnerability (e.g. high risk properties and socio-economic disadvantage).	Advice - Cross-agency/ government working group in collaboration with NGOs (e.g. Red Cross, QCOSS)	<b>State government</b> (community & disability services), NGOs (e.g. Red Cross, QCOSS)	Episodic	UPM 2.5.4	
<b>Action 1.5.5:</b> Create an inspection services scheme for homeowners in high risk areas to help them identify ways in which they could retrofit their homes to make them more resilient to coastal hazards.	Incentives for homeowners funded by private sector and government contributions	<b>State government</b> , local government and private sector	Ongoing	UPM 1.4.3, 1.17.3, 1.18.3, 2.4.3, 2.5.5, 2.6.5, 2.15.3, 2.16.3, 2.17.3	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.5.6:</b> Create incentives/rebates packages to property owners for the retrofitting of properties threatened by coastal hazards and/or ear-marked for planned retreat.	Incentives for homeowners funded by private sector and government contributions	<b>State government</b> , local government and private sector	Ongoing	UPM 1.5.5, 1.11, 1.12, 2.11, 2.12	
<b>Action 1.5.7:</b> Provide financial assistance to local governments to retrofit homes that have been repetitively damaged by coastal hazards, demolish damaged homes, elevate essential public assets, and move essential public assets.	Regulation - Statutory through inclusion into state and national disaster recovery arrangements	<b>State government</b> , Federal government	Ongoing	UPM 1.15.1, 2.6.7	FEMA, <i>Hazard Mitigation Assistance Unified Guidance</i> at 11-14 (Jun. 2010)
<b>Action 1.5.8:</b> Establish partnership with insurance companies to map properties at risk of coastal hazards and establish thresholds to guide insurance premiums.	Advice - Cross-agency/ government working group in collaboration with insurance companies	<b>State government</b> , Federal government, local government and insurance companies	Episodic	UPM 1.9.2, 2.6.8, 2.9.2	
<b>Action 1.5.9:</b> Identify barriers and opportunities for retrofitting program based on household tenure (e.g. rental properties, first home, second home).	Advice - Cross-agency/ government working group in collaboration with NGOs (e.g. Red Cross, QCOSS)	<b>State government</b> (community & disability services), NGOs (e.g. Red Cross, QCOSS)	Ongoing	UPM 2.6.9	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.5.1:</b> Conduct a comprehensive inventory to determine the physical number and nature of buildings (residential and commercial) threatened by coastal inundation due to rising sea levels and storm surge to estimate cost of retrofitting properties.	Completion of inventory	Retrofitting program included in planning scheme review cycles	<b>State government</b> , local government, private sector (developers and insurance companies)
<b>Action 1.5.2:</b> Define areas that require priority actions, including retrofitting of properties at risk.	Decrease in the number of properties requiring priority action	Regional plan and planning scheme reviews	<b>State government</b> , local government
<b>Action 1.5.3:</b> Establish funding mechanisms to support retrofitting of properties and buy back schemes, e.g. federal and state government and private sector.	Actual contribution from different government levels and private sector; Number of funding options available		State and local governments, insurance companies
<b>Action 1.5.4:</b> Create household funding metrics based on households' vulnerability (e.g. high risk properties and socio-economic disadvantage).	Funding metrics established		<b>State government</b> and NGOs (e.g. Red Cross, QCOSS)
<b>Action 1.5.5:</b> Create an inspection services scheme for homeowners in high risk areas to help them identify ways in which they could retrofit their homes to make them more resilient to coastal hazards.	Inspection scheme created; Number of households accessing scheme		<b>State government</b> , local government, homeowners
<b>Action 1.5.6:</b> Create incentives/rebates packages to property owners for the retrofitting of properties threatened by coastal hazards and/or ear-marked for planned retreat.	Amount of financial resources allocated to incentive and rebates yearly; number of households benefiting from incentives/rebates (i.e. engaged in retrofitting activities)		<b>State government</b> , local government
<b>Action 1.5.7:</b> Provide financial assistance to local governments to retrofit homes that have been repetitively damaged by coastal hazards, demolish damaged homes, elevate essential public assets, and move essential public assets.	Actual contribution state and federal government, and private sector		<b>State government</b> , Federal government
<b>Action 1.5.8:</b> Establish partnership with insurance companies to map properties at risk of coastal hazards and establish thresholds to guide insurance premiums.	Partnerships established and regulated		<b>State government</b> , Federal government, local government and insurance companies
<b>Action 1.5.9:</b> Identify barriers and opportunities for retrofitting program based on household tenure (e.g. rental properties, first home, second home).	Number of retrofitted houses based on household tenure		<b>State government</b> and NGOs (e.g. Red Cross, QCOSS)



**PROGRAM 1.6 PLANNED RETREAT:** Building structures, infrastructure and public facilities in areas adjacent to receding shorelines are sited landward and/ or relocated.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	High	Medium	Medium

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	High	High	Low	Low	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> , local governments	Coastal settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.2, 2.3 CM 3.1 PI 1.1, 2.1 UPM 1.7, 1.16, 2.7, 2.8, 2.14	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.; California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>

**Action 1.6.1:** Assess the vulnerability of existing urban areas to rising sea levels and storm surges.

**Action 1.6.2:** Establish a staging process to implement planned retreat of vulnerable areas whilst minimising adverse social impacts.

**Action 1.6.3:** Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, voluntary by-back schemes, rolling easements, transfer of development rights, purchase of development rights, tighter rules for setbacks and/or tax incentives.

**Action 1.6.4:** Limit or prohibit rebuilding of damaged structures in defined retreat areas.

**Action 1.6.5:** Identify suitable areas to accommodate the relocation of coastal communities/population at risk whilst ensuring emergency and health services and facilities continue to be provided to communities/population at risk.

**Action 1.6.6:** Establish an engagement and communication strategy to consult with coastal communities at risk.

**Action 1.6.7:** Encourage land owners to relocate structures through tax benefits, voluntary land acquisitions, or conservation easements schemes.

**Action 1.6.8:** Develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.

**Action 1.6.9:** Ensure the restoration and rehabilitation of areas post-retreat.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation on Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.6 Planned retreat:</b> Building structures, infrastructure and public facilities in areas adjacent to receding shorelines are sited landward and/ or relocated.					
<b>Action Implementation</b>					
<b>Action 1.6.1:</b> Assess the vulnerability of existing urban areas to rising sea levels and storm surges.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> , local government	Ongoing	UPM 1.1.1, 1.2.1, 1.5.1, 1.5.8, 1.7.1, 1.8.1, 1.10.1, 1.17.1, 1.18.1, 2.1.1, 2.2.1, 2.6.1, 2.7.1, 2.8.1, 2.10.1	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 1.6.2:</b> Establish a staging process to implement planned retreat of vulnerable areas whilst minimising adverse social impacts.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> , local government, private sector, landowners	Ongoing	UPM 1.7.3, 1.8.6, 1.10.5, 1.10.6, 1.15.2, 2.7.2, 2.8.3, 2.10.5, 2.10.6	(NZ example)
<b>Action 1.6.3:</b> Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, voluntary by-back schemes, rolling easements, transfer of development rights, purchase of development rights, tighter rules for setbacks and/or tax incentives.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> , local government, private sector, landowners	Episodic	UPM 1.13.6, 1.15.4, 1.17.5, 1.18.5	
<b>Action 1.6.4:</b> Limit or prohibit rebuilding of damaged structures in defined retreat areas.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local government (SEQ Council of Mayors)</b> , state government	Ongoing	UPM 1.16, 2.7.4, 2.14, 3.4.4	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.6.5:</b> Identify suitable areas to accommodate the relocation of coastal communities/population at risk whilst ensuring emergency and health services and facilities continue to be provided to communities/population at risk.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>Local government (SEQ Council of Mayors)</b> , state government, private sector (developers and insurance companies)	Episodic	UPM 1.1, 1.7, 1.10, 2.1, 2.7.5,	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.6.6:</b> Establish an engagement and communication strategy to consult with coastal communities at risk.	Policy - Statutory through inclusion into Regional Plan, SPP for coastal protection and planning schemes	<b>Local government</b> , state government, private sector	Ongoing	UPM 1.9.1, 1.7.4, 1.17.7, 1.18.7, 2.7.6, 2.8.4, 3.1.4, 3.4.8	
<b>Action 1.6.7:</b> Encourage land owners to relocate structures through tax benefits, voluntary land acquisitions, or conservation easements schemes.	Incentives through funding provided by governments and private sector (tax rebates, rates, state government contributions)	<b>Local government</b> , state government, private sector	Ongoing	UPM 2.7.7	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.6.8:</b> Develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.	Regulation - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>State government</b>	Episodic	UPM 2.7.8, 3.4.9	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 1.6.9:</b> Ensure the restoration and rehabilitation of areas post-retreat.	Policy - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>Local government</b> , state government, private sector, community	Ongoing	UPM 1.6.8, 1.13, 1.15.3, 2.7.9, 3.4.4	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.6.1:</b> Assess the vulnerability of existing urban areas to rising sea levels and storm surges.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>State government</b> , local government
<b>Action 1.6.2:</b> Establish a staging process to implement planned retreat of vulnerable areas whilst minimising adverse social impacts.	Retreat plan established in consultation with community	Planning schemes and regional plan reviews	<b>State government</b> , local government, private sector, landowners
<b>Action 1.6.3:</b> Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, voluntary by-back schemes, rolling easements, transfer of development rights, purchase of development rights, tighter rules for setbacks and/or tax incentives.	Cost benefit analysis of different mechanisms completed and disseminated	Planning schemes and regional plan reviews	<b>State government</b> , local government, private sector, landowners
<b>Action 1.6.4:</b> Limit or prohibit rebuilding of damaged structures in defined retreat areas.	Highly vulnerable areas are gradually abandoned and/or converted to different use	Planning schemes and regional plan reviews	<b>Local government</b> , state government, landowners, developers
<b>Action 1.6.5:</b> Identify suitable areas to accommodate the relocation of coastal communities/population at risk whilst ensuring emergency and health services and facilities continue to be provided to communities/population at risk.	Suitable areas for relocation are identified and safeguarded for future development	Planning schemes and regional plan reviews	<b>Local government</b> , state government landowners, developers, insurance companies
<b>Action 1.6.6:</b> Establish an engagement and communication strategy to consult with coastal communities at risk.	Funds allocated to support schemes	Planning schemes and regional plan reviews	<b>Local government</b> , landowners, developers, insurance companies
<b>Action 1.6.7:</b> Encourage land owners to relocate structures through tax benefits, voluntary land acquisitions, or conservation easements schemes. (adaptation tool kit)	Insurance premiums and conditions are reviewed to support planned retreat	Planning schemes and regional plan reviews	<b>Local government</b> , state government, landowners, developers, insurance companies
<b>Action 1.6.8:</b> Develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.	Regulatory policies developed	SPA review cycle	<b>Local government</b> , state government
<b>Action 1.6.9:</b> Ensure the restoration and rehabilitation of areas post-retreat.	Number of habitats restored	Planning schemes and regional plan reviews	<b>Local government</b> , state government, private sector

**PROGRAM 1.7 STRATEGIC RELOCATION AND UPGRADE OF ESSENTIAL EMERGENCY AND HEALTH SERVICES:** Emergency and health services departments (e.g. disaster management warehouses, disaster coordination centres, evacuation centres, hospitals, aged care facilities) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks so they can continue to operate during emergencies. This should consider threats to communications, transport and water infrastructure.

### **Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	Low	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> , local governments	All settlements	Ongoing	Immediate	EM 2.3 CM 3.1 PI 1.1, 1.2, 2.1, 2.2 HH 3.2 UPM 1.6, 1.16, 2.7, 2.8, 2.14	

**Action 1.7.1:** Assess the vulnerability of essential emergency and health services to coastal hazards and conduct an inventory to determine which ones require upgrade and/or strategic relocation.

**Action 1.7.2:** Calculate and allocate funds for relocation and upgrading of essential emergency and health services.

**Action 1.7.3:** Establish a staging process to implement relocation and upgrade of essential emergency and health services.

**Action 1.7.4:** Consult with communities to strategically relocate and/or upgrade essential emergency and health services to ensure communities do not become disadvantaged in the process.

**Action 1.7.5:** Investigate feasibility of decentralisation of essential emergency and health services and facilities as a retreat option.

**Action 1.7.6:** Ensure strategic relocation and upgrade of essential emergency and health services are aligned with strategies forecasted for transportation and communication systems.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.7 Strategic relocation and upgrade of essential emergency and health services:</b> Emergency and health services departments (e.g. disaster management warehouses, disaster coordination centres, evacuation centres, hospitals, aged care facilities) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks so they can continue to operate during emergencies. This should consider threats to communications, transport and water infrastructure.					
<b>Action Implementation</b>					
<b>Action 1.7.1:</b> Assess the vulnerability of essential emergency and health services to coastal hazards and conduct an inventory to determine which ones require upgrade and/or strategic relocation.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> (planning, communities, health), local governments, private sector	Ongoing	UPM 1.1.1, 1.1.8, 1.6.1, 1.8.1, 1.10.1, 2.1.1, 2.1.8, 2.7.1, 2.8.1, 2.10.1	
<b>Action 1.7.2:</b> Calculate and allocate funds for relocation and upgrading of essential emergency and health services.	Incentives funded by private sector and government contributions (state government contributions)	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.10.2, 2.8.2, 2.10.2	
<b>Action 1.7.3:</b> Establish a staging process to implement relocation and upgrade of essential emergency and health services.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> (planning, communities, health), local governments, private sector	Ongoing	UPM 1.6.2, 1.10.5, 1.17.7, 1.17.8, 1.18.7, 1.18.8, 2.7.2, 2.8.3, 2.10.5	
<b>Action 1.7.4:</b> Consult with communities to strategically relocate and/or upgrade essential emergency and health services to ensure communities do not become disadvantaged in the process.	Policy - Statutory through inclusion into Regional Plan and planning schemes; educational campaign targeting communities	<b>Local government</b> , state governments, private sector	Ongoing	UPM 1.6.6, 2.8.4	
<b>Action 1.7.5:</b> Investigate feasibility of decentralisation of essential emergency and health services and facilities as a retreat option.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> (planning, communities, health), local governments, private sector	Episodic	HH 6.2.6; UPM 1.10.3, 2.8.5, 2.10.3	stakeholder workshop



<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.7.6:</b> Ensure strategic relocation and upgrade of essential emergency and health services are aligned with strategies forecasted for transportation and communication systems.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> (planning, communities, health, transport), local governments, private sector	Episodic	UPM 2.8.6	stakeholder workshop

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.7.1:</b> Assess the vulnerability of essential emergency and health services to coastal hazards and conduct an inventory to determine which ones require upgrade and/or strategic relocation.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>State government</b> (communities, health)
<b>Action 1.7.2:</b> Calculate and allocate funds for relocation and upgrading of essential emergency and health services.	Funds allocated for relocation and upgrading of services and facilities.		<b>State government</b> , local governments, private sector
<b>Action 1.7.3:</b> Establish a staging process to implement relocation and upgrade of essential emergency and health services.	Staging process developed	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 1.7.4:</b> Consult with communities to strategically relocate and/or upgrade essential emergency and health services to ensure communities do not become disadvantaged in the process.	Community consultation completed	Planning schemes and regional plan reviews	State and local governments, emergency and health agencies

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.7.5:</b> Investigate feasibility of decentralisation of essential emergency and health services and facilities as a retreat option.	Feasibility investigation completed	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 1.7.6:</b> Ensure strategic relocation and upgrade of essential emergency and health services are aligned with strategies forecasted for transportation and communication systems.	Alignment with other strategies achieved	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector

**PROGRAM 1.8 COASTAL DEFENCE:** Coastal defence mechanisms are implemented to provide continuing flood and erosion risk management due to storm tides and sea level rise.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
High	Low	High	Low

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	Low	Low	High	High	High	Low	High	Low	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> , local governments	Coastal settlements	Ongoing	Immediate	EM 2.1, 2.2 CM 2.1 PI 2.1	NSW Department of Planning (2010) <i>NSW Coastal Planning Guidelines: Adapting to Sea level Rise</i> , NSW Government; Lowe et al, <i>Using the TE2100 science scenarios</i> , UK Environmental Agency

**Action 1.8.1:** Asses the vulnerability of existing urban areas to rising sea levels and storm surges.

**Action 1.8.2:** Undertake comprehensive research and analysis to determine alternative solutions to defence mechanisms by assessing the engineering, economic, social and environmental aspects of whether or not selected sections of the coasts can or should be protected.

**Action 1.8.3:** Identify and define protection zones, i.e. areas with dense urban development that permit coastal armouring.

**Action 1.8.4:** Investigate the feasibility of different mechanisms used to implement and manage coastal defence, including soft and/or hard armouring techniques.

**Action 1.8.5:** Allocate funding to enable the construction and management of coastal defence structures.

**Action 1.8.6:** Establish a staging process for the implementation of coastal defence structures to protect identified areas at risk.

**Action 1.8.7:** Conduct a review of legislative frameworks to identify and conduct necessary amendments to enable implementation of coastal defence mechanisms.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.8 Coastal defence:</b> Coastal defence mechanisms are implemented to provide continuing flood and erosion risk management due to storm tides and sea level rise.					
<b>Action Implementation</b>					
<b>Action 1.8.1:</b> Asses the vulnerability of existing urban areas to rising sea levels and storm surges.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> (PLANNING, COMMUNITIES, ENVIRONMENT), local governments, private sector	Ongoing	UPM 1.1.1, 1.2.1, 1.6.1, 1.7.1, 1.10.1, 1.17.1, 1.18.1	
<b>Action 1.8.2:</b> Undertake comprehensive research and analysis to determine alternative solutions to defence mechanisms by assessing the engineering, economic, social and environmental aspects of whether or not selected sections of the coasts can or should be protected.	Advice - Cross-agency/ government working group in collaboration with research agencies and universities	<b>State government</b> , local government, research agencies	Ongoing	UPM 3.1.1, 3.2.1, 1.15.4	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.
<b>Action 1.8.3:</b> Identify and define protection zones, i.e. areas with dense urban development that permit coastal armouring.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>State government</b> , local government	Episodic	UPM 1.1.4, 1.2.2, 1.17.2, 1.18.2	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center; San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 1.8.4:</b> Investigate the feasibility of different mechanisms used to implement and manage coastal defence, including soft and/or hard armouring techniques.	Advice - Cross-agency/ government working group in collaboration with research agencies and universities, and private sector	<b>State government</b> , local government, research agencies and private sector	Episodic	UPM 1.13, 1.16	
<b>Action 1.8.5:</b> Allocate funding to enable the construction and management of coastal defence structures.	Incentive through funding from federal and state governments, and private sector (PPPs)	<b>State government</b> , local government	Episodic		
<b>Action 1.8.6:</b> Establish a staging process for the implementation of coastal defence structures to protect identified areas at risk.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>Local government (SEQ Council of Mayors)</b> , state government	Ongoing	UPM 1.6.2, 1.7.3, 1.10.5	
<b>Action 1.8.7:</b> Conduct a review of legislative frameworks to identify and conduct necessary amendments to enable implementation of coastal defence mechanisms.	Regulation - Statutory through inclusion into SPA	<b>Local government (SEQ Council of Mayors)</b>	One-off		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.8.1:</b> Asses the vulnerability of existing urban areas to rising sea levels and storm surges.	Vulnerability assessment completed	Planning schemes, regional plan and SPPs reviews	<b>State government</b> (planning, communities, environment), local governments, private sector
<b>Action 1.8.2:</b> Undertake comprehensive research and analysis to determine alternative solutions to defence mechanisms by assessing the engineering, economic, social and environmental aspects of whether or not selected sections of the coasts can or should be protected.	Research studies undertaken and prioritised; Number of analyses and research		<b>Research agencies</b> , state government, local government
<b>Action 1.8.3:</b> Identify and define protection zones, i.e. areas with dense urban development that permit coastal armouring.	Areas for protection identified	Planning schemes, regional plan and SPPs reviews	<b>State government</b> , local government
<b>Action 1.8.4:</b> Investigate the feasibility of different mechanisms used to implement and manage coastal defence, including soft and/or hard armouring techniques.	Feasibility studies accomplished	Planning schemes, regional plan and SPPs reviews	<b>State government</b> , local government, research agencies and private sector
<b>Action 1.8.5:</b> Allocate funding to enable the construction and management of coastal defence structures.	Funds allocated		<b>Local government</b> , state government
<b>Action 1.8.6:</b> Establish a staging process for the implementation of coastal defence structures to protect identified areas at risk.	Staging process established	Planning schemes, regional plan reviews	<b>Local government</b> , state government
<b>Action 1.8.7:</b> Conduct a review of legislative frameworks to identify and conduct necessary amendments to enable implementation of coastal defence mechanisms.	Review accomplished and amendments implemented		<b>State government</b>

**PROGRAM 1.9 HAZARDS FULL DISCLOSURE CLAUSE:** A Coastal Hazards Full Disclosure Law is implemented to alert buyers of coastal properties about current and future climate related risks such as erosion rates, storm history, inundation and sea level rise.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through inclusion into SPA and planning schemes	<b>State government</b> , local government, private sector (developers and insurance companies)	Coastal settlements	One-off	Immediate	EM 3.3; EM 3.1 and 3.4 x UPM 1.9.6  UPM 1.14, 1.15, 1.16, 1.17, 1.18, 2.9, 2.13, 2.14, 2.15, 2.16, 2.17	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.; Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center

**Action 1.9.1:** Establish State laws to require sellers of real estate to disclose information to coastal property buyers either before or at the point of contract about risks related to coastal hazards, such as location in a known inundation hazard area, current erosion rate, and/or setback and building restrictions.

**Action 1.9.2:** Ensure insurance companies adequately inform their customers about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.

**Action 1.9.3:** Establish stronger rules for real estate disclosure to provide coastal property buyers information of the potential perils associated with developing or purchasing property seaward of the [state's] oceanfront setback line.

**Action 1.9.4:** Develop and update a coastal hazards website to provide information to the public and government, including maps and data.

**Action 1.9.5:** Conduct a review of legislative frameworks to identify and establish necessary amendments to enable enforcement of full hazards disclosure clause.

**Action 1.9.6:** Consult with community to improve communication about future climate related risks on private properties.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.9 Hazards full disclosure clause:</b> A Coastal Hazards Full Disclosure Law is implemented to alert buyers of coastal properties about current and future climate related risks such as erosion rates, storm history, inundation and sea level rise.					
<b>Action Implementation</b>					
<b>Action 1.9.1:</b> Establish State laws to require sellers of real estate to disclose information to coastal property buyers either before or at the point of contract about risks related to coastal hazards, such as location in a known inundation hazard area, current erosion rate, and/or setback and building restrictions.	Regulation - Statutory through inclusion into SPA and planning schemes	<b>State government</b> (planning, Premiers Dept, Attorney General), local government	One-off	UPM 2.9.1	
<b>Action 1.9.2:</b> Ensure insurance companies adequately inform their customers about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.	Regulation - Statutory through inclusion into SPA and planning schemes	<b>State government</b> (planning, Premier's Dept), local government, private sector (developers and insurance companies)	Ongoing	UPM 2.9.2, 3.4.9	
<b>Action 1.9.3:</b> Establish stronger rules for real estate disclosure to provide coastal property buyers information of the potential perils associated with developing or purchasing property seaward of the [state's] oceanfront setback line.	Regulation - Statutory through inclusion into SPA and planning schemes	<b>State government</b> (planning, Premiers Dept, Attorney General), local government, private sector (developers and real estate industry)	Episodic	UPM 3.4.5	
<b>Action 1.9.4:</b> Develop and update a coastal hazards website to provide information to the public and government, including maps and data.	Policy - Statutory through inclusion into SPPs and planning schemes	<b>State government</b> (planning, environment), local governments	Ongoing	UPM 2.9.3	QLD coastal plan; Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.9.5:</b> Conduct a review of legislative frameworks to identify and establish necessary amendments to enable enforcement of full hazards disclosure clause.	Regulation - Statutory through inclusion into SPA	<b>State government</b> (planning, Premiers Dept, Attorney General)	One-off	UPM 2.9.4	
<b>Action 1.9.6:</b> Consult with community to improve communication about future climate related risks on private properties.	Guideline - Educational through communication strategy involving public engagement	<b>Local governments (LGAQ)</b> , private sector, community	Ongoing	EM 3.1 and 3.4 x UPM 1.9.6 UPM 2.9.5, 3.3.2	stakeholders workshop

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.9.1:</b> Establish State laws to require sellers of real estate to disclose information to coastal property buyers either before or at the point of contract about risks related to coastal hazards, such as location in a known inundation hazard area, current erosion rate, and/or setback and building restrictions.	Laws reviewed	SPA review	<b>State government</b> , local governments
<b>Action 1.9.2:</b> Ensure insurance companies adequately inform their customers about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.	New regulations for insurance companies are established		<b>State government</b> , local governments, private sector, community
<b>Action 1.9.3:</b> Establish stronger rules for real estate disclosure to provide coastal property buyers information of the potential perils associated with developing or purchasing property seaward of the [state's] oceanfront setback line.	New rules for real estate industry are established		<b>State government</b> , local governments, private sector, community
<b>Action 1.9.4:</b> Develop and update a coastal hazards website to provide information to the public and government, including maps and data.	Costal hazards website developed and regularly updated	Planning schemes, regional plan and SPP reviews	<b>State government</b> , local governments, private sector, community
<b>Action 1.9.5:</b> Conduct a review of legislative frameworks to identify and establish necessary amendments to enable enforcement of full hazards disclosure clause.	Laws reviewed	SPA review	<b>State government</b> , local governments
<b>Action 1.9.6:</b> Consult with community to improve communication about future climate related risks on private properties.	Implementation of community consultation processes		<b>Local governments</b> , state government

**PROGRAM 1.10 REDUNDANCY AND BACK-UP FOR ESSENTIAL SERVICES AND BUILDINGS:** High priority buildings and services, such as Local Disaster Coordination Centres; hospitals; essential council buildings and evacuation centres; alternative access routes; communication; and supplies of power, fuel and water are decentralised and/ or equipped with back-up systems.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through assistance (capacity and financial) provided to local governments	<b>State government</b> (planning, communities, health), local governments, private sector	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.2, 2.3, 4.1 HH 1.1.4 UPM 1.6, 1.7, 1.8, 1.16, 2.7, 2.8, 2.10, 2.14 PI 1.1	Committee on Climate Change and U.S. Transportation (2008) <i>Potential impacts of climate change on U.S. transportation</i> , Committee on Climate Change and U.S. Transportation, Transportation Research Board and Division on Earth and Life Studies, National Research Council of the National Academies

**Action 1.10.1:** Assess the vulnerability of high priority services and buildings to coastal hazards and conduct an inventory to determine which ones require decentralisation and back-up.

**Action 1.10.2:** Calculate and allocate funds for construction and implementation of additional high priority services and buildings in low risk areas.

**Action 1.10.3:** Encourage the decentralisation of essential services and buildings.

**Action 1.10.4:** Encourage the establishment of back-up systems to provide spare capacity for essential services and buildings.

**Action 1.10.5:** Establish a staging process to implement decentralisation and back-up schemes for high priority services and buildings.

**Action 1.10.6:** Align the staging process for decentralisation and back-up schemes for high priority services and buildings with staging process for strategic relocation and upgrade of essential emergency and health services.

**Action 1.10.7:** Promote the establishment of decentralised and back-up systems of essential services and buildings in new developments.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.10 Redundancy and back-up for essential services and buildings:</b> High priority buildings and services, such as Local Disaster Coordination Centres; hospitals; essential council buildings and evacuation centres; alternative access routes; communication; and supplies of power, fuel and water are decentralised and/ or equipped with back-up systems.					
<b>Action Implementation</b>					
<b>Action 1.10.1:</b> Assess the vulnerability of high priority services and buildings to coastal hazards and conduct an inventory to determine which ones require decentralisation and back-up.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> (planning, communities, health), local governments, private sector	Ongoing	UPM 1.1.8, 1.6.1, 1.7.1, 1.17.1, 1.18.1, 2.1.8, 2.6.1, 2.7.1, 2.8.1, 2.10.1, 2.15.1, 2.16.1, 2.17.1	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 1.10.2:</b> Calculate and allocate funds for construction and implementation of additional high priority services and buildings in low risk areas.	Incentives funded by private sector and government contributions (state government contributions)	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.7.2, 2.8.2, 2.10.2	
<b>Action 1.10.3:</b> Encourage the decentralisation of essential services and buildings.	Incentives through assistance (capacity and financial) provided to local governments	<b>State government</b> , local governments, private sector	Ongoing	PI 1.A.4, 1.C.4, UPM 1.7.5, 1.12.5, 2.8.5, 2.10.3	Stakeholders workshops
<b>Action 1.10.4:</b> Encourage the establishment of back-up systems to provide spare capacity for essential services and buildings.	Incentives through assistance (capacity and financial) provided to local governments	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.1.9, 1.1.10, 2.1.9, 2.1.10, 2.10.4	
<b>Action 1.10.5:</b> Establish a staging process to implement decentralisation and back-up schemes for high priority services and buildings.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.6.2, 1.7.3, 1.8.6, 2.7.2, 2.8.3, 2.10.5	
<b>Action 1.10.6:</b> Align the staging process for decentralisation and back-up schemes for high priority services and buildings with staging process for strategic relocation and upgrade of essential emergency and health services.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.7.6, 2.8.6, 2.10.6	
<b>Action 1.10.7:</b> Promote the establishment of decentralised and back-up systems of essential services and buildings in new developments.	Incentives through rebate on infrastructure charges	<b>Local governments</b> , state government, private sector	Ongoing	UPM 1.1, 1.1.6, 2.1, 2.1.6, 2.10.7,	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.10.1:</b> Assess the vulnerability of high priority services and buildings to coastal hazards and conduct an inventory to determine which ones require decentralisation and back-up.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>State government</b> (planning, communities, health), local governments, private sector
<b>Action 1.10.2:</b> Calculate and allocate funds for construction and implementation of additional high priority services and buildings in low risk areas.	Funds allocated	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 1.10.3:</b> Encourage the decentralisation of essential services and buildings.	Number of decentralised services and buildings	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 1.10.4:</b> Encourage the establishment of back-up systems to provide spare capacity for essential services and buildings.	Number of established back-up systems	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 1.10.5:</b> Establish a staging process to implement decentralisation and back-up schemes for high priority services and buildings.	Staging process established	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 1.10.6:</b> Align the staging process for decentralisation and back-up schemes for high priority services and buildings with staging process for strategic relocation and upgrade of essential emergency and health services.	Staging process aligned with strategic relocation and upgrade scheme	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 1.10.7:</b> Promote the establishment of decentralised and back-up systems of essential services and buildings in new developments.	Number of new developments with established decentralised and back-up systems	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, private sector

**PROGRAM 1.11 INNOVATIVE DESIGN FOR COASTAL AREAS:** Innovative engineering and design solutions are employed to manage coastal hazards in low risk areas.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through rebates funded by governments and private sector, and regulations included in building code	<b>Private sector</b> (Building Regulations Advisory Committee, AILA, developers), local governments	Coastal settlements	Ongoing	Deferred	EM 2.1 CM 4.1, 4.2 PI 1.1, 2.1 UPM 1.4, 1.12, 2.4, 2.11, 2.12	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center; California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>

**Action 1.11.1:** Encourage residential structures in areas subject to coastal inundation to have the lowest habitable floor raised or above the highest flood level by 500 mm.

**Action 1.11.2:** Encourage built areas below the flood level of residential structures subject to coastal inundation to be designed to allow flood waters to exit (e.g. walls must be designed to break away in storm events without causing loss of structural integrity).

**Action 1.11.3:** Encourage buildings to be anchored to the foundation to prone-off movement of the structure during coastal inundation events.

**Action 1.11.4:** Encourage residential structures subject to coastal inundation to have their mechanical, electrical, and plumbing devices elevated above flood level.

**Action 1.11.5:** Encourage buildings structures subject to coastal inundation to be designed to be more resilient to flooding by using special coatings and sealings to make the walls impermeable to floodwater.

**Action 1.11.6:** Encourage essential infrastructure subject to coastal inundation to be either elevated or built to be more resilient to floods.

**Action 1.11.7:** Encourage building structures and essential infrastructure in areas subjected to damaging coastal wave action to be built and/or elevated above the base flood elevation, including storm surges. Building structures and essential infrastructure must also be specially anchored to withstand wind and wave action.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.11 Innovative design for coastal areas:</b> Innovative engineering and design solutions are employed to manage coastal hazards in low risk areas.					
<b>Action Implementation</b>					
<b>Action 1.11.1:</b> Encourage residential structures in areas subject to coastal inundation to have the lowest habitable floor raised or above the highest flood level by 500 mm.	Incentives through rebates funded by governments and private sector (levies, rates)	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 2.1, 2.1.3, 2.4.1, 2.4.2, 2.11.1	
<b>Action 1.11.2:</b> Encourage built areas below the flood level of residential structures subject to coastal inundation to be designed to allow flood waters to exit (e.g. walls must be designed to break away in storm events without causing loss of structural integrity).	Code - revised building code	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 2.1, 2.1.3, 2.4.1, 2.4.2, 2.11.2, 2.12.2, 2.12.3	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.11.3:</b> Encourage buildings to be anchored to the foundation to prone-off movement of the structure during coastal inundation events.	Incentives through rebates funded by governments and private sector (levies, rates)	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 2.1, 2.1.3, 2.4.1, 2.4.2, 2.11.3	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.11.4:</b> Encourage residential structures subject to coastal inundation to have their mechanical, electrical, and plumbing devices elevated above flood level.	Code - revised building code	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 2.1, 2.1.3, 2.4.1, 2.4.2, 2.11.4	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.11.5:</b> Encourage buildings structures subject to coastal inundation to be designed to be more resilient to flooding by using special coatings and sealings to make the walls impermeable to floodwater.	Incentives through rebates funded by governments and private sector (levies, rates)	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 2.1, 2.1.3, 2.4.1, 2.4.2, 2.11.5	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.11.6:</b> Encourage essential infrastructure subject to coastal inundation to be either elevated or built to be more resilient to floods.	Incentives through rebates funded by governments and private sector (levies, rates)	<b>Local governments,</b> state government, developers, landowners	Ongoing	UPM 1.2.2, 2.2.2, 2.11.6	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 1.11.7:</b> Encourage building structures and essential infrastructure in areas subjected to damaging coastal wave action to be built and/or elevated above the base flood elevation, including storm surges. Building structures and essential infrastructure must also be specially anchored to withstand wind and wave action.	Code - revised building code	<b>Local governments,</b> state government, developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 1.11.1, 2.1, 2.1.3, 2.4.1, 2.4.2, 2.11.7	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.11.1:</b> Encourage residential structures in areas subject to coastal inundation to have the lowest habitable floor raised or above the highest flood level by 500 mm.	Number of new developments and renovations built according to regulations	Planning schemes SPPs reviews	<b>Local governments</b> , developers, landowners
<b>Action 1.11.2:</b> Encourage built areas below the flood level of residential structures subject to coastal inundation to be designed to allow flood waters to exit (e.g. walls must be designed to break away in storm events without causing loss of structural integrity).	Number of new developments and renovations built according to regulations	Planning schemes, SPPs and building code reviews	<b>Local governments</b> , developers, landowners
<b>Action 1.11.3:</b> Encourage buildings to be anchored to the foundation to prone-off movement of the structure during coastal inundation events.	Number of new developments and renovations built according to regulations	Planning schemes and SPPs reviews	<b>Local governments</b> , developers, landowners
<b>Action 1.11.4:</b> Encourage residential structures subject to coastal inundation to have their mechanical, electrical, and plumbing devices elevated above flood level.	Number of new developments and renovations built according to regulations	Planning schemes, SPPs and building code reviews	<b>Local governments</b> , developers, landowners
<b>Action 1.11.5:</b> Encourage buildings structures subject to coastal inundation to be designed to be more resilient to flooding by using special coatings and sealings to make the walls impermeable to floodwater.	Number of new developments and renovations built according to regulations	Planning schemes and SPPs reviews	<b>Local governments</b> , developers, landowners
<b>Action 1.11.6:</b> Encourage essential infrastructure subject to coastal inundation to be either elevated or built to be more resilient to floods. (SPUR)	Number of new developments built according to regulations	Planning schemes and SPPs reviews	<b>Local governments</b> , developers, landowners
<b>Action 1.11.7:</b> Encourage building structures and essential infrastructure in areas subjected to damaging coastal wave action to be built and/or elevated above the base flood elevation, including storm surges. Building structures and essential infrastructure must also be specially anchored to withstand wind and wave action.	Number of new developments and renovations built according to regulations	Planning schemes, SPPs and building code reviews	<b>Local governments</b> , developers, landowners

**PROGRAM 1.12 FLOOD IMMUNITY:** Flood immunity for essential infrastructure and buildings is achieved through water sensitive movement and detention infrastructure that minimises alterations to natural flow regimes, including floodplain connectivity.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through rebates funded by governments and private sector	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment) and private sector (developers and infrastructure owners and providers)	All settlements	Ongoing	Immediate	EM 2.1 PI 1.1, 2.1 CM 4.1, 4.2 UPM 2.11, 2.12, 2.13	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127; Department of Infrastructure and Planning (2010c) <i>South East Queensland Infrastructure Plan and Program 2010-2031</i> , State of Queensland; Department of Infrastructure and Planning (2009) <i>South East Queensland Regional Plan 2009-2031</i> , State of Queensland.

**Action 1.12.1:** Investigate the feasibility of raising the height of land and existing development.

**Action 1.12.2:** Investigate the feasibility of constructing structures that float on the surface of the water, or may be floated occasionally during a flood, making them largely invulnerable to changing tides.

**Action 1.12.3:** Investigate the feasibility of constructing structures that are designed to withstand flooding or to retain storm water.

**Action 1.12.4:** Encourage the retention of living shorelines or wetlands to absorb flood, slow erosion and provide habitat.

**Action 1.12.5:** Ensure emergency and health services and facilities continue to be accessible and operational during and after extreme weather events.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.12 Flood immunity:</b> Flood immunity for essential infrastructure and buildings is achieved through water sensitive movement and detention infrastructure that minimises alterations to natural flow regimes, including floodplain connectivity.					
<b>Action Implementation</b>					
<b>Action 1.12.1:</b> Investigate the feasibility of raising the height of land and existing development.	Advice - Cross-agency/ government working group in collaboration with private sector and research agencies; incentives through assistance (financial and capacity) provided to local governments	<b>Local governments (LGAQ)</b> , state government and private sector (developers and infrastructure owners and providers)	One-off	UPM 1.1, 1.2, 1.11.1, , 2.1, 2.2, 2.12.1	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 1.12.2:</b> Investigate the feasibility of constructing structures that float on the surface of the water, or may be floated occasionally during a flood, making them largely invulnerable to changing tides.	Advice - Cross-agency/ government working group in collaboration with private sector and research agencies; incentives through assistance (financial and capacity) provided to local governments	<b>Local governments (LGAQ)</b> , state government and private sector (developers)	One-off	UPM 1.1, 2.1, 2.12.2	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 1.12.3:</b> Investigate the feasibility of constructing structures that are designed to withstand flooding or to retain storm water.	Advice - Cross-agency/ government working group in collaboration with private sector and research agencies; incentives through assistance (financial and capacity) provided to local governments	<b>Local governments (LGAQ)</b> , state government and private sector (developers and infrastructure owners and providers)	One-off	UPM 1.1, 1.2.1, 2.1, 2.2.1, 2.12.3	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 1.12.4:</b> Encourage the retention of living shorelines or wetlands to absorb flood, slow erosion and provide habitat.	Regulation - Statutory through inclusion into Regional Plan, SPP for coastal protection and planning schemes	<b>State government</b> (planning, environment)	Ongoing	CM 2.2.3, 3.2.1 UPM 1.13, 2.12.4	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 1.12.5:</b> Ensure emergency and health services and facilities continue to be accessible and operational during and after extreme weather events.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>Local governments</b> , state government (planning, communities, health) and private sector	Ongoing	UPM 1.7, 1.10, 1.18.8, 2.8, 2.10, 2.12.5, 2.15.8	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.12.1:</b> Investigate the feasibility of raising the height of land and existing development.	Number of land and existing development raised		<b>Local governments</b> , state government and private sector
<b>Action 1.12.2:</b> Investigate the feasibility of constructing structures that float on the surface of the water, or may be floated occasionally during a flood, making them largely invulnerable to changing tides.	Feasibility studies accomplished		<b>Local governments</b> , state government and private sector
<b>Action 1.12.3:</b> Investigate the feasibility of constructing structures that are designed to withstand flooding or to retain storm water.	Feasibility studies accomplished	Regional plan and planning schemes reviews	<b>Local governments</b> , state government and private sector
<b>Action 1.12.4:</b> Encourage the retention of living shorelines or wetlands to absorb flood, slow erosion and provide habitat.	Number of living shorelines retained	Planning schemes review	<b>Local governments</b> , state government and private sector
<b>Action 1.12.5:</b> Ensure emergency and health services and facilities continue to be accessible and operational during and after extreme weather events.	Accessibility of emergency and health services warranted	Planning schemes review	<b>Local governments</b> , state government and private sector

**PROGRAM 1.13 PROTECTION OF COASTAL HABITATS:** Areas that provide for the landward retreat of coastal habitats and species at risk from predicted sea level rise are identified and protected.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	Low	High	Low	High	High	High	High	Low	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through assistance (financial and capacity) to local governments	<b>State government</b> (planning, environment), local governments	Costal settlements	Episodic	Immediate	CM 1.15, 1.3.1, 4.1 UPM 1.6, 1.7, 1.8, 2.1, 2.2 PI 2.1	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>

**Action 1.13.1:** Improve knowledge and understanding of the vulnerability of ecosystems to climate change impacts.

**Action 1.13.2:** Integrate an agreed biodiversity mapping approach and conduct an inventory of priority conservation areas to be affected by climate change impacts.

**Action 1.13.3:** Increase ecosystem resilience by restoring tidal wetlands, living shoreline and related habitats, and establish habitat corridors.

**Action 1.13.4:** Maintain upland buffer areas around tidal wetlands.

**Action 1.13.5:** Manage sediment for marsh accretion and natural flood protection.

**Action 1.13.6:** Establish rolling easements regulations to prohibited private landowners to erect bulkheads and any other structures that interfere with naturally migrating shores.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.13 Protection of coastal habitats:</b> Areas that provide for the landward retreat of coastal habitats and species at risk from predicted sea level rise are identified and protected.					
<b>Action Implementation</b>					
<b>Action 1.13.1:</b> Improve knowledge and understanding of the vulnerability of ecosystems to climate change impacts.	Advice - Cross-agency/ government working group in collaboration with research agencies	<b>State government</b> (planning, environment), local governments, research agencies	Ongoing		California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 1.13.2:</b> Integrate an agreed biodiversity mapping approach and conduct an inventory of priority conservation areas to be affected by climate change impacts.	Incentives through assistance (financial and capacity) provided to local governments	<b>State government</b> (planning, environment), local governments, research agencies	Episodic		
<b>Action 1.13.3:</b> Increase ecosystem resilience by restoring tidal wetlands, living shoreline and related habitats, and establish habitat corridors.	Incentives through assistance (financial and capacity) provided to local governments (competitive grants)	<b>State government</b> (planning, environment), local governments, landowners	Ongoing	UPM 1.6.9, 1.12.4, 1.16.2	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i> ; Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.13.4:</b> Maintain upland buffer areas around tidal wetlands.	Incentives through assistance (financial and capacity) provided to local governments (levies, rates)	<b>State government</b> (planning, environment), local governments, landowners	Ongoing		California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i> ; Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.13.5:</b> Manage sediment for marsh accretion and natural flood protection.	Incentives through assistance (financial and capacity) provided to local governments (levies, rates)	<b>Local governments</b> , state government (planning, environment), landowners	Ongoing		California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.13.6:</b> Establish rolling easements regulations to prohibited private landowners to erect bulkheads and any other structures that interfere with naturally migrating shores.	Regulation - Statutory through inclusion into SPP for coastal protection and planning schemes; Incentives through assistance (financial and capacity) provided to local governments	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment), landowners	One-off		Titus (1998), Rising seas, coastal erosion, and the takings clause: how to save wetlands and beaches without hurting property owners, <i>Maryland Law Review</i> , 57 (4): 1279-1399.

### ***Action Monitoring & Evaluation***

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.13.1:</b> Improve knowledge and understanding of the vulnerability of ecosystems to climate change impacts.	Ongoing allocation of funding for studies		<b>State government</b> (planning, environment), local governments, research agencies
<b>Action 1.13.2:</b> Integrate an agreed biodiversity mapping approach and conduct an inventory of priority conservation areas to be affected by climate change impacts.	Mapping accomplished; Reduced development pressure on areas designated for conservation	State of the environment reporting	<b>State government</b> (planning, environment), local governments
<b>Action 1.13.3:</b> Increase ecosystem resilience by restoring tidal wetlands, living shoreline and related habitats, and establish habitat corridors.	Quality of habitats; Number of restored habitats; number of established habitat corridors	State of the environment reporting, Healthy Waterways report card	<b>Local governments</b> , state government, community groups
<b>Action 1.13.4:</b> Maintain upland buffer areas around tidal wetlands.	Number of buffer areas created	State of the environment reporting	<b>Local governments</b> , state government
<b>Action 1.13.5:</b> Manage sediment for marsh accretion and natural flood protection.	Reduced flood intensity	State of the environment reporting	<b>Local governments</b> , state government

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.13.6:</b> Establish rolling easements regulations to prohibited private landowners to erect bulkheads and any other structures that interfere with naturally migrating shores.	Regulations implemented	Planning schemes and SPP for coastal protection reviews	<b>State government</b> , local governments

**PROGRAM 1.14 LONG-TERM (STRATEGIC) PLANNING:** Planning and decision-making consider the potential implications of climate change over the life of long-term assets (100 year planning horizon).

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives	<b>State government</b> (planning) and local governments	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.2 UPM 1.1, 1.2, 1.15 PI 1.1, 1.2, 2.1, 2.2	Sunshine Coast Regional Council, <i>Climate Change and Peak Oil Strategy</i>

**Action 1.14.1:** Develop a 'worst-case scenario' state-level planning document that establishes general policies and guidelines for identifying areas and infrastructure that may no longer be supported through public funds.

**Action 1.14.2:** Discourage expenditure of public funds on infrastructure in areas highly vulnerable to climate change impacts, especially sea level rise and increased risk of flooding from intense rainfall events.

## Actions Implementation

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> ( and coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Program 1.14 Long-term (strategic) planning:</b> Planning and decision-making consider the potential implications of climate change over the life of long-term assets (100 year planning horizon).					
<b>Action Implementation</b>					
<b>Action 1.14.1:</b> Develop a 'worst-case scenario' state-level planning document that establishes general policies and guidelines for identifying areas and infrastructure that may no longer be supported through public funds.	Advice - Cross-government/agency working group in partnership with research agencies	<b>State government</b> (planning) and local governments	Episodic	UPM 1.1, 1.2, 1.15	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> ( and coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.14.2:</b> Discourage expenditure of public funds on infrastructure in areas highly vulnerable to climate change impacts, especially sea level rise and increased risk of flooding from intense rainfall events.	Regulation and incentives	<b>State government</b> (planning) and local governments	Ongoing	UPM 1.15, 1.16	Andrew Silton & Jessica Grannis, Georgetown Climate Center, <i>Virginia Case Study – Stemming the Tide: How Local Governments Can manage Rising Flood Risks</i> (Review Draft 3 – May 2010), available at <a href="http://www.georgetownclimate.org/adaptation/files/Va-Case-Study.pdf">http://www.georgetownclimate.org/adaptation/files/Va-Case-Study.pdf</a>

### ***Action Monitoring & Evaluation***

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.14.1:</b> Develop a 'worst-case scenario' state-level planning document that establishes general policies and guidelines for identifying areas and infrastructure that may no longer be supported through public funds.	'worst-case scenario' developed	Planning schemes and regional plan reviews	<b>State government</b> and local governments
<b>Action 1.14.2:</b> Discourage expenditure of public funds on infrastructure in areas highly vulnerable to climate change impacts, especially sea level rise and increased risk of flooding from intense rainfall events.	Fund expenditure reviewed based on climate change projections	Planning schemes and regional plan reviews	<b>State government</b> and local governments

**PROGRAM 1.15 COORDINATED RESPONSE TO SEA LEVEL RISE:** A coordinated response to sea-level rise is initiated to develop measures related to coastal defence, accommodation and planned retreat.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

***How well Program will address climate change*** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	Low	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (political support and capacity) to state and local governments from federal government and private sector; regulation - statutory through inclusion in SPPs and Regional Plan (actions 1.15.1/2)	<b>State government</b> (planning, environment) local governments, private sector	Coastal settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.2, 2.3, 4.1 UPM 1.1, 1.6, 1.7, 1.8, 1.13, 1.14, 1.16 PI 1.1, 2.1, 3.1, 3.2, 3.3	Titus et al (2009) State and local governments plan for development of most land vulnerable to rising sea level along the US Atlantic coast <i>Environmental Research Letters</i> Vol 4, p. 1-7.

**Action 1.15.1:** Encourage state and local governments to establish policies and funding to facilitate easements to (a) relocate developments further inland, (b) remove development as hazards encroach into developed areas, or (c) facilitate landward movement of coastal ecosystems subject to dislocation by sea level rise and other climate change impacts.

**Action 1.15.2:** Encourage state government to establish an oceanfront setback line to restrict further urban development in areas at risk from sea level rise.

**Action 1.15.3:** Encourage state and local governments (or private land trusts or non-profit organisations) to acquire undeveloped property at risk from sea level rise in order to conserve environmental assets, such as wetlands and beaches, provide upland migration corridors, preserve habitat, or provide flood buffers for existing development.

**Action 1.15.4:** Encourage state and local governments to prioritize developed properties at risk of sea level rise by purchasing conservation easements in areas identified to have significant value for habitat conservation, natural buffers and/or floodplain restoration, or where ecosystems can migrate inland as the seas rise.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.15 Coordinated response to sea level rise:</b> A coordinated response to sea-level rise is initiated to develop measures related to coastal defence, accommodation and planned retreat.					
<b>Action Implementation</b>					
<b>Action 1.15.1:</b> Encourage state and local governments to establish policies and funding to facilitate easements to (a) relocate developments further inland, (b) remove development as hazards encroach into developed areas, or (c) facilitate landward movement of coastal ecosystems subject to dislocation by sea level rise and other climate change impacts.	Policy - Statutory through inclusion in SPPs and Regional Plan	<b>Local governments (SEQ Council of Mayors)</b> , state government, private sector	Ongoing	UPM 1.6.2, 1.7.3, 1.13, 1.14, 1.16	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.15.2:</b> Encourage state government to establish an oceanfront setback line to restrict further urban development in areas at risk from sea level rise.	Regulation - Statutory through inclusion in SPP for coastal protection, Regional Plan and planning schemes	<b>State government</b> (planning) local governments, private sector	One-off	UPM 1.14	
<b>Action 1.15.3:</b> Encourage state and local governments (or private land trusts or non-profit organisations) to acquire undeveloped property at risk from sea level rise in order to conserve environmental assets, such as wetlands and beaches, provide upland migration corridors, preserve habitat, or provide flood buffers for existing development.	Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments (SEQ Council of Mayors)</b> , state government, private sector	Episodic	UPM 1.13, 1.16.1, 1.16.3, 1.17.5, 1.18.5	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 1.15.4:</b> Encourage state and local governments to prioritize developed properties at risk of sea level rise by purchasing conservation easements in areas identified to have significant value for habitat conservation, natural buffers and/or floodplain restoration, or where ecosystems can migrate inland as the seas rise.	Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments (SEQ Council of Mayors)</b> , state government, private sector	Episodic	UPM 1.6.1, 1.6.2, 1.6.4, 1.14, 1.16, 1.17.5, 1.18.5	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.15.1:</b> Encourage state and local governments to establish policies and funding to facilitate easements to (a) relocate developments further inland, (b) remove development as hazards encroach into developed areas, or (c) facilitate landward movement of coastal ecosystems subject to dislocation by sea level rise and other climate change impacts.	Policies and funding schemes established; Amount of funds allocated to support action	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (planning, environment), private sector
<b>Action 1.15.2:</b> Encourage state government to establish an oceanfront setback line to restrict further urban development in areas at risk from sea level rise.	State-wide oceanfront setback line established	SPP for coastal protection, planning schemes	<b>State government</b> (planning), local governments, private sector
<b>Action 1.15.3:</b> Encourage state and local governments (or private land trusts or non-profit organisations) to acquire undeveloped property at risk from sea level rise in order to conserve environmental assets, such as wetlands and beaches, provide upland migration corridors, preserve habitat, or provide flood buffers for existing development.	Number of high risk properties acquired	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, private sector
<b>Action 1.15.4:</b> Encourage state and local governments to prioritize developed properties at risk of sea level rise by purchasing conservation easements in areas identified to have significant value for habitat conservation, natural buffers and/or floodplain restoration, or where ecosystems can migrate inland as the seas rise.	Number of properties acquired	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, private sector

**PROGRAM 1.16 LAND USE CONVERSION:** Scenarios for land use conversion are defined to accommodate future population growth and incorporate future projected climate change threats over the next 50 to 100 years.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	High	High	Low	High	High	High	Low	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial and capacity) to local governments; Regulation - Statutory (amendment of SPA to address injurious affection)	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment), developers, landowners	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3; CM 4.1  UPM 1.1, 1.6, 1.7, 1.9, 1.14, 1.15, 1.17, 1.18, 2.1, 2.7, 2.8, 2.9, 2.14, 2.15, 2.16, 2.17  PI 1.1, 1.2, 2.1, 2.2	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

**Action 1.16.1:** Reduce pressure on systems or areas at risk of coastal hazards by restricting and discouraging further development.

**Action 1.16.2:** Introduce multiple land use strategies that account for coastal hazards due to climate change impacts. This includes raised buildings with less critical functions (e.g. parking, parkland) at ground level in flood prone areas, natural conservation areas that double as flood management areas, etc.

**Action 1.16.3:** Implement state legislation to afford protection from legal liability for local councils where they provide advice or make a decision in good faith relating to coastal planning and the impact of climate change.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.16 Land use conversion:</b> Scenarios for land use conversion are defined to accommodate future population growth and incorporate future projected climate change threats over the next 50 to 100 years.					
<b>Action Implementation</b>					
<b>Action 1.16.1:</b> Reduce pressure on systems or areas at risk of coastal hazards by restricting and discouraging further development.	Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments</b> , state government (planning), developers, landowners	Ongoing	UPM 1.1.5, 1.6.4, 1.9, 1.14, 1.15.3, 1.15.4, 2.1.5, 2.7.4, 2.9, 2.14.1	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 1.16.2:</b> Introduce multiple land use strategies that account for coastal hazards due to climate change impacts. This includes raised buildings with less critical functions (e.g. parking, parkland) at ground level in flood prone areas, natural conservation areas that double as flood management areas, etc.	Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.11, 1.12, 1.13, 1.15.3, 1.15.4, 2.11, 2.12, 2.14.2	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 1.16.3:</b> Implement state legislation to afford protection from legal liability for local councils where they provide advice or make a decision in good faith relating to coastal planning and the impact of climate change.	Regulation - Statutory through amendment of SPA to address injurious affection	<b>State government</b>	One-off	UPM 1.9.5, 2.9.4, 2.14.3	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.16.1:</b> Reduce pressure on systems or areas at risk of coastal hazards by restricting and discouraging further development.	Areas identified for and actually converted	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (planning), developers, landowners
<b>Action 1.16.2:</b> Introduce multiple land use strategies that account for coastal hazards due to climate change impacts. This includes raised buildings with less critical functions (e.g. parking, parkland) at ground level in flood prone areas, natural conservation areas that double as flood management areas, etc.	Areas identified for multiple land use	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (planning, environment), developers, landowners
<b>Action 1.16.3:</b> Implement state legislation to afford protection from legal liability for local councils where they provide advice or make a decision in good faith relating to coastal planning and the impact of climate change.	Legislation amendment completed	SPA review cycle	<b>State government</b>

**PROGRAM 1.17 COASTAL EROSION RISK MINIMISATION:** A coastal erosion preparedness and awareness scheme is initiated to minimise risks from coastal erosion, including climate change projections, in vulnerable areas.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment), developers, landowners	Coastal settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3, 3.1, 3.4, 4.1  UPM 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 1.8, 1.10, 1.11, 1.14, 1.15, 1.16, 1.18	

**Action 1.17.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to coastal erosion, including climate change projections that could exacerbate coastal erosion risks.

**Action 1.17.2:** Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).

**Action 1.17.3:** Create an inspection services scheme for homeowners in coastal erosion prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to coastal erosion.

**Action 1.17.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to coastal erosion.

**Action 1.17.5:** Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to coastal erosion and already identified for land use conversion.

**Action 1.17.6:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to coastal erosion.

**Action 1.17.7:** Encourage residents of areas highly vulnerable to coastal erosion to develop and maintain emergency plans, including evacuation procedures.

**Action 1.17.8:** Ensure emergency and health services and facilities located in areas highly vulnerable to coastal erosion continue to be operational during and after extreme weather events.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.17 Coastal erosion risk minimisation:</b> A coastal erosion preparedness and awareness scheme is initiated to minimise risks from coastal erosion, including climate change projections, in vulnerable areas.					
<b>Action Implementation</b>					
<b>Action 1.17.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to coastal erosion, including climate change projections that could exacerbate coastal erosion risks.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1.1, 1.2.1, 1.5.1, 1.6.1, 1.7.1, 1.8.1, 1.10.1, 1.16.1, 1.18.1	
<b>Action 1.17.2:</b> Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment), developers, landowners	Episodic	UPM 1.1.2, 1.2.2, 1.5.1, 1.8.3, 1.18.2	
<b>Action 1.17.3:</b> Create an inspection services scheme for homeowners in coastal erosion prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to coastal erosion.	Incentives for homeowners funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government, developers	Ongoing	UPM 1.4.3, 1.5.5, 1.18.3	
<b>Action 1.17.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to coastal erosion.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>State government</b> , local government and private sector	Ongoing	UPM 1.3.2, 1.5.3, 1.18.4	
<b>Action 1.17.5:</b> Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to coastal erosion and already identified for land use conversion.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> , local government and private sector	Episodic	UPM 1.6.3, 1.18.5	
<b>Action 1.17.6:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to coastal erosion.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning), developers	Episodic	UPM 1.1.3, 1.1.4, 1.18.6	
<b>Action 1.17.7:</b> Encourage residents of areas highly vulnerable to coastal erosion to develop and maintain emergency plans, including evacuation procedures.	Guideline - Educational campaign	<b>Local governments (LGAQ)</b> , state government (communities, community & disability services), developers, landowners	Ongoing	UPM 1.1.7, 1.3.5, 1.18.7	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or “original” (incl. modified)
<b>Action 1.17.8:</b> Ensure emergency and health services and facilities located in areas highly vulnerable to coastal erosion continue to be operational during and after extreme weather events.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments</b> , state government (planning, communities, health), developers	Ongoing	UPM 1.1.8, 1.1.9, 1.1.10, 1.7.5, 1.7.6, 1.18.8	

## **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.17.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to coastal erosion, including climate change projections that could exacerbate coastal erosion risks.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 1.17.2:</b> Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).	Areas identified	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers,
<b>Action 1.17.3:</b> Create an inspection services scheme for homeowners in coastal erosion prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to coastal erosion.	Inspection services scheme created Number of households using scheme		<b>Local governments</b> , state government, developers
<b>Action 1.17.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to coastal erosion.	Amount of funds allocated		<b>State government</b> , local government and private sector
<b>Action 1.17.5:</b> Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to coastal erosion and already identified for land use conversion.	Voluntary land acquisition program established; Number of landowners joining the program		<b>State government</b> , local government and private sector
<b>Action 1.17.6:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to coastal erosion.	Areas identified and building codes and design standards amended	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 1.17.7:</b> Encourage residents of areas highly vulnerable to coastal erosion to develop and maintain emergency plans, including evacuation procedures.	Number of households that have emergency plans		<b>Local governments</b> , state government (communities, community & disability services)
<b>Action 1.17.8:</b> Ensure emergency and health services and facilities located in areas highly vulnerable to coastal erosion continue to be operational during and after extreme weather events.	Number of alternative back-up and redundancy systems	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (communities,health)

**PROGRAM 1.18 COASTAL INUNDATION RISK MINIMISATION:** A coastal inundation preparedness and awareness scheme is initiated to minimise coastal inundation risks, including climate change projections, in vulnerable areas.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment), developers, landowners	Coastal settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3, 3.1, 3.4, 4.1;  UPM 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 1.8, 1.10, 1.11, 1.14, 1.15, 1.16, 1.17, 2.1, 2.2, 2.4, 2.6, 2.7, 2.8, 2.10, 2.11, 2.12, 2.13, 2.14, 2.16, 2.17  PI 1.1, 1.2, 2.1, 2.2	

**Action 1.18.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to coastal inundation, including climate change projections that could exacerbate coastal inundation risks.

**Action 1.18.2:** Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).

**Action 1.18.3:** Create an inspection services scheme for homeowners in coastal inundation prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.

**Action 1.18.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to coastal inundation.

**Action 1.18.5:** Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to coastal inundation and already identified for land use conversion.

**Action 1.18.6:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to coastal inundation.

**Action 1.18.7:** Encourage residents of areas highly vulnerable to coastal inundation to develop and maintain emergency plans, including evacuation procedures.

**Action 1.18.8:** Ensure emergency and health services and facilities located in areas highly vulnerable to coastal inundation continue to be operational during and after extreme weather events.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (and coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.18 Coastal inundation risk minimisation:</b> A coastal inundation preparedness and awareness scheme is initiated to minimise coastal inundation risks, including climate change projections, in vulnerable areas. <b>Action Implementation</b>					
<b>Action 1.18.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to coastal inundation, including climate change projections that could exacerbate coastal inundation risks.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1.1, 1.2.1, 1.5.1, 1.6.1, 1.7.1, 1.10.1, 1.16.1, 2.1.1, 2.2.2, 2.6.1, 2.7.1, 2.8.1, 2.10.1, 2.14.1, 2.15.1, 2.16.1, 2.17.1	
<b>Action 1.18.2:</b> Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment), developers, landowners	Episodic	UPM 1.1.2, 1.2.2, 1.5.2, 1.7.3, 1.17.2, 2.1.2, 2.2.2, 2.6.2, 2.8.3, 2.15.2, 2.16.2, 2.17.2	
<b>Action 1.18.3:</b> Create an inspection services scheme for homeowners in coastal inundation prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.	Incentives for homeowners funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government, developers	Ongoing	UPM 1.4.3, 1.5.5, 1.11, 1.17.3, 2.4.3, 2.6.5, 2.11, 2.15.3, 2.16.3, 2.17.3	
<b>Action 1.18.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to coastal inundation.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>State government</b> , local government and private sector	Ongoing	UPM 1.5.3, 1.17.4, 2.6.3, 2.15.4, 2.16.4, 2.17.4	
<b>Action 1.18.5:</b> Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to coastal inundation and already identified for land use conversion.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> , local government and private sector	Episodic	UPM 1.6.3, 1.17.5, 2.7.3, 2.15.5, 2.16.5, 2.17.5	
<b>Action 1.18.6:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to coastal inundation.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning), developers	Episodic	UPM 1.1.3, 1.1.4, 1.17.6, 2.1.3, 2.1.4, 2.15.6, 2.16.6, 2.17.6	
<b>Action 1.18.7:</b> Encourage residents of areas highly vulnerable to coastal inundation to develop and maintain emergency plans, including evacuation procedures.	Guideline - Educational campaign	<b>Local governments (LGAQ)</b> , state government (communities, community & disability services), developers, landowners	Ongoing	UPM 1.1.7, 1.3.5, 1.17.7, 2.1.7, 2.3.5, 2.15.7, 2.16.7, 2.17.6	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages (and coupling)</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.18.8:</b> Ensure emergency and health services and facilities located in areas highly vulnerable to coastal inundation continue to be operational during and after extreme weather events.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments</b> , state government (planning, communities, health), developers	Ongoing	UPM 1.1.8, 1.1.9, 1.1.10, 1.7.5, 1.7.6, 1.17.8, 2.1.8, 2.1.9, 2.1.10, 2.8.5, 2.8.6, 2.15.8, 2.16.8, 2.17.7	

## Action Monitoring & Evaluation

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.18.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to coastal inundation, including climate change projections that could exacerbate coastal inundation risks.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 1.18.2:</b> Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).	Areas identified	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers,
<b>Action 1.18.3:</b> Create an inspection services scheme for homeowners in coastal inundation prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.	Inspection services scheme created; Number of households using scheme		<b>Local governments</b> , state government, developers
<b>Action 1.18.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to coastal inundation.	Amount of funds allocated		<b>State government</b> , local government and private sector
<b>Action 1.18.5:</b> Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to coastal inundation and already identified for land use conversion.	Voluntary land acquisition program established; Number of landowners joining the program		<b>State government</b> , local government and private sector
<b>Action 1.18.6:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to coastal inundation.	Areas identified and building codes and design standards amended	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 1.18.7:</b> Encourage residents of areas highly vulnerable to coastal inundation to develop and maintain emergency plans, including evacuation procedures.	Number of households that have emergency plans		<b>Local governments</b> , state government (communities, community & disability services)
<b>Action 1.18.8:</b> Ensure emergency and health services and facilities located in areas highly vulnerable to coastal inundation continue to be operational during and after extreme weather events.	Number of alternative back-up and redundancy systems	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (communities,health)

**PROGRAM 1.19 URBAN PARKS AND OPEN SPACES:** Urban parks and open spaces are protected, enhanced and restored to protect and strengthen community wellbeing under a changing climate.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial) to local governments and community groups from state government and private sector	<b>Local governments</b> , state government (planning, environment), developers, community	Coastal settlements	Ongoing	Immediate	HH 2.1, 3.2 UPM 1.1, 1.13, 2.1 PI 1.1, 1.2, 2.1, 2.2	Toronto City (2010) <i>Toronto Official Plan</i> , Toronto City Planning.

**Action 1.19.1:** Enhance existing parklands and acquire new parkland where feasible to improve availability of green spaces and reduce risks from future urban heat island effects (UHIE).  
**Action 1.19.2:** Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure.  
**Action 1.19.3:** Provide appropriate space and design for recreational needs, including forms of productive recreation such as community gardening, city farms and farmers markets.  
**Action 1.19.4:** Protect, enhance and restore the health and integrity of natural ecosystems such as urban forests and waterways.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.19 Urban parks and open spaces:</b> Urban parks and open spaces are protected, enhanced and restored to protect and strengthen community wellbeing under a changing climate. <b>Action Implementation</b>					
<b>Action 1.19.1:</b> Enhance existing parklands and acquire new parkland where feasible to improve availability of green spaces and reduce risks from future urban heat island effects (UHIE).	Incentives funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1, 2.1	Toronto City (2010) <i>Toronto Official Plan</i> , Toronto City Planning;
<b>Action 1.19.2:</b> Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>Local governments</b> , state government (planning, environment), developers, landowners	Ongoing		Spickett et al (2007); Heart Foundation & VicHealth (2011); CAP 2010
<b>Action 1.19.3:</b> Provide appropriate space and design for recreational needs, including forms of productive recreation such as community gardening, city farms and farmers markets.	Incentives funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government, developers	Ongoing	UPM 1.1, 2.1	Toronto City (2010) <i>Toronto Official Plan</i> , Toronto City Planning; Heart Foundation & VicHealth (2011); Edwards et al (2011)
<b>Action 1.19.4:</b> Protect, enhance and restore the health and integrity of natural ecosystems such as urban forests and waterways.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>Local governments</b> , state government, developers, landowners	Ongoing	UPM 1.13	Toronto City (2010) <i>Toronto Official Plan</i> , Toronto City Planning;

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.19.1:</b> Enhance existing parklands and acquire new parkland where feasible to improve availability of green spaces and reduce risks from future urban heat island effects (UHIE).	Spatial extent of urban parklands.	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 1.19.2:</b> Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure.	Changes in urban heat shown in thermal imaging and UHIE mapping;  Community participation in urban greening initiatives	Neighbourhood Planning	<b>Local governments</b> , state government, developers,
<b>Action 1.19.3:</b> Provide appropriate space and design for recreational needs, including forms of productive recreation such as community gardening, city farms and farmers markets.	Community feedback and consistency of these environmental / landuse interventions with community interests expressed in neighbourhood planning; Spatial extent of urban areas producing food.	Neighbourhood Planning	<b>Local governments</b> , state government, developers
<b>Action 1.19.4:</b> Protect, enhance and restore the health and integrity of natural ecosystems such as urban forests and waterways.	Quality of ecosystems, number of restored habitats	State of the Environment reporting	<b>State government</b> , local government and private sector

**UPM POLICY 2.** The statutory and non-statutory planning processes must seek to minimise the vulnerability of inland landscapes to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.

### Policy Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well the Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - statutory planning	<b>State government</b> , local government, private sector (developers)	Inland settlements	Current and future communities and assets will be protected from the risks of climate change hazards in the future. Reduced costs linked to damage to public and private assets.	Difficulty in identifying low-risk areas for future growth. Encroaching of rural/agricultural and conservation areas to accommodate future urban and population growth.	Department of Infrastructure and Planning (2009), <i>South East Queensland Regional Plan 2009-2031</i> , the State of Queensland.

**PROGRAM 2.1 CONSOLIDATION OF URBAN DEVELOPMENT:** Infill development is consolidated in existing urban areas while avoiding areas with high exposure to flooding and bushfire.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	Medium

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	Low	Low	High	High	Low	Low	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - statutory planning	<b>State government</b> , local government, private sector	Inland settlements	Ongoing	Immediate	EM 2.1, 2.2, 2.3, 4.1 PI 1.1, 1.2, 2.1, 2.2  UPM 1.1, 1.2, 1.6, 1.7, 1.10, 1.14, 1.16, 2.2, 2.7, 2.8, 2.9, 2.10, 2.14	SPP for Coastal Protection (QLD); National Coastal Adaptation Agenda (DCCEE 2010)

**Action 2.1.1:** Assess the vulnerability, socially and physically, to flooding and bushfire of areas designated to accommodate future population growth, including transit oriented developments (TODs).

**Action 2.1.2:** Identify and monitor areas that require special protection, i.e. areas that have been flooded 3 or more times in the last 10 years, including retrofitting of properties at risk and implementation of buy back schemes of areas subject to recurrent flooding.

**Action 2.1.3:** Establish special zoning and performance criteria to trigger more stringent building codes and design standards for building structures located in areas at risk from flooding and bushfire.

**Action 2.1.4:** Define zones within new development that should have limited density and intensity determined by their level of risk and ensure structures are designed or retrofitted to be more resilient to flood impacts.

**Action 2.1.5:** Identify areas for land use conversion that incorporate climate change projections likely to exacerbate the risk of floods and bushfires in the next 50 to 100 years.

**Action 2.1.6:** Define developers' responsibilities in land use development of areas subject to flooding and bushfire in the next 50 to 100 years. (e.g. fee to cover the costs of potential emergency response or to improve flood resilience of infrastructure that services the new development. Developers must design the new development and its supporting infrastructure to be more resilient to flood impacts. For example, permits could require that roads be elevated and that sewer lines be more resilient to floods).

**Action 2.1.7:** Define landowners' responsibilities in locations subject to flooding and bushfire in the next 50 to 100 years (e.g. landowner agrees to build and/or rebuild structures based on more stringent building codes and design standards, and have evacuation plans).

**Action 2.1.8:** Ensure siting of essential public assets outside areas at risk and/ or in vulnerable areas with low risk of flooding whilst avoiding the isolation of communities.

**Action 2.1.9:** Ensure essential infrastructure is decentralised and/or are equipped with redundancy and back-up systems.

**Action 2.1.10:** Ensure infill and redevelopment of existing urban areas take into account the provision of evacuation routes and shelters to minimise the vulnerability of communities to flooding and bushfire.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation on Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.1 Consolidation of urban development:</b> Infill development is consolidated in existing urban areas while avoiding areas with high exposure to flooding and bushfire.					
<b>Action Implementation</b>					
<b>Action 2.1.1:</b> Assess the vulnerability, socially and physically, to flooding and bushfire of areas designated to accommodate future population growth, including transit oriented developments (TODs).	Advice - Cross-agency working group to guide identification of indicators and mapping	<b>State government</b> (planning, environment, communities, community & disability services), local governments	Ongoing	UPM 1.1.1, 1.2.1, 1.3.1, 1.6.1, 1.6.4, 1.7.1, 1.8.1, 1.10.1, 1.16, 1.18.1, 2.2.1, 2.3.1, 2.7.1, 2.8.1, 2.10.1, 2.13	NSW Department of Planning (2010) <i>NSW Coastal Planning Guidelines: Adapting to Sea level Rise</i> , NSW Government.
<b>Action 2.1.2:</b> Identify and monitor areas that require special protection, i.e. areas that have been flooded 3 or more times in the last 10 years, including retrofitting of properties at risk and implementation of buy back schemes of areas subject to recurrent flooding.	Policy - Regional level statute established under the advice of cross-agency working group	<b>State government</b> (planning and environment), local governments	Episodic	UPM 1.1.2, 1.8.3, 2.2.2	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.
<b>Action 2.1.3:</b> Establish special zoning and performance criteria to trigger more stringent building codes and design standards for building structures located in areas at risk from flooding and bushfire.	Regulation - Statutory through inclusion in planning schemes	<b>Local government</b>	Ongoing	UPM 1.1.3, 2.4, 2.5, 2.11, 2.12, 1.4, 1.11, 1.12, 2.4, 2.5, 2.11, 2.12	
<b>Action 2.1.4:</b> Define zones within new development that should have limited density and intensity determined by their level of risk and ensure structures are designed or retrofitted to be more resilient to flood impacts.	Regulation - Statutory through inclusion in planning schemes	<b>Local government</b>	Ongoing	UPM 1.1.4, 2.6, 2.11, 2.12	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center.
<b>Action 2.1.5:</b> Identify areas for land use conversion that incorporate climate change projections likely to exacerbate the risk of floods and bushfires in the next 50 to 100 years.	Regulation - Statutory through inclusion in planning schemes	<b>State government</b> (planning and environment), local governments, developers	Ongoing	UPM 1.15, 2.14	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation on Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.1.6:</b> Define developers' responsibilities in land use development of areas subject to flooding and bushfire in the next 50 to 100 years. (e.g. fee to cover the costs of potential emergency response or to improve flood resilience of infrastructure that services the new development. Developers must design the new development and its supporting infrastructure to be more resilient to flood impacts. For example, permits could require that roads be elevated and that sewer lines be more resilient to floods).	Regulation - Statutory through inclusion in SPA and SPPs (potential funding contribution to compensate costs through infrastructure charges)	<b>State government</b> , developers	Ongoing	UPM 1.1.6, 3.4	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center.
<b>Action 2.1.7:</b> Define landowners' responsibilities in locations subject to flooding and bushfire in the next 50 to 100 years (e.g. landowner agrees to build and/or rebuild structures based on more stringent building codes and design standards, and have evacuation plans).	Regulation - Statutory through inclusion in SPA and SPPs in combination with incentives such as rebate schemes	<b>State government</b> , local governments, developers, landowners	Ongoing	UPM 1.1.7, 3.4, 1.18.7, 2.15.7, 2.16.7, 2.17.6	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.1.8:</b> Ensure siting of essential public assets outside areas at risk and/ or in vulnerable areas with low risk of flooding whilst avoiding the isolation of communities.	Regulation - Statutory through inclusion in planning schemes	<b>Local governments</b> , state government, private sector	Ongoing	UPM 1.1.8, 1.2, 2.2	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 2.1.9:</b> Ensure essential infrastructure is decentralised and/or are equipped with redundancy and back-up systems.	Regulation - Statutory through inclusion of conditions into planning schemes	<b>State government</b> (planning), local governments, private sector	Ongoing	UPM 1.1.9, 2.2, 2.8, 2.10, 1.10, 2.10	Committee on Climate Change and U.S. Transportation (2008) <i>Potential impacts of climate change on U.S. transportation</i> , Committee on Climate Change and U.S. Transportation, Transportation Research Board and Division on Earth and Life Studies, National Research Council of the National Academies
<b>Action 2.1.10:</b> Ensure infill and redevelopment of existing urban areas take into account the provision of evacuation routes and shelters to minimise the vulnerability of communities to flooding and bushfire.	Policy - Statutory through inclusion of conditions into planning schemes	<b>Local governments</b>	Ongoing	UPM 1.1.10, 1.7, 2.8, 2.10	



## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.1.1:</b> Assess the vulnerability, socially and physically, to flooding and bushfire of areas designated to accommodate future population growth, including transit oriented developments (TODs).	Vulnerability assessment completed and periodically reviewed	Planning Schemes, SEQ Regional Plan and SPP reviews	<b>State government</b> , local governments,
<b>Action 2.1.2:</b> Identify and monitor areas that require special protection, i.e. areas that have been flooded 3 or more times in the last 10 years, including retrofitting of properties at risk and implementation of buy back schemes of areas subject to recurrent flooding.	Areas identified for protection receive appropriate defence mechanisms	Planning Schemes, SEQ Regional Plan reviews	<b>State government</b> , local governments,
<b>Action 2.1.3:</b> Establish special zoning and performance criteria to trigger more stringent building codes and design standards for building structures located in areas at risk from flooding and bushfire.	Development in identified areas are implemented according to updated zoning and performance criteria	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government,
<b>Action 2.1.4:</b> Define zones within new development that should have limited density and intensity determined by their level of risk and ensure structures are designed or retrofitted to be more resilient to flood impacts.	Developments follow criteria and diversify density and intensity based on their degree of vulnerability	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government, developers
<b>Action 2.1.5:</b> Identify areas for land use conversion that incorporate climate change projections likely to exacerbate the risk of floods and bushfires in the next 50 to 100 years.	Areas for land use conversion are identified and communicated to stakeholders	Planning Schemes, SEQ Regional Plan reviews	<b>State government</b> , local governments, developers
<b>Action 2.1.6:</b> Define developers' responsibilities in land use development of areas subject to flooding and bushfire in the next 50 to 100 years. (e.g. fee to cover the costs of potential emergency response or to improve flood resilience of infrastructure that services the new development. Developers must design the new development and its supporting infrastructure to be more resilient to flood impacts. For example, permits could require that roads be elevated and that sewer lines be more resilient to floods).	Developers' responsibilities are clearly identified and regulated by state legislation	SPA review	<b>State government</b> , local governments, developers
<b>Action 2.1.7:</b> Define landowners' responsibilities in locations subject to flooding and bushfire in the next 50 to 100 years (e.g. landowner agrees to build and/or rebuild structures based on more stringent building codes and design standards, and have evacuation plans).	landowners' responsibilities are clearly identified and regulated by state legislation	SPA review	<b>State government</b> , local governments, landowners
<b>Action 2.1.8:</b> Ensure siting of essential public assets outside areas at risk and/ or in vulnerable areas with low risk of flooding whilst avoiding the isolation of communities.	Essential infrastructure are sited outside areas at risk	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government, private sector
<b>Action 2.1.9:</b> Ensure essential infrastructure is decentralised and/or are equipped with redundancy and back-up systems.	Number of decentralise services and systems	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government, private sector
<b>Action 2.1.10:</b> Ensure infill and redevelopment of existing urban areas take into account the provision of evacuation routes and shelters to minimise the vulnerability of communities to flooding and bushfire.	Number of evacuation routes and shelters established	Planning Schemes, SEQ Regional Plan reviews	<b>Local governments</b> , state government, private sector

**PROGRAM 2.2 INFRASTRUCTURE SITES:** Essential infrastructure sites and corridors are identified, protected and managed from climate change impacts.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	High	High	High	Low	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - statutory planning	<b>State government</b> , local government, private sector	All settlements	Ongoing	Immediate	EM 2.1, 2.2, 2.3  UPM 1.2, 1.6, 1.7, 1.8, 1.14, 1.16, 1.18, 2.7, 2.8, 2.10, 2.14  PI 1.1, 1.2, 2.1, 2.2	SEQ Regional Plan; QLD Infrastructure Plan; Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.

**Action 2.2.1:** Conduct inventory to identify the vulnerability of essential infrastructure sites and corridors to flooding and bushfires.

**Action 2.2.2:** Define protection zones, i.e. areas with essential infrastructure that permit elevation/retrofitting to withstand flooding, and retrofitting to withstand bushfires.

**Action 2.2.3:** Ensure proposed essential infrastructure assets and corridors are sited outside risk areas and/ or in vulnerable areas with low risk of flooding and bushfire.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.2 Infrastructure sites:</b> Essential infrastructure sites and corridors are identified, protected and managed from climate change impacts.					
<b>Action Implementation</b>					
<b>Action 2.2.1:</b> Conduct inventory to identify the vulnerability of essential infrastructure sites and corridors to flooding and bushfires.	Advice - State-led working group in collaboration with local governments and private sector	<b>State government</b> (planning), local government, private sector (infrastructure owners)	Ongoing	UPM 1.1.1, 1.2.1, 1.6.1, 1.7.1, 1.10.1, 1.14, 1.18.1, 2.1.1, 2.7.1, 2.8.1, 2.10.1, 2.12, 2.13, 2.14, 2.15.1, 2.16.1, 2.17.1	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 2.2.2:</b> Define protection zones, i.e. areas with essential infrastructure that permit elevation/retrofitting to withstand flooding, and retrofitting to withstand bushfires.	Regulation - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>State government</b> (planning), local government, private sector (infrastructure owners)	Ongoing	UPM 1.1.2, 1.2.2, 1.8, 1.18.2, 2.1.2, 2.15.2, 2.16.2	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.2.3:</b> Ensure proposed essential infrastructure assets and corridors are sited outside risk areas and/ or in vulnerable areas with low risk of flooding and bushfire.	Policy - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>State government</b> (planning), local government, private sector (infrastructure owners)	Ongoing	UPM 1.1, 1.2.3, 1.7, 1.10, 1.14, 2.1, 2.8, 2.10	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.2.1:</b> Conduct inventory to identify the vulnerability of essential infrastructure sites and corridors to flooding and bushfires.	Inventory accomplished	Planning schemes and regional plan reviews	<b>State government</b> local government, private sector (infrastructure owners and providers)
<b>Action 2.2.2:</b> Define protection zones, i.e. areas with essential infrastructure that permit elevation/retrofitting to withstand flooding, and retrofitting to withstand bushfires.	Protection zones identified	Planning schemes and regional plan reviews	<b>State government</b> local government, private sector (infrastructure owners and providers)
<b>Action 2.2.3:</b> Ensure proposed essential infrastructure assets and corridors are sited outside risk areas and/ or in vulnerable areas with low risk of flooding and bushfire.	Sites area assessed against defined risks	Planning schemes and regional plan reviews	<b>State government</b> local government, private sector (infrastructure owners and providers)

**PROGRAM 2.3 COMMUNITY PLANNING:** Residential accommodation, which is designed and located to integrate with the surrounding community, is provided to meet the specific needs of youth, the aged, people with disabilities and other disadvantaged groups to minimise their vulnerability to climate change impacts.

### **Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - statutory planning	<b>Local government</b> , state government, private sector	All settlements	ongoing	Immediate	EM 2.1, 2.2, 2.3, 4.1 HH 2.1, 3.2  UPM 1.3, 1.5, 1.6, 1.7, 1.10, 1.18, 2.6, 2.7, 2.8, 2.10, 2.15, 2.16, 2.17  PI 1.1, 2.1	Gold Coast City Council Planning Scheme

**Action 2.3.1:** Conduct an inventory in partnership with health and emergency management agencies to identify areas within the community that have a high concentration of vulnerable groups.

**Action 2.3.2:** Calculate and allocate funds to assist vulnerable groups to retrofit their residences to be more resilient to climate change impacts, including flooding, bushfire and heatwaves.

**Action 2.3.3:** Determine, based on inventory, as to whether localities require the establishment of shelters, including public cool spaces, to protect community from extreme weather events.

**Action 2.3.4:** Ensure new development provide adequate number of residential accommodation that caters for the needs of vulnerable groups, including the assessment of the need for shelters for extreme weather events.

**Action 2.3.5:** Ensure residents are familiar with evacuation procedures in case of extreme weather events.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.3 Community planning:</b> Residential accommodation, which is designed and located to integrate with the surrounding community, is provided to meet the specific needs of youth, the aged, people with disabilities and other disadvantaged groups to minimise their vulnerability to climate change impacts.					
<b>Action Implementation</b>					
<b>Action 2.3.1:</b> Conduct an inventory in partnership with health and emergency management agencies to identify areas within the community that have a high concentration of vulnerable groups.	Advice - Cross-agency/ government working group in collaboration with NGOs	<b>Local government (LGAQ)</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)	Ongoing	UPM 1.3.1	
<b>Action 2.3.2:</b> Calculate and allocate funds to assist vulnerable groups to retrofit their residences to be more resilient to climate change impacts, including flooding, bushfire and heatwaves.	Incentives funded by private sector and government contributions (bushfire, flood levy)	<b>Local government</b> , state government	Episodic	UPM 1.3.2, 1.5.3, 2.6.3, 2.15.4, 2.16.4, 2.17.4	
<b>Action 2.3.3:</b> Determine, based on inventory, as to whether localities require the establishment of shelters, including public cool spaces, to protect community from extreme weather events.	Advice - Cross-agency/ government working group in collaboration with NGOs	<b>Local government (LGAQ)</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)	Ongoing	UPM 1.3.3	
<b>Action 2.3.4:</b> Ensure new development provide adequate number of residential accommodation that caters for the needs of vulnerable groups, including the assessment of the need for shelters for extreme weather events	Policy - Statutory through inclusion in planning schemes	<b>Local government</b> , state government, private sector (developers)	Ongoing	UPM 1.1;1.3.4, 2.1	
<b>Action 2.3.5:</b> Ensure residents are familiar with evacuation procedures in case of extreme weather events.	Guideline - Educational and awareness campaign	<b>Local government</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)	Ongoing	UPM 1.3.5, 1.18.8, 2.15.7, 2.16.7, 2.17.6	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.3.1:</b> Conduct an inventory in partnership with health and emergency management agencies to identify areas within the community that have a high concentration of vulnerable groups.	Completion of inventory	In parallel with planning scheme review periods	<b>Local government</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)
<b>Action 2.3.2:</b> Calculate and allocate funds to assist vulnerable groups to retrofit their residences to be more resilient to climate change impacts, including flooding, bushfire and heatwaves.	Increase in funding allocation due to increased political / community awareness of the benefits of retrofitting; Number of households / residences engaged in retrofitting		<b>Local government</b> , state government
<b>Action 2.3.3:</b> Determine, based on inventory, as to whether localities require the establishment of shelters, including public cool spaces, to protect community from extreme weather events.	Reduced vulnerability of disadvantaged social groups in	M&E based on extreme weather events	<b>Local government</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)
<b>Action 2.3.4:</b> Ensure new development provide adequate number of residential accommodation that caters for the needs of vulnerable groups, including the assessment of the need for shelters for extreme weather events	Improved social cohesion and equity within local community – less social polarisation; Decrease in proportion / number of vulnerable groups at risk from climate change impacts or reduced vulnerability of disadvantaged social groups	In parallel with planning scheme review periods	<b>Local government</b> , state government, private sector
<b>Action 2.3.5:</b> Ensure residents are familiar with evacuation procedures in case of extreme weather events.	Awareness and educational campaigns are implemented; Percentage of households aware of evacuation procedures		<b>Local government</b> , state government (communities, health, community & disability services), NGOs (e.g. Red Cross, QCOSS)



**PROGRAM 2.4 BUILDING CODE DESIGN CRITERIA FOR FLOODS:** Building codes are reviewed to ensure building structures withstand projected site-specific flood levels.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	Low	Low	High	High	High	High	Low	High	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through review and amendment of Building Code of Australia	<b>Building Regulations Advisory Committee</b> , local government, state government, developers	All settlements	Ongoing	Immediate	UPM 1.4, 1.5, 2.5, 2.6 PI 2.2	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

**Action 2.4.1:** Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located along floodplains provide for setbacks from the waterway and have 500mm freeboard measurement above a projected site-specific flood level.

**Action 2.4.2:** Require special foundations that are more resilient to flood impacts and use of flood-resilient construction materials.

**Action 2.4.3:** Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.

## Actions Implementation

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Program 2.4. Building code design criteria for floods</b> - Building codes are reviewed to ensure building structures withstand projected site-specific flood levels.					
<b>Action Implementation</b>					
<b>Action 2.4.1:</b> Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located along floodplains provide for setbacks from the waterway and have 500mm freeboard measurement above a projected site-specific flood level.	Code - Statutory through inclusion into planning schemes	<b>Local government (LGAQ)</b> , developers, landowners	Ongoing	UPM 1.1, 1.11, 1.12, 1.5,	Gold Coast City Council Planning Scheme

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or “original” (incl. modified)
<b>Action 2.4.2:</b> Require special foundations that are more resilient to flood impacts and use of flood-resilient construction materials.	Code - Statutory through inclusion into planning schemes	<b>Local government (LGAQ)</b> , developers, landowners	Ongoing	UPM 2.11, 2.12	Maryland Commission on Climate Change Adaptation and Response Working Group (2008), <i>Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change Phase I: Sea-level Rise and Coastal Storms</i> , Ch. 5
<b>Action 2.4.3:</b> Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.	Incentives for homeowners funded by private sector and government contributions (rates and/or competitive grants)	<b>Local government</b> , state government, developers, Building Authorities	Ongoing	UPM 1.4.3, 1.5.5, 1.17, 1.18, 2.5.3, 2.6.5, 2.15.3, 2.16.3, 2.17.3	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.4.1:</b> Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located along floodplains provide for setbacks from the waterway and have 500mm freeboard measurement above a projected site-specific flood level.	Number of buildings adhering to regulations	Planning scheme reviews	<b>Local government</b> , developers, landowners
<b>Action 2.4.2:</b> Require special foundations that are more resilient to flood impacts and use of flood-resilient construction materials.	Number o constructions adhering to regulations	Planning schemes reviews	<b>Local government</b> , developers, landowners
<b>Action 2.4.3:</b> Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.	Number of households using scheme		<b>Local government</b> , developers, landowners

**PROGRAM 2.5 BUILDING CODE DESIGN CRITERIA FOR BUSHFIRE:** Building codes are reviewed to ensure building structures are more resilient to bushfires.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	Low	Low	High	High	High	High	Low	High	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through review and amendment of Building Code of Australia	<b>Building Regulations Advisory Committee</b> , local government, state government, developers	All settlements	Ongoing	Immediate	EM 3.5.3 x UPM 2.5.3 UPM 1.4, 1.5, 2.4, 2.6	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

**Action 2.5.1:** Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located in bushfire prone areas provide for setbacks and buffers to be more resilient to bushfires.

**Action 2.5.2:** Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located in bushfire prone areas utilise building material which are more fire retardant and/or resistant.

**Action 2.5.3:** Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to bushfire.

## Actions Implementation

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Program 2.5 Building code design criteria for bushfire:</b> Building codes are reviewed to ensure building structures are more resilient to bushfires.					
<b>Action Implementation</b>					
<b>Action 2.5.1:</b> Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located in bushfire prone areas provide for setbacks and buffers to be more resilient to bushfires.	Code - Statutory through inclusion into planning schemes	<b>Local government (LGAQ)</b> , developers, landowners	Ongoing	UPM 1.1, 1.11, 1.12, 1.5	Gold Coast City Council Planning Scheme

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.5.2:</b> Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located in bushfire prone areas utilise building material which are more fire retardant and/or resistant.	Code - Statutory through inclusion into planning schemes	<b>Local government (LGAQ)</b> , developers, landowners	Ongoing	UPM 2.11, 2.12	
<b>Action 2.5.3:</b> Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to bushfire.	Incentives for homeowners funded by private sector and government contributions (rates and/or competitive grants)	<b>Local government</b> , state government, developers, Building Authorities	Ongoing	EM 3.5.3 UPM 1.4.3, 1.5.5, 1.17, 1.18, 2.4.3, 2.6.5, 2.15.3, 2.16.3, 2.17.3	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.5.1:</b> Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located in bushfire prone areas provide for setbacks and buffers to be more resilient to bushfires.	Number of buildings adhering to regulations	Planning scheme reviews	<b>Local government</b> , developers, landowners
<b>Action 2.5.2:</b> Ensure all new and substantially renovated buildings (greater than 25% of the current replacement value of the structure) located in bushfire prone areas utilise building material which are more fire retardant and/or resistant.	Number o constructions adhering to regulations	Planning schemes reviews	<b>Local government</b> , developers, landowners
<b>Action 2.5.3:</b> Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to bushfire.	Number of households using scheme		<b>Local government</b> , developers, landowners

**PROGRAM 2.6 RETROFITTING OF RESIDENTIAL PROPERTIES:** A program to assist households to retrofit high risk homes is created to improve adaptation to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

***How well Program will address climate change*** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy - Statutory	<b>State government</b> , local government	Inland settlements	Ongoing	Immediate	PI 1.1, 2.1 UPM 1.5	UK adaptation Sub-Committee; Stakeholder feedback

**Action 2.6.1:** Conduct a comprehensive inventory to determine the number and nature of buildings and properties (residential or commercial) threatened by heatwaves and high temperatures, flooding, severe storms and hail, and bushfires to estimate cost of retrofitting properties.

**Action 2.6.2:** Define areas that require priority actions, including retrofitting of properties at risk.

**Action 2.6.3:** Establish funding mechanisms to support retrofitting of properties and buy back schemes, e.g. federal and state government and private sector.

**Action 2.6.4:** Create household funding metrics based on households' vulnerability (e.g. high risk properties and socio-economic disadvantage).

**Action 2.6.5:** Create an inspection services scheme for homeowners in high risk areas to help them identify ways in which they could retrofit their homes to make them more resilient to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.

**Action 2.6.6:** Create incentives/rebates package for the retrofitting of households threatened by heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.

**Action 2.6.7:** Provide financial assistance to local governments to retrofit homes that have been repetitively damaged by floods, severe storms and hail, and bushfires, demolish damaged homes, elevate essential public assets, and move essential public assets.

**Action 2.6.8:** Establish partnership with insurance companies to map properties at risk of heatwaves and high temperatures, flooding, severe storms and hail, and bushfires and establish thresholds to guide insurance premiums.

**Action 2.6.9:** Identify barriers and opportunities for retrofitting program based on household tenure (e.g. rental properties, first home, second home).



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.6 Retrofitting of residential properties:</b> A program to assist households to retrofit high risk homes is created to improve adaptation to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.					
<b>Action Implementation</b>					
<b>Action 2.6.1:</b> Conduct a comprehensive inventory to determine the number and nature of buildings and properties (residential or commercial) threatened by heatwaves and high temperatures, flooding, severe storms and hail, and bushfires to estimate cost of retrofitting properties.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> (planning, environment, communities), local government, private sector (developers and insurance companies)	Ongoing	UPM 1.1.1, 1.3.1, 1.17.1, 1.18.1, 2.1.1, 2.3.1, 2.15.1, 2.16.1, 2.17.1	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i> ; Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 2.6.2:</b> Define areas that require priority actions, including retrofitting of properties at risk.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> (planning), local government	Ongoing	UPM 1.1.2, 1.1.4, 1.17.2, 1.18.2, 2.1.2, 2.2.4, 2.15.2, 2.16.2, 2.17.2	
<b>Action 2.6.3:</b> Establish funding mechanisms to support retrofitting of properties and buy back schemes, e.g. federal and state government and private sector.	Incentives funded by private sector and government contributions (rates, competitive grants and/or levies)	<b>State government</b> , federal government, local government and private sector	Episodic	UPM 1.5.3, 1.17.4, 1.18.4, 2.15.4, 2.16.4, 2.17.4	
<b>Action 2.6.4:</b> Create household funding metrics based on households' vulnerability (e.g. high risk properties and socio-economic disadvantage).	Advice - Cross-agency/ government working group in collaboration with NGOs (e.g. Red Cross, QCOSS)	<b>State government</b> (community & disability services), NGOs (e.g. Red Cross, QCOSS)	Episodic	UPM 1.5.4	
<b>Action 2.6.5:</b> Create an inspection services scheme for homeowners in high risk areas to help them identify ways in which they could retrofit their homes to make them more resilient to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.	Incentives for homeowners funded by private sector and government contributions (rates, competitive grants)	<b>State government</b> , local government and private sector	Ongoing	UPM 1.4.3, 1.5.5, 1.17.3, 1.18.3, 2.4.3, 2.5.5, 2.15.3, 2.16.3, 2.17.3	
<b>Action 2.6.6:</b> Create incentives/rebates package for the retrofitting of households threatened by heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.	Incentives for homeowners funded by private sector and government contributions	<b>State government</b> , local government and private sector	Ongoing	UPM 1.5.5, 1.11, 1.12, 2.11, 2.12	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.6.7:</b> Provide financial assistance to local governments to retrofit homes that have been repetitively damaged by floods, severe storms and hail, and bushfires, demolish damaged homes, elevate essential public assets, and move essential public assets.	Regulation - Statutory through inclusion into state and national disaster recovery arrangements	<b>State government</b> , federal government	Ongoing	UPM 1.5.7, 1.15.1	FEMA, <i>Hazard Mitigation Assistance Unified Guidance</i> at 11-14 (Jun. 2010)
<b>Action 2.6.8:</b> Establish partnership with insurance companies to map properties at risk of heatwaves and high temperatures, flooding, severe storms and hail, and bushfires and establish thresholds to guide insurance premiums.	Advice - Cross-agency/ government working group in collaboration with insurance companies	<b>State government</b> , federal government, local government and insurance companies	Ongoing	UPM 1.5.8, 1.9.2, 2.9.2	
<b>Action 2.6.9:</b> Identify barriers and opportunities for retrofitting program based on household tenure (e.g. rental properties, first home, second home).	Advice - Cross-agency/ government working group in collaboration with NGOs (e.g. Red Cross, QCOSS)	<b>State government</b> (COMMUNITY & DISABILITY SERVICES), NGOs (e.g. Red Cross, QCOSS)	Ongoing	UPM 1.5.9	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.6.1:</b> Conduct a comprehensive inventory to determine the number and nature of buildings and properties (residential or commercial) threatened by heatwaves and high temperatures, flooding, severe storms and hail, and bushfires to estimate cost of retrofitting properties.	Completion of inventory	Retrofitting program included in planning scheme review cycles	<b>State government</b> , local government, private sector (developers and insurance companies)
<b>Action 2.6.2:</b> Define areas that require priority actions, including retrofitting of properties at risk.	Decrease in the number of properties requiring priority action	Regional plan and planning scheme reviews	<b>State government</b> , local government
<b>Action 2.6.3:</b> Establish funding mechanisms to support retrofitting of properties and buy back schemes, e.g. federal and state government and private sector.	Actual contribution from different government levels and private sector; Number of funding options available		State and local governments, insurance companies
<b>Action 2.6.4:</b> Create household funding metrics based on households' vulnerability (e.g. high risk properties and socio-economic disadvantage).	Funding metrics established		<b>State government</b> and NGOs (e.g. Red Cross, QCOSS)
<b>Action 2.6.5:</b> Create an inspection services scheme for homeowners in high risk areas to help them identify ways in which they could retrofit their homes to make them more resilient to heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.	Inspection scheme created; Number of households accessing scheme		<b>State government</b> , local government, homeowners
<b>Action 2.6.6:</b> Create incentives/rebates package for the retrofitting of households threatened by heatwaves and high temperatures, flooding, severe storms and hail, and bushfires.	Amount of financial resources allocated to incentive and rebates yearly; number of households benefiting from incentives/rebates (i.e. engaged in retrofitting activities)		<b>State government</b> , local government
<b>Action 2.6.7:</b> Provide financial assistance to local governments to retrofit homes that have been repetitively damaged by floods, severe storms and hail, and bushfires, demolish damaged homes, elevate essential public assets, and move essential public assets.	Actual contribution state and federal government, and private sector		<b>State government</b> , federal government
<b>Action 2.6.8:</b> Establish partnership with insurance companies to map properties at risk of heatwaves and high temperatures, flooding, severe storms and hail, and bushfires and establish thresholds to guide insurance premiums.	Partnerships established and regulated		<b>State government</b> , federal government, local government and insurance companies
<b>Action 2.6.9:</b> Identify barriers and opportunities for retrofitting program based on household tenure (e.g. rental properties, first home, second home).	Number of retrofitted houses based on household tenure		<b>State government</b> and NGOs (e.g. Red Cross, QCOSS)

**PROGRAM 2.7 PLANNED RETREAT:** Building structures, infrastructure and public facilities in areas adjacent to floodplains are sited landward and/ or relocated.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	High	Medium	Medium

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	High	High	Low	Low	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> , local governments	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.2, 2.3; PI 1.1, 2.1  UPM 1.6, 1.7, 1.16, 2.8, 2.14	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.; California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>

**Action 2.7.1:** Assess the vulnerability of existing urban areas to flood events.

**Action 2.7.2:** Establish a staging process to implement planned retreat of vulnerable areas whilst minimising adverse social impacts.

**Action 2.7.3:** Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, conservation easements, transfer of development rights, purchase of development rights, tighter rules setbacks and/or tax incentives.

**Action 2.7.4:** Limit or prohibit rebuilding of damaged structures in defined retreat areas.

**Action 2.7.5:** Identify suitable areas to accommodate the relocation of flooded communities/population at risk whilst ensuring emergency and health services and facilities continue to be provided to communities/population at risk.

**Action 2.7.6:** Establish an engagement and communication strategy to consult with communities at risk.

**Action 2.7.7:** Encourage land owners to relocate structures through tax benefits, voluntary land acquisitions, or conservation easements schemes.

**Action 2.7.8:** Develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.

**Action 2.7.9:** Ensure the restoration and rehabilitation of areas post-retreat.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.7. Planned retreat.</b> Building structures, infrastructure and public facilities in areas adjacent to floodplains are sited landward and/ or relocated.					
<b>Action Implementation</b>					
<b>Action 2.7.1:</b> Assess the vulnerability of existing urban areas to flood events.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government,</b> local government	Ongoing	UPM 1.1.1, 1.2.1, 1.5.1, 1.6.1, 1.5.8, 1.7.1, 1.8.1, 1.10.1, 1.17.1, 1.18.1, 2.1.1, 2.2.1, 2.6.1, 2.8.1, 2.10.1	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 2.7.2:</b> Establish a staging process to implement planned retreat of vulnerable areas whilst minimising adverse social impacts.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government,</b> local government, private sector, landowners	Ongoing	UPM 1.6.2, 1.7.3, 1.8.6, 1.10.5, 1.10.6, 1.15.2, 2.8.3, 2.10.5, 2.10.6	(NZ example)
<b>Action 2.7.3:</b> Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, conservation easements, transfer of development rights, purchase of development rights, tighter rules setbacks and/or tax incentives.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government,</b> local government, private sector, landowners	Ongoing	UPM 1.13.6, 1.15.4, 1.17.5, 1.18.5	
<b>Action 2.7.4:</b> Limit or prohibit rebuilding of damaged structures in defined retreat areas.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local government (SEQ Council of Mayors),</b> state government	Ongoing	UPM 1.16, 1.6.4, 2.14, 3.4.4	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.7.5:</b> Identify suitable areas to accommodate the relocation of flooded communities/population at risk whilst ensuring emergency and health services and facilities continue to be provided to communities/population at risk.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>Local government (SEQ Council of Mayors),</b> state government, private sector (developers and insurance companies)	Ongoing	UPM 1.1, 1.6.5, 1.7, 1.10, 2.1,	
<b>Action 2.7.6:</b> Establish an engagement and communication strategy to consult with communities at risk.	Policy - Statutory through inclusion into Regional Plan, SPP for coastal protection and planning schemes	<b>Local government,</b> state government, private sector	Ongoing	UPM 1.9.1, 1.6.6, 1.7.4, 1.17.7, 1.18.7, 2.8.4, 3.1.4, 3.4.8, 3.6.6	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.7.7:</b> Encourage land owners to relocate structures through tax benefits, voluntary land acquisitions, or conservation easements schemes.	Incentives through funding provided by governments and private sector (tax rebates, rates, state government contributions)	<b>Local government</b> , state government, private sector	Ongoing	UPM 1.6.7	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.7.8:</b> Develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.	Regulation - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>State government</b>	Episodic	UPM 1.6.8, 3.4.9	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 2.7.9:</b> Ensure the restoration and rehabilitation of areas post-retreat.	Policy - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>Local government</b> , state government, private sector, community	Ongoing	UPM 1.6.8,1.13, 1.15.3, 3.4.4	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.7.1:</b> Assess the vulnerability of existing urban areas to flood events.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>State government</b> , local government
<b>Action 2.7.2:</b> Establish a staging process to implement planned retreat of vulnerable areas whilst minimising adverse social impacts.	Retreat plan established in consultation with community	Planning schemes and regional plan reviews	<b>State government</b> , local government, private sector, landowners
<b>Action 2.7.3:</b> Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, conservation easements, transfer of development rights, purchase of development rights, tighter rules setbacks and/or tax incentives.	Cost benefit analysis of different mechanisms completed and disseminated	Planning schemes and regional plan reviews	<b>State government</b> , local government, private sector, landowners
<b>Action 2.7.4:</b> Limit or prohibit rebuilding of damaged structures in defined retreat areas.	Highly vulnerable areas are gradually abandoned and/or converted to different use	Planning schemes and regional plan reviews	<b>Local government</b> , state government, landowners, developers
<b>Action 2.7.5:</b> Identify suitable areas to accommodate the relocation of flooded communities/population at risk whilst ensuring emergency and health services and facilities continue to be provided to communities/population at risk.	Suitable areas for relocation are identified and safeguarded for future development	Planning schemes and regional plan reviews	<b>Local government</b> , state government, landowners, developers, insurance companies
<b>Action 2.7.6:</b> Establish an engagement and communication strategy to consult with communities at risk.	Funds allocated to support schemes	Planning schemes and regional plan reviews	<b>Local government</b> , landowners, developers, insurance companies
<b>Action 2.7.7:</b> Encourage land owners to relocate structures through tax benefits, voluntary land acquisitions, or conservation easements schemes.	Insurance premiums and conditions are reviewed to support planned retreat	Planning schemes and regional plan reviews	<b>Local government</b> , state government, landowners, developers, insurance companies
<b>Action 2.7.8:</b> Develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.	Regulatory policies developed	SPA review cycle	<b>Local government</b> , state government
<b>Action 2.7.9:</b> Ensure the restoration and rehabilitation of areas post-retreat.	Number of habitats restored	Planning schemes and regional plan reviews	<b>Local government</b> , state government, private sector



**PROGRAM 2.8 STRATEGIC RELOCATION AND UPGRADE OF ESSENTIAL EMERGENCY AND HEALTH SERVICES:** Emergency and health services departments (e.g. disaster management warehouses, disaster coordination centres, evacuation centres, hospitals, aged care facilities) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks so they can continue to operate during emergencies. This should consider threats to communications, transport and water infrastructure.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	Low	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> , local governments	All settlements	Ongoing	Immediate	EM 2.3; PI 1.1, 1.2, 2.1, 2.2 HH 3.2 UPM 1.6, 1.7, 1.16, 2.7, 2.14	

**Action 2.8.1:** Assess the vulnerability of essential emergency and health services to flood and bushfires and conduct an inventory to determine which ones require upgrade and/or strategic relocation.

**Action 2.8.2:** Calculate and allocate funds for construction and implementation of additional essential services and buildings.

**Action 2.8.3:** Establish a staging process to implement relocation and back-up schemes for essential emergency and health services.

**Action 2.8.4:** Consult with communities to strategically relocate and/or upgrade essential emergency and health services to ensure communities do not become disadvantaged in the process.

**Action 2.8.5:** Investigate feasibility of decentralisation of essential emergency and health services and facilities as a retreat option.

**Action 2.8.6:** Ensure strategic relocation and upgrade of essential emergency and health services are aligned with strategies forecasted for transportation and communication systems.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.8 Strategic relocation and upgrade of essential emergency and health services:</b> Emergency and health services departments (e.g. disaster management warehouses, disaster coordination centres, evacuation centres, hospitals, aged care facilities) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks so they can continue to operate during emergencies. This should consider threats to communications, transport and water infrastructure.					
<b>Action Implementation</b>					
<b>Action 2.8.1:</b> Assess the vulnerability of essential emergency and health services to flood and bushfires and conduct an inventory to determine which ones require upgrade and/or strategic relocation.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> (planning, communities, health), local governments, private sector	Ongoing	UPM 1.1.1, 1.1.8, 1.6.1, 1.7.1, 1.8.1, 1.10.1, 2.1.1, 2.1.8, 2.7.1, 2.10.1	
<b>Action 2.8.2:</b> Calculate and allocate funds for construction and implementation of additional essential services and buildings.	Incentives funded by private sector and government contributions (state government contributions)	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.7.2, 1.10.2, 2.10.2	
<b>Action 2.8.3:</b> Establish a staging process to implement relocation and back-up schemes for essential emergency and health services.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> (planning, communities, health), local governments, private sector	Ongoing	UPM 1.6.2, 1.7.3, 1.10.5, 1.17.7, 1.17.8, 1.18.7, 1.18.8, 2.7.2, 2.10.5	
<b>Action 2.8.4:</b> Consult with communities to strategically relocate and/or upgrade essential emergency and health services to ensure communities do not become disadvantaged in the process.	Policy - Statutory through inclusion into Regional Plan and planning schemes; educational campaign targeting communities	<b>Local government</b> , state governments, private sector	Ongoing	UPM 1.6.6, 1.7.4	
<b>Action 2.8.5:</b> Investigate feasibility of decentralisation of essential emergency and health services and facilities as a retreat option.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> (planning, communities, health), local governments, private sector	Ongoing	HH 6.2.6; UPM 1.7.5, 1.10.3, 2.10.3	stakeholder workshop
<b>Action 2.8.6:</b> Ensure strategic relocation and upgrade of essential emergency and health services are aligned with strategies forecasted for transportation and communication systems.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government</b> (planning, communities, health, transport), local governments, private sector		UPM 1.7.6	stakeholder workshop

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.8.1:</b> Assess the vulnerability of essential emergency and health services to flood and bushfires and conduct an inventory to determine which ones require upgrade and/or strategic relocation.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>State government</b> (communities, health)
<b>Action 2.8.2:</b> Calculate and allocate funds for construction and implementation of additional essential services and buildings.	Funds allocated for relocation and upgrading of services and facilities.		<b>State government</b> , local governments, private sector
<b>Action 2.8.3:</b> Establish a staging process to implement relocation and back-up schemes for essential emergency and health services.	Staging process developed	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 2.8.4:</b> Consult with communities to strategically relocate and/or upgrade essential emergency and health services to ensure communities do not become disadvantaged in the process.	Community consultation completed	Planning schemes and regional plan reviews	State and local governments, emergency and health agencies
<b>Action 2.8.5:</b> Investigate feasibility of decentralisation of essential emergency and health services and facilities as a retreat option.	Feasibility investigation completed	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 2.8.6:</b> Ensure strategic relocation and upgrade of essential emergency and health services are aligned with strategies forecasted for transportation and communication systems.	Alignment with other strategies achieved	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector

**PROGRAM 2.9 FULL HAZARDS DISCLOSURE CLAUSE:** A Hazards Full Disclosure Law is implemented to alert buyers of properties about current and future climate related risks associated with flooding, including riverine and flash floods, and bushfire.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl modified)
Regulation - Statutory through inclusion into SPA and planning schemes	<b>State government</b> , local government, private sector (developers and insurance companies)	All settlements	Ongoing	Immediate	EM 3.3; EM 3.1 and 3.4 x UPM 2.9.5  UPM 1.9, 1.14, 1.15, 1.16, 1.17, 1.18, 2.13, 2.14, 2.15, 2.16, 2.17	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.; Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center

**Action 2.9.1:** Establish State laws to require sellers of real estate to disclose information to property buyers either before or at the point of contract about risks related to flooding, including riverine and flash floods, bushfire, such as location in a known inundation hazard area and/or setback and building restrictions.

**Action 2.9.2:** Ensure insurance companies adequately inform their customers about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.

**Action 2.9.3:** Develop and update a hazards website to provide information to the public and government, including maps and data related to flooding, including riverine and flash floods, bushfire.

**Action 2.9.4:** Conduct a review of legislative frameworks to identify and establish necessary amendments to enable enforcement of full hazards disclosure clause.

**Action 2.9.5:** Consult with community to improve communication about future climate related risks on private properties.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.9 Full Hazards disclosure clause:</b> A Hazards Full Disclosure Law is implemented to alert buyers of properties about current and future climate related risks associated with flooding, including riverine and flash floods, and bushfire.					
<b>Action Implementation</b>					
<b>Action 2.9.1:</b> Establish State laws to require sellers of real estate to disclose information to property buyers either before or at the point of contract about risks related to flooding, including riverine and flash floods, bushfire, such as location in a known inundation hazard area and/or setback and building restrictions.	Regulation - Statutory through inclusion into SPA and planning schemes	<b>State government</b> (planning, Premiers Dept, Attorney General), local government	Episodic	UPM 1.9.1	
<b>Action 2.9.2:</b> Ensure insurance companies adequately inform their customers about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.	Regulation - Statutory through inclusion into SPA and planning schemes	<b>State government</b> (planning, Premiers Dept), local government, private sector (developers and insurance companies)	Ongoing	UPM 1.9.2, 3.4.9	
<b>Action 2.9.3:</b> Develop and update a hazards website to provide information to the public and government, including maps and data related to flooding, including riverine and flash floods, bushfire.	Policy - Statutory through inclusion into SPA and planning schemes	<b>State government</b> (planning, Premiers Dept, Attorney General), local government, private sector (developers and real estate industry)	Episodic	UPM 1.9.4, 3.4.5	QLD coastal plan; Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.9.4:</b> Conduct a review of legislative frameworks to identify and establish necessary amendments to enable enforcement of full hazards disclosure clause.	Regulation - Statutory through inclusion into SPPs and planning schemes	<b>State government</b> (planning, environment), local governments	Ongoing	UPM 1.9.5	
<b>Action 2.9.5:</b> Consult with community to improve communication about future climate related risks on private properties.	Guideline - Educational through communication strategy involving public engagement	<b>Local governments (LGAQ)</b> , private sector, community	Ongoing	EM 3.1 and 3.4 x UPM 2.9.5 UPM 1.9.6, 3.3.2	stakeholders workshop

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.9.1:</b> Establish State laws to require sellers of real estate to disclose information to property buyers either before or at the point of contract about risks related to flooding, including riverine and flash floods, bushfire, such as location in a known inundation hazard area and/or setback and building restrictions.	Laws reviewed	SPA review	<b>State government</b> , local governments
<b>Action 2.9.2:</b> Ensure insurance companies adequately inform their customers about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.	New regulations for insurance companies are established		<b>State government</b> , local governments, private sector, community
<b>Action 2.9.3:</b> Develop and update a hazards website to provide information to the public and government, including maps and data related to flooding, including riverine and flash floods, bushfire.	Hazards website developed and regularly updated	Planning schemes, regional plan and SPP reviews	<b>State government</b> , local governments, private sector, community
<b>Action 2.9.4:</b> Conduct a review of legislative frameworks to identify and establish necessary amendments to enable enforcement of full hazards disclosure clause.	Laws reviewed	SPA review	<b>State government</b> , local governments
<b>Action 2.9.5:</b> Consult with community to improve communication about future climate related risks on private properties.	Implementation of community consultation processes		<b>Local governments</b> , state government



**PROGRAM 2.10 REDUNDANCY AND BACK-UP FOR ESSENTIAL SERVICES AND BUILDINGS:** High priority buildings and services, such as Local Disaster Coordination Centres; hospitals; essential council buildings and evacuation centres; alternative access routes; communication; and supplies of power, fuel and water are decentralised and/ or equipped with back-up systems.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through assistance (capacity and financial) provided to local governments	<b>State government</b> (planning, communities, health), local governments, private sector	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.2, 2.3, 4.1; HH 3.2 UPM 1.6, 1.7, 1.8, 1.10, 1.16, 2.7, 2.8, 2.14 PI 1.1	Committee on Climate Change and U.S. Transportation (2008) <i>Potential impacts of climate change on U.S. transportation</i> , Committee on Climate Change and U.S. Transportation, Transportation Research Board and Division on Earth and Life Studies, National Research Council of the National Academies

**Action 2.10.1:** Assess the vulnerability of high priority services and buildings to flooding and bushfires and conduct an inventory to determine which ones require decentralisation and back-up.

**Action 2.10.2:** Calculate and allocate funds for construction and implementation of additional high priority services and buildings in low risk areas.

**Action 2.10.3:** Encourage the decentralisation of essential services and buildings.

**Action 2.10.4:** Encourage the establishment of back-up systems to provide spare capacity for essential services and buildings.

**Action 2.10.5:** Establish a staging process to implement decentralisation and back-up schemes for high priority services and buildings.

**Action 2.10.6:** Align the staging process for decentralisation and back-up schemes for high priority services and buildings with staging process for strategic relocation and upgrade of essential emergency and health services.

**Action 2.10.7:** Promote the establishment of decentralised and back-up systems of essential services and buildings in new developments.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.10 Redundancy and back-up for essential services and buildings:</b> High priority buildings and services, such as Local Disaster Coordination Centres; hospitals; essential council buildings and evacuation centres; alternative access routes; communication; and supplies of power, fuel and water are decentralised and/ or equipped with back-up systems.					
<b>Action Implementation</b>					
<b>Action 2.10.1:</b> Assess the vulnerability of high priority services and buildings to flooding and bushfires and conduct an inventory to determine which ones require decentralisation and back-up.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> (planning, communities, health), local governments, private sector	Ongoing	UPM 1.1.8, 1.6.1, 1.7.1, 1.10.1, 1.17.1, 1.18.1, 2.1.8, 2.6.1, 2.7.1, 2.8.1, 2.15.1, 2.16.1, 2.17.1	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 2.10.2:</b> Calculate and allocate funds for construction and implementation of additional high priority services and buildings in low risk areas.	Incentives funded by private sector and government contributions (state government contributions)	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.7.2, 1.10.2, 2.8.2	
<b>Action 2.10.3:</b> Encourage the decentralisation of essential services and buildings.	Incentives through assistance (capacity and financial) provided to local governments	<b>State government</b> , local governments, private sector	Ongoing	PI 1.A.4, 1.C.4, UPM 1.7.5, 1.10.3, 1.12.5, 2.8.5	Stakeholders workshops
<b>Action 2.10.4:</b> Encourage the establishment of back-up systems to provide spare capacity for essential services and buildings.	Incentives through assistance (capacity and financial) provided to local governments	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.1.9, 1.1.10, 1.10.4, 2.1.9, 2.1.10	
<b>Action 2.10.5:</b> Establish a staging process to implement decentralisation and back-up schemes for high priority services and buildings.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.6.2, 1.7.3, 1.8.6, 1.10.5, 2.7.2, 2.8.3,	
<b>Action 2.10.6:</b> Align the staging process for decentralisation and back-up schemes for high priority services and buildings with staging process for strategic relocation and upgrade of essential emergency and health services.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>State government</b> , local governments, private sector	Ongoing	UPM 1.7.6, 1.10.6, 2.8.6	
<b>Action 2.10.7:</b> Promote the establishment of decentralised and back-up systems of essential services and buildings in new developments.	Incentives through rebate on infrastructure charges	<b>Local governments</b> , state government, private sector	Ongoing	UPM 1.1, 1.1.6, 1.10.7, 2.1, 2.1.6	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.10.1:</b> Assess the vulnerability of high priority services and buildings to flooding and bushfires and conduct an inventory to determine which ones require decentralisation and back-up.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>State government</b> (planning, communities, health), local governments, private sector
<b>Action 2.10.2:</b> Calculate and allocate funds for construction and implementation of additional high priority services and buildings in low risk areas.	Funds allocated	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 2.10.3:</b> Encourage the decentralisation of essential services and buildings.	Number of decentralised services and buildings	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 2.10.4:</b> Encourage the establishment of back-up systems to provide spare capacity for essential services and buildings.	Number of established back-up systems	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 2.10.5:</b> Establish a staging process to implement decentralisation and back-up schemes for high priority services and buildings.	Staging process established	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 2.10.6:</b> Align the staging process for decentralisation and back-up schemes for high priority services and buildings with staging process for strategic relocation and upgrade of essential emergency and health services.	Staging process aligned with strategic relocation and upgrade scheme	Planning schemes and regional plan reviews	<b>State government</b> , local governments, private sector
<b>Action 2.10.7:</b> Promote the establishment of decentralised and back-up systems of essential services and buildings in new developments.	Number of new developments with established decentralised and back-up systems	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, private sector

**PROGRAM 2.11 INNOVATIVE DESIGNS FOR FLOODS:** Innovative engineering and design solutions are employed to minimise vulnerability to flooding in low risk areas.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through rebates funded by governments and private sector, and regulations included in building code	<b>Private sector</b> (Building Regulations Advisory Committee, AILA, developers), local governments	All settlements	Ongoing	Deferred	EM 2.1 PI 1.1, 2.1 UPM 1.4, 1.11, 1.12, 2.4, 2.12	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center; California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>

**Action 2.11.1:** Encourage residential structures in areas at risk of flooding to have the lowest habitable floor raised or above the highest flood level by 500 mm.

**Action 2.11.2:** Encourage built areas below the flood level of residential structures subject to flood risk to be designed to allow flood waters to exit (e.g. walls must be designed to break away in storm events without causing loss of structural integrity).

**Action 2.11.3:** Encourage buildings to be anchored to the foundation to prevent movement of the structure during flood events.

**Action 2.11.4:** Encourage residential structures at risk of flooding to have their mechanical, electrical, and plumbing devices elevated above flood level.

**Action 2.11.5:** Encourage buildings structures subject to flood risk to be designed to be more resilient to flooding by using special coatings and sealings to make the walls impermeable to floodwater.

**Action 2.11.6:** Encourage essential infrastructure at risk of flooding to be either elevated or built to be more resilient to floods.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.11. Innovative designs for floods.</b> Innovative engineering and design solutions are employed to minimise vulnerability to flooding in low risk areas.					
<b>Action Implementation</b>					
<b>Action 2.11.1:</b> Encourage residential structures in areas at risk of flooding to have the lowest habitable floor raised or above the highest flood level by 500 mm.	Incentives through rebates funded by governments and private sector (levies, rates)	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 1.11.1, 2.1, 2.1.3, 2.4.1, 2.4.2,	
<b>Action 2.11.2:</b> Encourage built areas below the flood level of residential structures subject to flood risk to be designed to allow flood waters to exit (e.g. walls must be designed to break away in storm events without causing loss of structural integrity).	Code - Regulatory through revised building code	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 1.11.2, 2.1, 2.1.3, 2.4.1, 2.4.2, 2.12.2, 2.12.3	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.11.3:</b> Encourage buildings to be anchored to the foundation to prevent movement of the structure during flood events.	Incentives through rebates funded by governments and private sector (levies, rates)	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 1.11.3, 2.1, 2.1.3, 2.4.1, 2.4.2	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.11.4:</b> Encourage residential structures at risk of flooding to have their mechanical, electrical, and plumbing devices elevated above flood level.	Code - Regulatory through revised building code	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 1.11.4, 2.1, 2.1.3, 2.4.1, 2.4.2	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.11.5:</b> Encourage buildings structures subject to flood risk to be designed to be more resilient to flooding by using special coatings and sealings to make the walls impermeable to floodwater.	Incentives through rebates funded by governments and private sector (levies, rates)	<b>Local governments,</b> developers, landowners	Ongoing	UPM 1.1, 1.1.3, 1.4.1, 1.4.2, 1.11.5, 2.1, 2.1.3, 2.4.1, 2.4.2	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 2.11.6:</b> Encourage essential infrastructure at risk of flooding to be either elevated or built to be more resilient to floods.	Incentives through rebates funded by governments and private sector (levies, rates)	<b>Local governments,</b> state government, developers, landowners	Ongoing	UPM 1.2.2, 1.11.6, 2.2.2	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.11.1:</b> Encourage residential structures in areas at risk of flooding to have the lowest habitable floor raised or above the highest flood level by 500 mm.	Number of new developments and renovations built according to regulations	Planning schemes SPPs reviews	<b>Local governments</b> , developers, landowners
<b>Action 2.11.2:</b> Encourage built areas below the flood level of residential structures subject to flood risk to be designed to allow flood waters to exit (e.g. walls must be designed to break away in storm events without causing loss of structural integrity).	Number of new developments and renovations built according to regulations	Planning schemes, SPPs and building code reviews	<b>Local governments</b> , developers, landowners
<b>Action 2.11.3:</b> Encourage buildings to be anchored to the foundation to prevent movement of the structure during flood events.	Number of new developments and renovations built according to regulations	Planning schemes and SPPs reviews	<b>Local governments</b> , developers, landowners
<b>Action 2.11.4:</b> Encourage residential structures at risk of flooding to have their mechanical, electrical, and plumbing devices elevated above flood level.	Number of new developments and renovations built according to regulations	Planning schemes, SPPs and building code reviews	<b>Local governments</b> , developers, landowners
<b>Action 2.11.5:</b> Encourage buildings structures subject to flood risk to be designed to be more resilient to flooding by using special coatings and sealings to make the walls impermeable to floodwater.	Number of new developments and renovations built according to regulations	Planning schemes and SPPs reviews	<b>Local governments</b> , developers, landowners
<b>Action 2.11.6:</b> Encourage essential infrastructure at risk of flooding to be either elevated or built to be more resilient to floods.	Number of new developments built according to regulations	Planning schemes and SPPs reviews	<b>Local governments</b> , developers, landowners



**PROGRAM 2.12 FLOOD IMMUNITY:** Flood immunity for essential infrastructure and buildings is achieved through water sensitive movement and detention infrastructure that minimises alterations to natural flow regimes, including floodplain connectivity.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through rebates funded by governments and private sector	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment) and private sector (developers and infrastructure owners and providers)	All settlements	Ongoing	Immediate	EM 2.1 PI 1.1, 2.1 UPM 1.12, 2.11, 2.13	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127; Department of Infrastructure and Planning (2010c) <i>South East Queensland Infrastructure Plan and Program 2010-2031</i> , State of Queensland; Department of Infrastructure and Planning (2009) <i>South East Queensland Regional Plan 2009-2031</i> , State of Queensland.

**Action 2.12.1:** Investigate the feasibility of raising the height of land and existing development.

**Action 2.12.2:** Investigate the feasibility of constructing structures that float on the surface of the water, or may be floated occasionally during a flood event, making them largely invulnerable to changing flood levels.

**Action 2.12.3:** Investigate the feasibility of constructing structures that are designed to withstand flooding or to retain storm water.

**Action 2.12.4:** Encourage the retention of wetlands to absorb flood, slow erosion and provide habitat.

**Action 2.12.5:** Ensure emergency and health services and facilities continue to be accessible and operational during and after extreme flood events.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.12 Flood immunity:</b> Flood immunity for essential infrastructure and buildings must be achieved through water sensitive movement and detention infrastructure that minimises alterations to natural flow regimes, including floodplain connectivity.					
<b>Action Implementation</b>					
<b>Action 2.12.1:</b> Investigate the feasibility of raising the height of land and existing development.	Advice - Cross-agency/ government working group in collaboration with private sector and research agencies; incentives through assistance (financial and capacity) provided to local governments	<b>Local governments (LGAQ)</b> , state government and private sector (developers and infrastructure owners and providers)	Ongoing	UPM 1.1, 1.2, 1.11.1, 1.12.1, 2.1, 2.2	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 2.12.2:</b> Investigate the feasibility of constructing structures that float on the surface of the water, or may be floated occasionally during a flood event, making them largely invulnerable to changing flood levels.	Advice - Cross-agency/ government working group in collaboration with private sector and research agencies; incentives through assistance (financial and capacity) provided to local governments	<b>Local governments (LGAQ)</b> , state government and private sector (developers)	Ongoing	UPM 1.1, 1.12.2, 2.1	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 2.12.3:</b> Investigate the feasibility of constructing structures that are designed to withstand flooding or to retain storm water.	Advice - Cross-agency/ government working group in collaboration with private sector and research agencies; incentives through assistance (financial and capacity) provided to local governments	<b>Local governments (LGAQ)</b> , state government and private sector (developers and infrastructure owners and providers)	Ongoing	UPM 1.1, 1.2.1, 1.12.3, 2.1, 2.2.1	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 2.12.4:</b> Encourage the retention of wetlands to absorb flood, slow erosion and provide habitat.	Regulation - Statutory through inclusion into Regional Plan, SPP for coastal protection and planning schemes	<b>Local governments</b> , state government (planning, environment)	Ongoing	CM 2.2.3, 3.2.1 UPM 1.12.4, 1.13	San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 2.12.5:</b> Ensure emergency and health services and facilities continue to be accessible and operational during and after extreme flood events.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>Local governments</b> , state government (planning, communities, health) and private sector	Ongoing	UPM 1.7, 1.10, 1.12.5, 1.18.8, 2.8, 2.10, 2.15.8	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.12.1:</b> Investigate the feasibility of raising the height of land and existing development.	Number of land and existing development raised		<b>Local governments</b> , state government and private sector
<b>Action 2.12.2:</b> Investigate the feasibility of constructing structures that float on the surface of the water, or may be floated occasionally during a flood one-off, making them largely invulnerable to changing flood levels.	Feasibility studies accomplished		<b>Local governments</b> , state government and private sector
<b>Action 2.12.3:</b> Investigate the feasibility of constructing structures that are designed to withstand flooding or to retain storm water.	Feasibility studies accomplished	Regional plan and planning schemes reviews	<b>Local governments</b> , state government and private sector
<b>Action 2.12.4:</b> Encourage the retention of wetlands to absorb flood, slow erosion and provide habitat.	Number of living shorelines retained	Planning schemes review	<b>Local governments</b> , state government and private sector
<b>Action 2.12.5:</b> Ensure emergency and health services and facilities continue to be accessible and operational during and after extreme flood events.	Accessibility of emergency and health services warranted	Planning schemes review	<b>Local governments</b> , state government and private sector

**PROGRAM 2.13 MAPPING OF FLOOD VULNERABLE AREAS:** A program is created to map and catalogue developed building sites that are flooded three or more times over a 10 year-period.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	High	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	Low	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through assistance (financial and capacity) to local governments from state government and private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment)	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3, 4.1; UPM 1.1, 1.2, 1.3, 1.6, 1.7, 1.10, 2.1, 2.2, 2.3, 2.7, 2.8, 2.10 PI 1.1, 1.2, 2.1, 2.2	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

**Action 2.13.1:** Ensure local authorities keep and maintain a database of currently developed building sites that have been flooded three or more times within the last 10 years.

**Action 2.13.2:** Ensure information from database is shared and consistent across local authorities, particularly for emergency services.

**Action 2.13.3:** Target those sites for future land use conversion to reduce the risks to population and to potential property damage.

**Action 2.13.4:** Investigate funding options for both voluntary and compulsory land acquisition programs of areas identified to be highly vulnerable to floods.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.13 Mapping of flood vulnerable areas:</b> A program is created to map and catalogue developed building sites that are flooded three or more times over a 10 year-period.					
<b>Action Implementation</b>					
<b>Action 2.13.1:</b> Ensure local authorities keep and maintain a database of currently developed building sites that have been flooded three or more times within the last 10 years.	Incentives (financial and capacity) to local governments from state government	<b>Local governments</b> , state governments (planning, environment)	Ongoing		Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.
<b>Action 2.13.2:</b> Ensure information from database is shared and consistent across local authorities, particularly for emergency services.	Policy - Unified database maintained by the state government	<b>State government</b> (planning, environment, communities), local governments	Ongoing		
<b>Action 2.13.3:</b> Target those sites for future land use conversion to reduce the risks to population and to potential property damage.	Incentives through assistance (financial and capacity) provided to local governments from state government and private sector	<b>State government</b> (planning, environment), local governments, private sector	Ongoing	UPM 1.16, 2.14	
<b>Action 2.13.4:</b> Investigate funding options for both voluntary and compulsory land acquisition programs of areas identified to be highly vulnerable to floods.	Incentives from state government and private sector	<b>State government</b> (planning, environment), local governments, private sector, landowners	Ongoing	UPM 1.15.3, 1.15.4, 1.17.5, 1.18.5, 2.15.5, 2.16.5	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.13.1:</b> Ensure local authorities keep and maintain a database of currently developed building sites that have been flooded three or more times within the last 10 years.	Database created and maintained		<b>State government</b> (planning, environment, communities), local governments
<b>Action 2.13.2:</b> Ensure information from database is shared and consistent across local authorities, particularly for emergency services.	Number of government agencies able to access database		<b>State government</b> (planning, environment, communities), local governments
<b>Action 2.13.3:</b> Target those sites for future land use conversion to reduce the risks to population and to potential property damage.	Sites for land use conversion identified and prioritise	Regional Plan and planning scheme reviews	<b>State government</b> , local governments and private sector
<b>Action 2.13.4:</b> Investigate funding options for both voluntary and compulsory land acquisition programs of areas identified to be highly vulnerable to floods.	Number of funding options available, amount of funds allocated	Regional Plan and planning scheme reviews	<b>State government</b> , local governments and private sector



**PROGRAM 2.14 LAND USE CONVERSION:** Scenarios for land use conversion are defined to accommodate future population growth and incorporate future projected climate change threats over the next 50 to 100 years.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	High	High	Low	High	High	High	Low	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial and capacity) to local governments; Regulation - Statutory (amendment of SPA to address injurious affection)	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment), developers, landowners	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3; UPM 1.1, 1.6, 1.7, 1.9, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19; 2.1, 2.7, 2.8, 2.9, 2.15, 2.16, 2.17, 2.18 PI 1.1, 1.2, 2.1, 2.2	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

**Action 2.14.1:** Reduce pressure on systems or areas at risk of flooding by restricting and discouraging further development.

**Action 2.14.2:** Introduce multiple land use strategies that account for flood hazards due to climate change impacts. This includes raised buildings with less critical functions (e.g. parking, parkland) at ground level in flood prone areas, natural conservation areas that double as flood management areas, etc.

**Action 2.14.3:** Implement state legislation to afford protection from legal liability for local councils where they provide advice or make a decision in good faith relating to planning along floodplains and the impact of climate change.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.14 Land use conversion:</b> Scenarios for land use conversion are defined to accommodate future population growth and incorporate future projected climate change threats over the next 50 to 100 years.					
<b>Action Implementation</b>					
<b>Action 2.14.1:</b> Reduce pressure on systems or areas at risk of flooding by restricting and discouraging further development.	Incentives (financial and capacity) to local governments from state government and private sector (development fees)	<b>Local governments</b> , state government (planning), developers, landowners	Ongoing	UPM 1.1.5, 1.6.4, 1.9,1.14, 1.15.3, 1.15.4, 1.16.1, 2.1.5, 2.7.4, 2.9	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 2.14.2:</b> Introduce multiple land use strategies that account for flood hazards due to climate change impacts. This includes raised buildings with less critical functions (e.g. parking, parkland) at ground level in flood prone areas, natural conservation areas that double as flood management areas, etc.	Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.11, 1.12, 1.13, 1.15.3, 1.15.4,1.16.2, 2.11, 2.12	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 2.14.3:</b> Implement state legislation to afford protection from legal liability for local councils where they provide advice or make a decision in good faith relating to planning along floodplains and the impact of climate change.	Regulation - Statutory through amendment of SPA to address injurious affection	<b>State government</b>	Episodic	UPM 1.9.5, 1.16.3, 2.9.4	

## Action Monitoring & Evaluation

Action	Key Performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.14.1:</b> Reduce pressure on systems or areas at risk of flooding by restricting and discouraging further development.	Areas identified for and actually converted	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (planning), developers, landowners
<b>Action 2.14.2:</b> Introduce multiple land use strategies that account for flood hazards due to climate change impacts. This includes raised buildings with less critical functions (e.g. parking, parkland) at ground level in flood prone areas, natural conservation areas that double as flood management areas, etc.	Areas identified for multiple land use	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (planning, environment), developers, landowners
<b>Action 2.14.3:</b> Implement state legislation to afford protection from legal liability for local councils where they provide advice or make a decision in good faith relating to planning along floodplains and the impact of climate change.	Legislation amendment completed	SPA review cycle	<b>State government</b>

**PROGRAM 2.15 FLOOD RISK MINIMISATION:** A flood preparedness and awareness scheme is initiated to minimise both flash flood and riverine flood risks, including climate change projections, in flood prone areas.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment), developers, landowners	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3, 3.1, 3.4, 4.1;  UPM 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 1.8, 1.10, 1.11, 1.14, 1.15, 1.16, 1.17, 1.18, 2.1, 2.2, 2.4, 2.6, 2.7, 2.8, 2.10, 2.11, 2.12, 2.13, 2.14, 2.16, 2.17  PI 2.1, 2.2	

**Action 2.15.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to flooding, including climate change projections that could exacerbate flood risks.

**Action 2.15.2:** Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).

**Action 2.15.3:** Create an inspection services scheme for homeowners in flood prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.

**Action 2.15.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to flooding.

**Action 2.15.5:** Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to flooding and already identified for land use conversion.

**Action 2.15.6:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to flooding.

**Action 2.15.7:** Encourage residents of areas highly vulnerable to flooding to develop and maintain emergency plans, including evacuation procedures.

**Action 2.15.8:** Ensure emergency and health services and facilities located in areas highly vulnerable to flooding continue to be operational during and after extreme flood events.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.15 Flood risk minimisation:</b> A flood preparedness and awareness scheme is initiated to minimise both flash flood and riverine flood risks, including climate change projections, in flood prone areas.					
<b>Action Implementation</b>					
<b>Action 2.15.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to flooding, including climate change projections that could exacerbate flood risks.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1.1, 1.2.1, 1.5.1, 1.6.1, 1.7.1, 1.10.1, 1.16.1, 1.18.1, 2.1.1, 2.2.2, 2.6.1, 2.7.1, 2.8.1, 2.10.1, 2.14.1, 2.16.1, 2.17.1	
<b>Action 2.15.2:</b> Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1.2, 1.2.2, 1.5.2, 1.7.3, 1.17.2, 1.18.2, 2.1.2, 2.2.2, 2.6.2, 2.8.3, 2.16.2, 2.17.2	
<b>Action 2.15.3:</b> Create an inspection services scheme for homeowners in flood prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.	Incentives for homeowners funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government, developers	Ongoing	UPM 1.4.3, 1.5.5, 1.11, 1.17.3, 1.18.3, 2.4.3, 2.6.5, 2.11, 2.16.3, 2.17.3	
<b>Action 2.15.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to flooding.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>State government</b> , local government and private sector	Ongoing	UPM 1.5.3, 1.17.4, 1.18.4, 2.6.3, 2.16.4, 2.17.4	
<b>Action 2.15.5:</b> Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to flooding and already identified for land use conversion.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> , local government and private sector	Ongoing	UPM 1.6.3, 1.17.5, 1.18.5, 2.7.3, 2.16.5, 2.17.5	
<b>Action 2.15.6:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to flooding.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning), developers	Ongoing	UPM 1.1.3, 1.1.4, 1.17.6, 1.18.6, 2.1.3, 2.1.4, 2.16.6, 2.17.6	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.15.7:</b> Encourage residents of areas highly vulnerable to flooding to develop and maintain emergency plans, including evacuation procedures.	Guideline - Educational campaign	<b>Local governments (LGAQ)</b> , state government (communities, community & disability services), developers, landowners	Ongoing	UPM 1.1.7, 1.3.5, 1.17.7, 1.18.7, 2.1.7, 2.3.5, 2.16.7, 2.17.6	
<b>Action 2.15.8:</b> Ensure emergency and health services and facilities located in areas highly vulnerable to flooding continue to be operational during and after extreme flood events.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments</b> , state government (planning, communities, health), developers	Ongoing	UPM 1.1.8, 1.1.9, 1.1.10, 1.7.5, 1.7.6, 1.17.8, 1.18.8, 2.1.8, 2.1.9, 2.1.10, 2.8.5, 2.8.6, 2.16.8, 2.17.7	



## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.15.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to flooding, including climate change projections that could exacerbate flood risks.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 2.15.2:</b> Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).	Areas identified	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers,
<b>Action 2.15.3:</b> Create an inspection services scheme for homeowners in flood prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to flooding.	Inspection services scheme created Number of households using scheme		<b>Local governments</b> , state government, developers
<b>Action 2.15.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to flooding.	Amount of funds allocated		<b>State government</b> , local government and private sector
<b>Action 2.15.5:</b> Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to flooding and already identified for land use conversion.	Voluntary land acquisition program established; Number of landowners joining the program		<b>State government</b> , local government and private sector
<b>Action 2.15.6:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to flooding.	Areas identified and building codes and design standards amended	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 2.15.7:</b> Encourage residents of areas highly vulnerable to flooding to develop and maintain emergency plans, including evacuation procedures.	Number of households that have emergency plans		<b>Local governments</b> , state government (communities, community & disability services)
<b>Action 2.15.8:</b> Ensure emergency and health services and facilities located in areas highly vulnerable to flooding continue to be operational during and after extreme flood events.	Number of alternative back-up and redundancy systems	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (communities,health)

**PROGRAM 2.16 BUSHFIRE RISK MINIMISATION:** A bushfire preparedness and awareness scheme is initiated to minimise bushfire risks, including climate change projections, in bushfire prone areas.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments</b> , state government (planning, environment), developers, landowners	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3, 3.1, 3.4, 3.5, 4.1;  UPM 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 1.8, 1.10, 1.11, 1.14, 1.15, 1.16, 1.17, 1.18, 2.1, 2.2, 2.4, 2.6, 2.7, 2.8, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.17  PI 1.1, 1.2	

**Action 2.16.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to bushfire, including climate change projections that could exacerbate bushfire risks.

**Action 2.16.2:** Identify areas for special protection and priority action (e.g. retrofitting; relocation of structures; land use conversion).

**Action 2.16.3:** Create an inspection services scheme for homeowners in bushfire prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to bushfire.

**Action 2.16.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to bushfires.

**Action 2.16.5:** Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to bushfire and already identified for land use conversion.

**Action 2.16.6:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to bushfire.

**Action 2.16.7:** Encourage residents of bushfire prone areas to develop and maintain emergency plans, including evacuation procedures.

**Action 2.16.8:** Ensure residents of bushfire prone areas continue to have access to emergency and health services and facilities during and after extreme bushfire events.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.16 Bushfire risk minimisation:</b> A bushfire preparedness and awareness scheme is initiated to minimise bushfire risks, including climate change projections, in bushfire prone areas.					
<b>Action Implementation</b>					
<b>Action 2.16.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to bushfire, including climate change projections that could exacerbate bushfire risks.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1.1, 1.2.1, 1.5.1, 1.6.1, 1.7.1, 1.10.1, 1.16.1, 1.18.1, 2.1.1, 2.2.2, 2.6.1, 2.7.1, 2.8.1, 2.10.1, 2.14.1, 2.15.1, 2.17.1	
<b>Action 2.16.2:</b> Identify areas for special protection and Timing of Implementation action (e.g. retrofitting; relocation of structures; land use conversion).	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1.2, 1.2.2, 1.5.2, 1.7.3, 1.17.2, 1.18.2, 2.1.2, 2.2.2, 2.6.2, 2.8.3, 2.15.2, 2.17.2	
<b>Action 2.16.3:</b> Create an inspection services scheme for homeowners in bushfire prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to bushfire.	Incentives for homeowners funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government, developers	Ongoing	UPM 1.4.3, 1.5.5, 1.11, 1.17.3, 1.18.3, 2.4.3, 2.6.5, 2.11, 2.15.3, 2.17.3	
<b>Action 2.16.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to bushfires.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>State government</b> , local government and private sector	Ongoing	UPM 1.5.3, 1.17.4, 1.18.4, 2.6.3, 2.15.4, 2.17.4	
<b>Action 2.16.5:</b> Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to bushfire and already identified for land use conversion.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> , local government and private sector	Ongoing	UPM 1.6.3, 1.17.5, 1.18.5, 2.7.3, 2.15.5, 2.17.5	
<b>Action 2.16.6:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to bushfire.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning), developers	Ongoing	UPM 1.1.3, 1.1.4, 1.17.6, 1.18.6, 2.1.3, 2.1.4, 2.15.6, 2.17.6	
<b>Action 2.16.7:</b> Encourage residents of bushfire prone areas to develop and maintain emergency plans, including evacuation procedures.	Guideline - Educational campaign	<b>Local governments (LGAQ)</b> , state government (communities, community & disability services), developers, landowners	Ongoing	UPM 1.1.7, 1.3.5, 1.17.7, 1.18.7, 2.1.7, 2.3.5, 2.15.7, 2.17.6	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.16.8:</b> Ensure residents of bushfire prone areas continue to have access to emergency and health services and facilities during and after extreme bushfire events.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments</b> , state government (planning, communities, health), developers	Ongoing	UPM 1.1.8, 1.1.9, 1.1.10, 1.7.5, 1.7.6, 1.17.8, 1.18.8, 2.1.8, 2.1.9, 2.1.10, 2.8.5, 2.8.6, 2.15.8, 2.17.7	

## Action Monitoring & Evaluation

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.16.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to bushfire, including climate change projections that could exacerbate bushfire risks.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 2.16.2:</b> Identify areas for special protection and Timing of Implementation action (e.g. retrofitting; relocation of structures; land use conversion).	Areas identified	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers,
<b>Action 2.16.3:</b> Create an inspection services scheme for homeowners in bushfire prone areas to help them identify ways in which they could retrofit their homes to make them more resilient to bushfire.	Inspection services scheme created; Number of households using scheme		<b>Local governments</b> , state government, developers
<b>Action 2.16.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to bushfires.	Amount of funds allocated		<b>State government</b> , local government and private sector
<b>Action 2.16.5:</b> Investigate funding options for voluntary land acquisition programs of areas highly vulnerable to bushfire and already identified for land use conversion.	Voluntary land acquisition program established; Number of landowners joining the program		<b>State government</b> , local government and private sector
<b>Action 2.16.6:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to bushfire.	Areas identified and building codes and design standards amended	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 2.16.7:</b> Encourage residents of bushfire prone areas to develop and maintain emergency plans, including evacuation procedures.	Number of households that have emergency plans		<b>Local governments</b> , state government (communities, community & disability services)

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.16.8:</b> Ensure residents of bushfire prone areas continue to have access to emergency and health services and facilities during and after extreme bushfire events.	Number of alternative back-up and redundancy systems	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (communities, health)

**PROGRAM 2.17 HEATWAVE RISK MINIMISATION:** A heatwave preparedness and awareness scheme is initiated to minimise heatwave risks, including climate change projections, in heatwave prone areas.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial and capacity) to local governments from state government and private sector	<b>Local governments</b> , state government (planning, environment), developers, landowners	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3, 3.1, 3.4, 4.1; HH 1.2  UPM 1.1, 1.2, 1.4, 1.5, 1.6, 1.7, 1.8, 1.10, 1.11, 1.14, 1.15, 1.16, 1.17, 1.18, 2.1, 2.2, 2.4, 2.6, 2.7, 2.8, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16  PI 1.2, 2.2	

**Action 2.17.1:** Assess the vulnerability of existing and proposed new urban and peri-urban areas to heatwaves, including climate change projections that could exacerbate heatwave risks.

**Action 2.17.2:** Identify areas for priority action (e.g. retrofitting; provision of public cool spaces).

**Action 2.17.3:** Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to heatwaves.

**Action 2.17.4:** Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to heatwaves.

**Action 2.17.5:** Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to heatwaves.

**Action 2.17.6:** Encourage residents of areas highly vulnerable to heatwaves to develop and maintain emergency plans, including how to access public cool spaces.

**Action 2.17.7:** Ensure residents continue to have access to emergency and health services and facilities during heatwave events.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.17 Heatwave risk minimisation:</b> A heatwave preparedness and awareness scheme is initiated to minimise heatwave risks, including climate change projections, in heatwave prone areas.					
<b>Action Implementation</b>					
<b>Action 2.17.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to heatwaves, including climate change projections that could exacerbate heatwave risks.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>Local governments (LGAQ)</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1.1, 1.2.1, 1.5.1, 1.6.1, 1.7.1, 1.10.1, 1.16.1, 1.18.1, 2.1.1, 2.2.2, 2.6.1, 2.7.1, 2.8.1, 2.10.1, 2.14.1, 2.15.1, 2.16.1	
<b>Action 2.17.2:</b> Identify areas for priority action (e.g. retrofitting; provision of public cool spaces).	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1.2, 1.2.2, 1.5.2, 1.7.3, 1.17.2, 1.18.2, 2.1.2, 2.2.2, 2.6.2, 2.8.3, 2.15.2, 2.16.2	
<b>Action 2.17.3:</b> Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to heatwaves.	Incentives for homeowners funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government, developers	Ongoing	UPM 1.4.3, 1.5.5, 1.11, 1.17.3, 1.18.3, 2.4.3, 2.6.5, 2.11, 2.15.3, 2.16.3	
<b>Action 2.17.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to heatwaves.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>State government</b> , local government and private sector	Ongoing	UPM 1.5.3, 1.17.4, 1.18.4, 2.6.3, 2.15.4, 2.16.4	
<b>Action 2.17.5:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to heatwaves.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government (planning), developers	Ongoing	UPM 1.1.3, 1.1.4, 1.17.6, 1.18.6, 2.1.3, 2.1.4, 2.15.6, 2.16.6	
<b>Action 2.17.6:</b> Encourage residents of areas highly vulnerable to heatwaves to develop and maintain emergency plans, including how to access public cool spaces.	Guideline - Educational campaign	<b>Local governments (LGAQ)</b> , state government (communities, community & disability services), developers, landowners	Ongoing	UPM 1.1.7, 1.3.5, 1.17.7, 1.18.7, 2.1.7, 2.3.5, 2.15.7, 2.16.6	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.17.7:</b> Ensure residents continue to have access to emergency and health services and facilities during heatwave events.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments</b> , state government (planning, communities, health), developers	Ongoing	UPM 1.1.8, 1.1.9, 1.1.10, 1.7.5, 1.7.6, 1.17.8, 1.18.8, 2.1.8, 2.1.9, 2.1.10, 2.8.5, 2.8.6, 2.15.8, 2.16.7	

## **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.17.1:</b> Assess the vulnerability of existing and proposed new urban and peri-urban areas to heatwaves, including climate change projections that could exacerbate heatwave risks.	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 2.17.2:</b> Identify areas for priority action (e.g. retrofitting; provision of public cool spaces).	Areas identified	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers,
<b>Action 2.17.3:</b> Create an inspection services scheme for homeowners to help them identify ways in which they could retrofit their homes to make them more resilient to heatwaves.	Inspection services scheme created; Number of households using scheme		<b>Local governments</b> , state government, developers
<b>Action 2.17.4:</b> Calculate and allocate funds to assist homeowners to retrofit their residences to be more resilient to heatwaves.	Amount of funds allocated		<b>State government</b> , local government and private sector
<b>Action 2.17.5:</b> Identify special zoning to trigger more stringent building codes and design standards for new and existing developments in areas highly vulnerable to heatwaves.	Areas identified and building codes and design standards amended	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 2.17.6:</b> Encourage residents of areas highly vulnerable to heatwaves to develop and maintain emergency plans, including how to access public cool spaces.	Number of households that have emergency plans		<b>Local governments</b> , state government (communities, community & disability services)
<b>Action 2.17.7:</b> Ensure residents continue to have access to emergency and health services and facilities during heatwave events.	Number of alternative back-up and redundancy systems	Planning schemes and regional plan reviews	<b>Local governments</b> , state government (communities,health)

**PROGRAM 2.18 URBAN PARKS AND OPEN SPACES:** Urban parks and open spaces are protected, enhanced and restored to protect and strengthen community wellbeing under a changing climate.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives (financial) to local governments and community groups from state government and private sector	<b>Local governments</b> , state government (planning, environment), developers, community	Coastal settlements	Ongoing	Immediate	HH 2.1, 3.2 UPM 1.1, 1.13, 2.1 PI 1.1, 1.2, 2.1, 2.2	Toronto City (2010) <i>Toronto Official Plan</i> , Toronto City Planning.

**Action 2.18.1:** Enhance existing parklands and acquire new parkland where feasible to improve availability of green spaces and reduce risks from future urban heat island effects (UHIE).  
**Action 2.18.2:** Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure.  
**Action 2.18.3:** Provide appropriate space and design for recreational needs, including forms of productive recreation such as community gardening, city farms and farmers markets.  
**Action 2.18.4:** Protect, enhance and restore the health and integrity of natural ecosystems such as urban forests and waterways.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.18 Urban parks and open spaces:</b> Urban parks and open spaces are protected, enhanced and restored to protect and strengthen community wellbeing under a changing climate. <b>Action Implementation</b>					
<b>Action 2.18.1:</b> Enhance existing parklands and acquire new parkland where feasible to improve availability of green spaces and reduce risks from future urban heat island effects (UHIE).	Incentives funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government (planning, environment), developers, landowners	Ongoing	UPM 1.1, 2.1	Toronto City (2010) <i>Toronto Official Plan</i> , Toronto City Planning;
<b>Action 2.18.2:</b> Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>Local governments</b> , state government (planning, environment), developers, landowners	Ongoing		Spickett et al (2007); Heart Foundation & VicHealth (2011); CAP 2010
<b>Action 2.18.3:</b> Provide appropriate space and design for recreational needs, including forms of productive recreation such as community gardening, city farms and farmers markets.	Incentives funded by private sector and government contributions (rates, levies)	<b>Local governments</b> , state government, developers	Ongoing	UPM 1.1, 2.1	Toronto City (2010) <i>Toronto Official Plan</i> , Toronto City Planning; Heart Foundation & VicHealth (2011); Edwards et al (2011)
<b>Action 2.18.4:</b> Protect, enhance and restore the health and integrity of natural ecosystems such as urban forests and waterways.	Incentives funded by private sector and government contributions (rates, levies, competitive grants)	<b>Local governments</b> , state government, developers, landowners	Ongoing	UPM 1.13	Toronto City (2010) <i>Toronto Official Plan</i> , Toronto City Planning;

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.18.1:</b> Enhance existing parklands and acquire new parkland where feasible to improve availability of green spaces and reduce risks from future urban heat island effects (UHIE).	Spatial extent of urban parklands.	Planning schemes and regional plan reviews	<b>Local governments</b> , state government, developers
<b>Action 2.18.2:</b> Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure.	Changes in urban heat shown in thermal imaging and UHIE mapping; Community participation in urban greening initiatives	Neighbourhood Planning	<b>Local governments</b> , state government, developers,
<b>Action 2.18.3:</b> Provide appropriate space and design for recreational needs, including forms of productive recreation such as community gardening, city farms and farmers markets.	Community feedback and consistency of these environmental / land use interventions with community interests expressed in neighbourhood planning; Spatial extent of urban areas producing food.	Neighbourhood Planning	<b>Local governments</b> , state government, developers
<b>Action 2.18.4:</b> Protect, enhance and restore the health and integrity of natural ecosystems such as urban forests and waterways.	Quality of ecosystems, number of restored habitats	State of the Environment reporting	<b>State government</b> , local government and private sector

**UPM POLICY 3.** SEQ's planning processes must have strong adaptive capacity to improve decision-making to adapt to climate change.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well the Policy will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentive (financial and non-financial)	<b>State Government,</b> local government, private sector (developers)	All settlements	Increase institutional adaptive capacity; Improved decision-making process; Reduced regional climate change vulnerability	Difficulty in accessing financial systems to sustain programs; Reduced political acceptability due to short-term electoral cycle	



**PROGRAM 3.1 LEADERSHIP DEVELOPMENT:** Leadership must be developed by encouraging strong partnerships across government, business and the community in order to improve communication of climate change risks to decision-makers and wider community.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through grants schemes funded by federal and state governments	<b>Local governments (SEQ Mayors)</b> , state government, private sector, community	All settlements	Ongoing	Immediate	EM 3.1, 3.2, 3.4, 4.3 HH 2.4, 2.5 UPM 1.14, 1.15, 3.2, 3.3, 3.4, 3.6 PI 3.1	Gold Coast Climate adaptation strategy

**Action 3.1.1:** Establish a regional consortium for climate change adaptation facilitated through SEQ's Council of Mayors to define priorities for research, priority state climate adaptation research and monitoring needs, proposed resources and timeframes to implement actions and programs, and strategic planning, including regional policy statements to promote and/or improve adaptation to climate change impacts.

**Action 3.1.2:** Establish a working group within SEQ's Council of Mayors to improve collaboration across agencies and governments, including local government, state and federal agencies, for the implementation of climate change adaptation strategies.

**Action 3.1.3:** Ensure partnering agencies adopt a policy collaboration scheme to optimise the implementation of cross-border and cross-agency climate change adaptation strategies.

**Action 3.1.4:** Initiate a public education campaign to raise awareness and inform business and the community about climate change risks.

**Action 3.1.5:** Identify and support climate change champions.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.1 Leadership development:</b> Leadership must be developed by encouraging strong partnerships across government, business and the community in order to improve communication of climate change risks to decision-makers and wider community.					
<b>Action Implementation</b>					
<b>Action 3.1.1:</b> Establish a regional consortium for climate change adaptation facilitated through SEQ's Council of Mayors to define priorities for research, priority state climate adaptation research and monitoring needs, proposed resources and timeframes to implement actions and programs, and strategic planning, including regional policy statements to promote and/or improve adaptation to climate change impacts.	Incentives through Commonwealth competitive grants, state and local governments contributions	<b>Local governments (SEQ Council of Mayors)</b> , state government private sector and community	Episodic	UPM 1.14.1, 3.2, 3.5	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i> ; UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 3.1.2:</b> Establish a working group within SEQ's Council of Mayors to improve collaboration across agencies and governments, including local government, state and federal agencies, for the implementation of climate change adaptation strategies.	Incentives funded through state and local governments contributions	<b>Local governments (SEQ Council of Mayors)</b> , state government	Episodic		
<b>Action 3.1.3:</b> Ensure partnering agencies adopt a policy collaboration scheme to optimise the implementation of cross-border and cross-agency climate change adaptation strategies.	Policy - Statutory through inclusion in the Regional Plan	<b>State government</b> (planning, environment, community & disability services), local governments	One-off	UPM 3.4.1	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 3.1.4:</b> Initiate a public education campaign to raise awareness and inform business and the community about climate change risks.	Guideline - State-wide educational campaign	<b>State government</b> , local governments, private sector and community	Ongoing	UPM 3.3, 3.4	
<b>Action 3.1.5:</b> Identify and support climate change champions.	Incentives (financial and capacity) supported with state and local government contributions	<b>Local governments</b> , state government private sector and community	Ongoing	UPM 3.2.3, 3.2.4, 3.5.4	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.1.1:</b> Establish a regional consortium for climate change adaptation facilitated through SEQ's Council of Mayors to define priorities for research, priority state climate adaptation research and monitoring needs, proposed resources and timeframes to implement actions and programs, and strategic planning, including regional policy statements to promote and/or improve adaptation to climate change impacts.	Consortium established; Number of members		<b>Local governments</b> , state government private sector and community
<b>Action 3.1.2:</b> Establish a working group within SEQ's Council of Mayors to improve collaboration across agencies and governments, including local government, state and federal agencies, for the implementation of climate change adaptation strategies.	Partnerships established; Number of partnerships established		<b>Local governments</b> , state government
<b>Action 3.1.3:</b> Ensure partnering agencies adopt a policy collaboration scheme to optimise the implementation of cross-border and cross-agency climate change adaptation strategies.	Policy collaboration agreement implemented	Planning schemes and regional plan reviews	<b>State government</b> (planning, environment, communities), local governments
<b>Action 3.1.4:</b> Initiate a public education campaign to raise awareness and inform business and the community about climate change risks.	Education campaign established		<b>State government</b> , local governments, private sector and community
<b>Action 3.1.5:</b> Identify and support climate change champions.	Champions identified and supported		<b>Local governments</b> , state government private sector and community

**PROGRAM 3.2 CAPACITY BUILDING:** Local governments' capacity must continue to be built through improved knowledge and skills about climate change.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Guideline - Educational through incentives (financial and capacity) to local governments from government and private sector contributions	<b>Local governments (SEQ Council of Mayors)</b> , state government	All settlements	Ongoing	Immediate	EM 4.2, 4.3 PI 3.1 UPM 3.1	

**Action 3.2.1:** Establish partnerships with research agencies to ensure the best available science informs climate adaptation decision-making.

**Action 3.2.2:** Compile and disseminate strategies, tools and information generated through partnerships for use by local governments when updating their local and general plans and to inform public discussion on climate change risks.

**Action 3.2.3:** Establish institutional collaboration between larger and smaller local authorities within the region to provide mentoring programs for staff focused on climate change adaptation.

**Action 3.2.4:** Implement training and individual development programs for staff focused on identifying and evaluating climate risks.

**Action 3.2.5:** Implement an adaptive management cycle focused on a monitoring, evaluation and report (MER) approach to enable decision-makers to learn from successes and failures when developing and implementing climate change adaptation initiatives/strategies.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.2 Capacity building:</b> Local governments' capacity must continue to be built through improved knowledge and skills about climate change.					
<b>Action Implementation</b>					
<b>Action 3.2.1:</b> Establish partnerships with research agencies to ensure the best available science informs climate adaptation decision-making.	Advice - Cross-agency/government working group in collaboration with research agencies	<b>Local governments (LGAQ)</b> , state government and research agencies	Ongoing	UPM 1.14.1	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 3.2.2:</b> Compile and disseminate strategies, tools and information generated through partnerships for use by local governments when updating their local and general plans and to inform public discussion on climate change risks.	Guideline - Educational disseminated through LGAQ	<b>Local governments (LGAQ)</b> , state government and research agencies	Episodic	UPM 3.1, 3.2.4, 3.3	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 3.2.3:</b> Establish institutional collaboration between larger and smaller local authorities within the region to provide mentoring programs for staff focused on climate change adaptation.	Incentives with the support from SEQ Council of Mayors and LGAQ	<b>Local governments (SEQ Council of Mayors)</b> , state government	Episodic	UPM 3.1.1, 3.1.2	Stakeholders interview
<b>Action 3.2.4:</b> Implement training and individual development programs for staff focused on identifying and evaluating climate risks.	Incentives with the support (financial and capacity) from SEQ Council of Mayors and LGAQ	<b>Local governments (LGAQ)</b> , state government and research agencies	Episodic	UPM 3.2.2	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 3.2.5:</b> Implement an adaptive management cycle focused on a monitoring, evaluation and report (MER) approach to enable decision-makers to learn from successes and failures when developing and implementing climate change adaptation initiatives/strategies.	Guideline - Educational disseminated through LGAQ	<b>Local governments (LGAQ)</b> , state government and research agencies	Ongoing		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.2.1:</b> Establish partnerships with research agencies to ensure the best available science informs climate adaptation decision-making.	Partnerships established; Number and types of partnerships		<b>Local governments</b> , state government and research agencies
<b>Action 3.2.2:</b> Compile and disseminate strategies, tools and information generated through partnerships for use by local governments when updating their local and general plans and to inform public discussion on climate change risks.	Tools and strategies are widely disseminated; Number of governments (departments and units) accessing resource pool		<b>Local governments</b> , state government and research agencies
<b>Action 3.2.3:</b> Establish institutional collaboration between larger and smaller local authorities within the region to provide mentoring programs for staff focused on climate change adaptation.	Mentoring programs established; Number of mentoring programs established		<b>Local governments</b> , state government
<b>Action 3.2.4:</b> Implement training and individual development programs for staff focused on identifying and evaluating climate risks.	Training programs established; Number of training programs established		<b>Local governments</b> , state government
<b>Action 3.2.5:</b> Implement an adaptive management cycle focused on a monitoring, evaluation and report (MER) approach to enable decision-makers to learn from successes and failures when developing and implementing climate change adaptation initiatives/strategies.	MER approach adopted; Number of governments (departments and units) adopting approach		<b>Local governments</b> , state government



**PROGRAM 3.3 RISK COMMUNICATION ON CLIMATE CHANGE:** Communication of climate change risks to decision-makers and wider community (flooding, storm surge, heatwave and sea level rise) must be improved.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	Low	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through governments and private sector contributions	<b>State government</b> , local governments, private sector (developers, insurance companies), research agencies	All settlements	Ongoing	Immediate	EM 3.1, 3.4, 3.5; PI 1.2, 2.2, 3.2	Sunshine Coast Climate Change and Peak Oil Strategy

**Action 3.3.1:** Establish a partnership between pertinent federal and state agencies and the research community to develop a database of information related to climate change risks to be used by decision-makers to reduce climate change impacts.

**Action 3.3.2:** Develop and implement a communication and engagement strategy with vulnerable communities to examine adaptive strategies available to state and local agencies to prepare for potential climate change impacts.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.3 Risk communication on climate change:</b> Communication of climate change risks to decision-makers and wider community (flooding, storm surge, heatwave and sea level rise) must be improved.					
<b>Action Implementation</b>					
<b>Action 3.3.1:</b> Establish a partnership between pertinent federal and state agencies and the research community to develop a database of information related to climate change risks to be used by decision-makers to reduce climate change impacts.	Incentives through governments and private sector contributions	<b>State government</b> , local governments, private sector (developers, insurance companies), research agencies	Ongoing	UPM 1.9.3, 1.14.1, 2.9.3, 2.13.1, 2.13.2, 3.2.1	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.
<b>Action 3.3.2:</b> Develop and implement a communication and engagement strategy with vulnerable communities to examine adaptive strategies available to state and local agencies to prepare for potential climate change impacts.	Incentives to local governments from state government and private sector	<b>Local government (LGAQ)</b> , state government, private sector	Ongoing	UPM 1.6.6, 1.7.4, 1.9.6, 2.7.6, 2.8.4, 2.9.5	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.3.1:</b> Establish a partnership between pertinent federal and state agencies and the research community to develop a database of information related to climate change risks to be used by decision-makers to reduce climate change impacts.	Partnership established; Number of participating agencies		<b>State government</b> , local governments, private sector, research agencies
<b>Action 3.3.2:</b> Develop and implement a communication and engagement strategy with vulnerable communities to examine adaptive strategies available to state and local agencies to prepare for potential climate change impacts.	Communication strategy developed and implemented; Outreach of communication strategy		<b>Local government</b> , state government, private sector

**PROGRAM 3.4 RISK ALLOCATION MECHANISMS:** Climate change risks must be incorporated into decision-making processes.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	Low	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - inclusion into SPA	<b>State government</b> , local governments, private sector, community	All settlements	Ongoing	Immediate	EM 2.1, 2.2, 3.2, 3.3 UPM 1.14, 1.15, 1.16, 1.9, 2.9, 2.14, 3.1, 3.3, 3.6 PI 3.2	Office of Climate Change (2011) <i>Climate Change: Adaptation for Queensland</i> , Department of Environment and Resource Management, State of Queensland

**Action 3.4.1:** Implement a hazard avoidance policy adopting the most risk-averse approach for minimizing the adverse effects of climate change to carefully consider new development within areas vulnerable to climate change impacts, and to consider prohibiting development of undeveloped, vulnerable areas containing critical habitat or opportunities for habitat creation.

**Action 3.4.2:** Integrate climate risk and adaptation assessments into business and community planning.

**Action 3.4.3:** Integrate climate risks and adaptation into existing and emerging policy and planning frameworks and strategies in key socio-economical and environmental areas.

**Action 3.4.4:** Accept losses where there are no other acceptable or feasible options. Losses could be related to habitats and/or ecosystems; individuals' property and financial losses following extreme weather events; public assets; insurance companies' losses as part of their business.

**Action 3.4.5:** Define responsibilities for losses or risks across governments, private sector and insurance companies.

**Action 3.4.6:** Provide incentives that promote risk adverse behaviour when purchasing and developing properties. This would include linking financial terms and conditions to climate risk and subsidising technologies that are consistent with contributing to avoiding or reducing climate risks.

**Action 3.4.7:** Define developers' responsibilities in development located in vulnerable areas in the next 50 years (e.g. fee to cover the costs of potential emergency response, or to improve resilience of infrastructure that services the new development to natural hazards; developer must design the new development and its supporting infrastructure to be more resilient to natural hazards).

**Action 3.4.8:** Define landowners' responsibilities in locations subject to natural hazards in the next 50 (e.g. landowner agrees to retrofit properties, undertake measures to reduce impacts from natural hazards).

**Action 3.4.9:** Develop regulatory policies for insurance companies to guide private insurers in dealing with properties located in areas vulnerable to climate change impacts, including natural hazards.

**Action 3.4.10:** Investigate the feasibility of establishing partnerships between government and insurance companies to determine conditions to guide insurance of private and public assets based on improved risk mitigation mechanisms (e.g. flood mitigation plans are developed and implemented to reduce the risk of recurrent floods in low-lying areas).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.4 Risk allocation mechanisms:</b> Climate change risks must be incorporated into decision-making processes.					
<b>Action Implementation</b>					
<b>Action 3.4.1:</b> Implement a hazard avoidance policy adopting the most risk-averse approach for minimizing the adverse effects of climate change to carefully consider new development within areas vulnerable to climate change impacts, and to consider prohibiting development of undeveloped, vulnerable areas containing critical habitat or opportunities for habitat creation.	Regulation - Statutory through inclusion into SPA	<b>State government,</b> local governments	One-off	UPM 1.1, 1.2, 1.6, 1.7, 1.9, 1.13, 2.1, 2.2, 2.7, 2.8, 2.9	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 3.4.2:</b> Integrate climate risk and adaptation assessments into business and community planning.	Regulation - Statutory through inclusion into SPA	<b>State government,</b> local governments	Episodic	UPM 3.3, 3.1.4	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 3.4.3:</b> Integrate climate risks and adaptation into existing and emerging policy and planning frameworks and strategies in key socio-economical and environmental areas.	Regulation - Statutory through inclusion into Regional Plan, SPPs and planning schemes	<b>State government,</b> local governments	Episodic	UPM 3.3	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 3.4.4:</b> Accept losses where there are no other acceptable or feasible options. Losses could be related to habitats and/or ecosystems; individuals' property and financial losses following extreme weather events; public assets; insurance companies' losses as part of their business.	Advice - Cross agency/government working group in collaboration with private sector to define Statutory inclusion into SPA and insurance policies	<b>State government,</b> local governments, private sector, community	Ongoing	UPM 1.16.3, 2.14.3	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 3.4.5:</b> Define responsibilities for losses or risks across governments, private sector and insurance companies.	Advice - Cross agency/government working group in collaboration with private sector and community	<b>State government,</b> local governments, private sector, community	Episodic	UPM 1.5.8, 2.6.8	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 3.4.6:</b> Provide incentives that promote risk adverse behaviour when purchasing and developing properties. This would include linking financial terms and conditions to climate risk and subsidising technologies that are consistent with contributing to avoiding or reducing climate risks.	Incentives through rebate schemes funded by contributions from governments and private sector	<b>Local governments (SEQ Council of Mayors),</b> state government, private sector	Ongoing	UPM 1.4.3, 1.5.5, 1.11, 1.17.3, 1.18.3, 2.4.3, 2.6.5, 3.11, 2.15.3, 2.16.3, 2.17.3	UK Climate Impacts Programme <i>Identifying Adaptation Options</i>

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 3.4.7:</b> Define developers' responsibilities in development located in vulnerable areas in the next 50 years (e.g. fee to cover the costs of potential emergency response, or to improve resilience of infrastructure that services the new development to natural hazards; developer must design the new development and its supporting infrastructure to be more resilient to natural hazards).	Regulation - Statutory through inclusion into SPA and SPPs (link to infrastructure charges)	<b>State government</b> , developers	Episodic	UPM 1.1.6, 2.1.6	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 3.4.8:</b> Define landowners' responsibilities in locations subject to natural hazards in the next 50 (e.g. landowner agrees to retrofit properties, undertake measures to reduce impacts from natural hazards).	Regulation - Statutory through inclusion into SPA and SPPs in combination with rebate schemes	<b>State government</b> , local governments, developers, landowners	Episodic	UPM 1.1.7, 1.17.7, 1.18.7, , 2.1.7, 2.15.7, 2.16.7, 2.17.6, 3.1.4	
<b>Action 3.4.9:</b> Develop regulatory policies for insurance companies to guide private insurers in dealing with properties located in areas vulnerable to climate change impacts, including natural hazards.	Regulation	<b>State government</b>	One-off	UPM 1.6.8, 1.9.2, 2.7.8, 2.9.2	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 3.4.10:</b> Investigate the feasibility of establishing partnerships between government and insurance companies to determine conditions to guide insurance of private and public assets based on improved risk mitigation mechanisms (e.g. flood mitigation plans are developed and implemented to reduce the risk of recurrent floods in low-lying areas).	Advice - Cross agency/government working group in collaboration with private sector to define Statutory inclusion into SPA and insurance policies	<b>State government</b> , local government, insurance companies, landowners	One-off		

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.4.1:</b> Implement a hazard avoidance policy adopting the most risk-averse approach for minimizing the adverse effects of climate change to carefully consider new development within areas vulnerable to climate change impacts, and to consider prohibiting development of undeveloped, vulnerable areas containing critical habitat or opportunities for habitat creation.	Hazard policy developed and implemented; Number of new developments in line with policy	Planning schemes, regional plan and SPP reviews	<b>State government</b> , local governments

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.4.2:</b> Integrate climate risk and adaptation assessments into business and community planning.	Number of planning instruments incorporating climate risk and adaptation assessments	Planning schemes, regional plan and SPP reviews	<b>State government</b> , local governments
<b>Action 3.4.3:</b> Integrate climate risks and adaptation into existing and emerging policy and planning frameworks and strategies in key socio-economical and environmental areas.	Number of instruments integrating climate risks and adaptation	Planning schemes, regional plan and SPP reviews	<b>State government</b> , local governments
<b>Action 3.4.4:</b> Accept losses where there are no other acceptable or feasible options. Losses could be related to habitats and/or ecosystems; individuals' property and financial losses following extreme weather events; public assets; insurance companies' losses as part of their business.	Number of sectors accepting losses		<b>State government</b> , local governments, private sector, community
<b>Action 3.4.5:</b> Define responsibilities for losses or risks across governments, private sector and insurance companies.	Number of sectors accepting responsibility for losses		<b>State government</b> , local governments, private sector, community
<b>Action 3.4.6:</b> Provide incentives that promote risk adverse behaviour when purchasing and developing properties. This would include linking financial terms and conditions to climate risk and subsidising technologies that are consistent with contributing to avoiding or reducing climate risks.	Incentives provided and adopted; Number of members of community and private sector (real estate industry) benefiting from scheme		<b>Local governments</b> , state government, private sector
<b>Action 3.4.7:</b> Define developers' responsibilities in development located in vulnerable areas in the next 50 years (e.g. fee to cover the costs of potential emergency response, or to improve resilience of infrastructure that services the new development to natural hazards; developer must design the new development and its supporting infrastructure to be more resilient to natural hazards).	Developers' responsibilities are clearly identified and regulated by state legislation	SPA review	<b>State government</b> , local governments, developers
<b>Action 3.4.8:</b> Define landowners' responsibilities in locations subject to natural hazards in the next 50 (e.g. landowner agrees to retrofit properties, undertake measures to reduce impacts from natural hazards).	Landowners' responsibilities are clearly identified and regulated by state legislation	SPA review	<b>State government</b> , local governments, landowners
<b>Action 3.4.9:</b> Develop regulatory policies for insurance companies to guide private insurers in dealing with properties located in areas vulnerable to climate change impacts, including natural hazards.	New regulations for insurance companies are established		<b>State government</b> , local governments, private sector, community
<b>Action 3.4.10:</b> Investigate the feasibility of establishing partnerships between government and insurance companies to determine conditions to guide insurance of private and public assets based on improved risk mitigation mechanisms (e.g. flood mitigation plans are developed and implemented to reduce the risk of recurrent floods in low-lying areas).	Partnerships between government and insurance companies are established	Planning schemes reviews	<b>State government</b> , local government, private sector, community



**PROGRAM 3.5 PROFESSIONAL AND SUB-PROFESSIONAL EDUCATION AND TRAINING:** A mandatory training program is created to educate professionals and sub-professionals in relevant fields (e.g. planning, architecture, surveying, building certification, real estate agents, engineering, and construction management) on the need to incorporate adaptation to climate change and natural hazards as a basis for establishing design criteria for new infrastructure and housing estates.

### **Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Self-regulation (Industry standards) - Compulsory educational training to attain qualification/accreditation and registration	<b>Professional and sub-professional bodies</b> , state government, education and training organisations	All settlements	Ongoing	Immediate	EM 2.4 UPM 3.2 PI 3.1, 3.3	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.

**Action 3.5.1:** Encourage universities, vocational training and TAFE colleges in SEQ to develop educational programs for building design and construction professionals, planners, and those in other pertinent fields such as real estate agents, focusing on vulnerability to climate change and adaptation methodologies.

**Action 3.5.2:** Include compulsory training on climate change as part of professional and sub-professional membership accreditation and certification (e.g. PIA, EIANZ, AILA).

**Action 3.5.3:** Implement continued professional development programs for professionals and sub-professional focused on identifying and evaluating climate risks.

**Action 3.5.4:** Promote climate change awareness through education and training (formal and informal), including integration into curriculum and targeted programs or activities.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.5 Professional and sub-professional education and training:</b> A mandatory training program is created to educate professionals and sub-professionals in relevant fields (e.g. planning, architecture, surveying, building certification, real estate agents, engineering, and construction management) on the need to incorporate adaptation to climate change and natural hazards as a basis for establishing design criteria for new infrastructure and housing estates.					
<b>Action Implementation</b>					
<b>Action 3.5.1:</b> Encourage universities, vocational training and TAFE colleges in SEQ to develop educational programs for building design and construction professionals, planners, and those in other pertinent fields such as real estate agents, focusing on vulnerability to climate change and adaptation methodologies.	Directive - Compulsory component of continuing professional and sub-professional development	<b>Professional and sub-professional bodies</b> , state government, education and training organisations	Episodic		Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.
<b>Action 3.5.2:</b> Include compulsory training on climate change as part of professional and sub-professional membership accreditation and certification (e.g. PIA, EIANZ, AILA).	Directive - Compulsory component of continuing professional and sub-professional development	<b>Professional and sub-professional bodies</b> , state government, education agencies	One-off		
<b>Action 3.5.3:</b> Implement continued professional development programs for professionals and sub-professional focused on identifying and evaluating climate risks.	Directive - Compulsory component of continuing professional and sub-professional development	<b>Professional and sub-professional bodies</b> , state government, education agencies	Ongoing		UK Climate Impacts Programme <i>Identifying Adaptation Options</i>
<b>Action 3.5.4:</b> Promote climate change awareness through education and training (formal and informal), including integration into curriculum and targeted programs or activities.	Guideline - Educational campaign targeting education and training organisations	<b>State government</b> , education and training organisations	Ongoing		UK Climate Impacts Programme <i>Identifying Adaptation Options</i>

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.5.1:</b> Encourage universities, vocational training and TAFE colleges in SEQ to develop educational programs for building design and construction professionals, planners, and those in other pertinent fields such as real estate agents, focusing on vulnerability to climate change and adaptation methodologies.	Educational programs developed and implemented; Number of institutions adopting programs	Professional/ sub-professional and course accreditation cycles	<b>Professional and sub-professional bodies,</b> state government, education and training organisations
<b>Action 3.5.2:</b> Include compulsory training on climate change as part of professional and sub-professional membership accreditation and certification (e.g. PIA, EIANZ, AILA).	Training programs developed and implemented; Number of institutions complying with compulsory training	Professional/ sub-professional and course accreditation cycles	<b>Professional and sub-professional bodies,</b> state government, education agencies
<b>Action 3.5.3:</b> Implement continued professional development programs for professionals and sub-professional focused on identifying and evaluating climate risks.	Program implemented; Degree of outreach of program	Professional/ sub-professional and course accreditation cycles	<b>Professional and sub-professional bodies,</b> state government, education agencies
<b>Action 3.5.4:</b> Promote climate change awareness through education and training (formal and informal), including integration into curriculum and targeted programs or activities.	Awareness campaign implemented; Degree of outreach of campaign		<b>State government,</b> education and training organisations

**PROGRAM 3.6 ANTICIPATORY PLANNING RESPONSE:** The vulnerability of existing settlements in SEQ to climate change-exacerbated hazards, including natural hazards must be reduced through pro-active action.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	Low	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulation - Statutory through inclusion into SPA, SPPs, regional plan and planning schemes	<b>State government</b> (planning, environment, communities, Premier's Department), local governments, private sector, communities	All settlements	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.4, 4.1 CM 3.1 UPM 1.4, 1.5, 1.6, 1.7, 1.9, 1.16, 1.17, 1.18, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.15, 2.16, 2.17	

**Action 3.6.1:** Assess the vulnerability, socially and physically, of existing settlements in SEQ to climate change impacts, including natural hazards.

**Action 3.6.2:** Reduce vulnerability of identified areas by encouraging the retrofitting of private properties at low and medium risk from climate change impacts, including natural hazards.

**Action 3.6.3:** Reduce vulnerability of identified areas by encouraging the relocation of building structures and infrastructure at high risk from climate change impacts, including natural hazards, whilst ensuring communities continue to have access to emergency and health services and facilities.

**Action 3.6.4:** Reduce vulnerability of identified areas by acquiring high risk properties through voluntary land acquisition, rolling easements, transfer of development rights, and/or purchase of development rights.

**Action 3.6.5:** Establish partnerships with the private sector (development industry, insurance companies, real estate agencies) to increase leadership capacity of local governments to undertake anticipatory planning responses to address climate change impacts, including natural hazards.

**Action 3.6.6:** Establish an engagement and communication strategy to consult with communities at risk.

**Action 3.6.7:** Implement state legislation to afford protection from legal liability to local councils where they provide advice or make a decision in good faith relating to anticipatory planning response to address climate change impacts, including natural hazards.

**Action 3.6.8:** Ensure state and local governments develop a long term post-disaster recovery plan. This plan should identify policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of a community after a disaster.

**Action 3.6.9:** Integrate long term post-disaster recovery considerations into pre-disaster plans of government agencies leading recovery processes.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.6 Anticipatory planning response:</b> The vulnerability of existing settlements in SEQ to climate change-exacerbated hazards, including natural hazards must be reduced through pro-active action.					
<b>Action Implementation</b>					
<b>Action 3.6.1:</b> Assess the vulnerability, socially and physically, of existing settlements in SEQ to climate change impacts, including natural hazards.	Advice - Cross-agency working group to guide identification of indicators and mapping	<b>Local governments (LGAQ)</b> , state government (planning, environment, community & disability services), private sector	Ongoing	UPM 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.16, 1.17, 1.18	
<b>Action 3.6.2:</b> Reduce vulnerability of identified areas by encouraging the retrofitting of private properties at low and medium risk from climate change impacts, including natural hazards.	Incentives funded by private sector and government contributions	<b>Local governments</b> , state government, private sector, communities	Ongoing	UPM 1.5, 2.6	UK adaptation Sub-Committee; Stakeholder feedback
<b>Action 3.6.3:</b> Reduce vulnerability of identified areas by encouraging the relocation of building structures and infrastructure at high risk from climate change impacts, including natural hazards, whilst ensuring communities continue to have access to emergency and health services and facilities.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments (SEQ Council of Mayors)</b> , state government, private sector, communities	Ongoing	UPM 1.7, 1.10, 2.8, 2.10	
<b>Action 3.6.4:</b> Reduce vulnerability of identified areas by acquiring high risk properties through voluntary land acquisition, rolling easements, transfer of development rights, and/or purchase of development rights.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>Local governments</b> , state government, private sector, communities	Ongoing	UPM 1.6, 1.9, 1.16, 2.7, 2.9, 2.14	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.; California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>
<b>Action 3.6.5:</b> Establish partnerships with the private sector (development industry, insurance companies, real estate agencies) to increase leadership capacity of local governments to undertake anticipatory planning responses to address climate change impacts, including natural hazards.	Advice - Cross-agency/government working group (SEQ Council of Mayors and LGAQ) in collaboration with the private sector	<b>State government</b> , local governments, private sector	Ongoing	UPM 3.1	
<b>Action 3.6.6:</b> Establish an engagement and communication strategy to consult with communities at risk.	Guideline - Educational through communication strategy involving public engagement	<b>Local governments (LGAQ)</b> , state government, private sector, communities	Ongoing	UPM 1.9.1, 1.6.6, 1.7.4, 1.17.7, 1.18.7, 2.7.6, 2.8.4, 3.1.4, 3.4.8	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 3.6.7:</b> Implement state legislation to afford protection from legal liability to local councils where they provide advice or make a decision in good faith relating to anticipatory planning response to address climate change impacts, including natural hazards.	Regulation - Statutory through inclusion into SPA	<b>State government</b> , local governments	One-off	UPM 1.16.3, 2.14.3	
<b>Action 3.6.8:</b> Ensure state and local governments develop a long term post-disaster recovery plan. This plan should identify policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of a community after a disaster.	Directive	<b>State government, local governments</b>	Ongoing		Meyer et al 2010; Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )
<b>Action 3.6.9:</b> Integrate long term post-disaster recovery considerations into pre-disaster plans of government agencies leading recovery processes.	Directive	<b>State government agencies with a lead agency role in recovery processes</b> (e.g. emergency management, planning, communities, health) supported by local governments	Ongoing		Meyer et al 2010; Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.6.1:</b> Assess the vulnerability, socially and physically, of existing settlements in SEQ to climate change impacts, including natural hazards.	Vulnerability assessment completed and periodically reviewed	Planning Schemes, SEQ Regional Plan and SPP reviews	<b>Local governments</b> , state government, private sector
<b>Action 3.6.2:</b> Reduce vulnerability of identified areas by encouraging the retrofitting of private properties at low and medium risk from climate change impacts, including natural hazards.	Number of properties retrofitted	Planning Schemes, SEQ Regional Plan and SPP reviews	<b>Local governments</b> , state government, private sector, communities



<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.6.3:</b> Reduce vulnerability of identified areas by encouraging the relocation of building structures and infrastructure at high risk from climate change impacts, including natural hazards, whilst ensuring communities continue to have access to emergency and health services and facilities.	Number of building structures and infrastructure relocated	Planning Schemes, SEQ Regional Plan and SPP reviews	<b>Local governments</b> , state government, private sector
<b>Action 3.6.4:</b> Reduce vulnerability of identified areas by acquiring high risk properties through voluntary land acquisition, rolling easements, transfer of development rights, and/or purchase of development rights.	Number of landowners joining schemes	Planning Schemes, SEQ Regional Plan and SPP reviews	<b>Local governments</b> , state government, private sector, communities
<b>Action 3.6.5:</b> Establish partnerships with the private sector (development industry, insurance companies, real estate agencies) to increase leadership capacity of local governments to undertake anticipatory planning responses to address climate change impacts, including natural hazards.	Partnerships established		<b>State government</b> , local governments, private sector
<b>Action 3.6.6:</b> Establish an engagement and communication strategy to consult with communities at risk.	Funds allocated to support schemes		<b>Local governments</b> , state government, private sector, communities
<b>Action 3.6.7:</b> Implement state legislation to afford protection from legal liability to local councils where they provide advice or make a decision in good faith relating to anticipatory planning response to address climate change impacts, including natural hazards.	Legislation implemented	SPA review	<b>State government</b>
<b>Action 3.6.8:</b> Ensure state and local governments develop a long term post-disaster recovery plan. This plan should identify policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of a community after a disaster.	Relevant goals and actions from the long-term recovery plan included in both statutory and non-statutory plans	SPA, SEQ Regional Plan reviews	<b>State government</b> , local government
<b>Action 3.6.9:</b> Integrate long term post-disaster recovery considerations into pre-disaster plans of government agencies leading recovery processes.	Relevant goals and actions from the long-term recovery plan included in both statutory and non-statutory plans	SPA, SEQ Regional Plan reviews	<b>State government</b>

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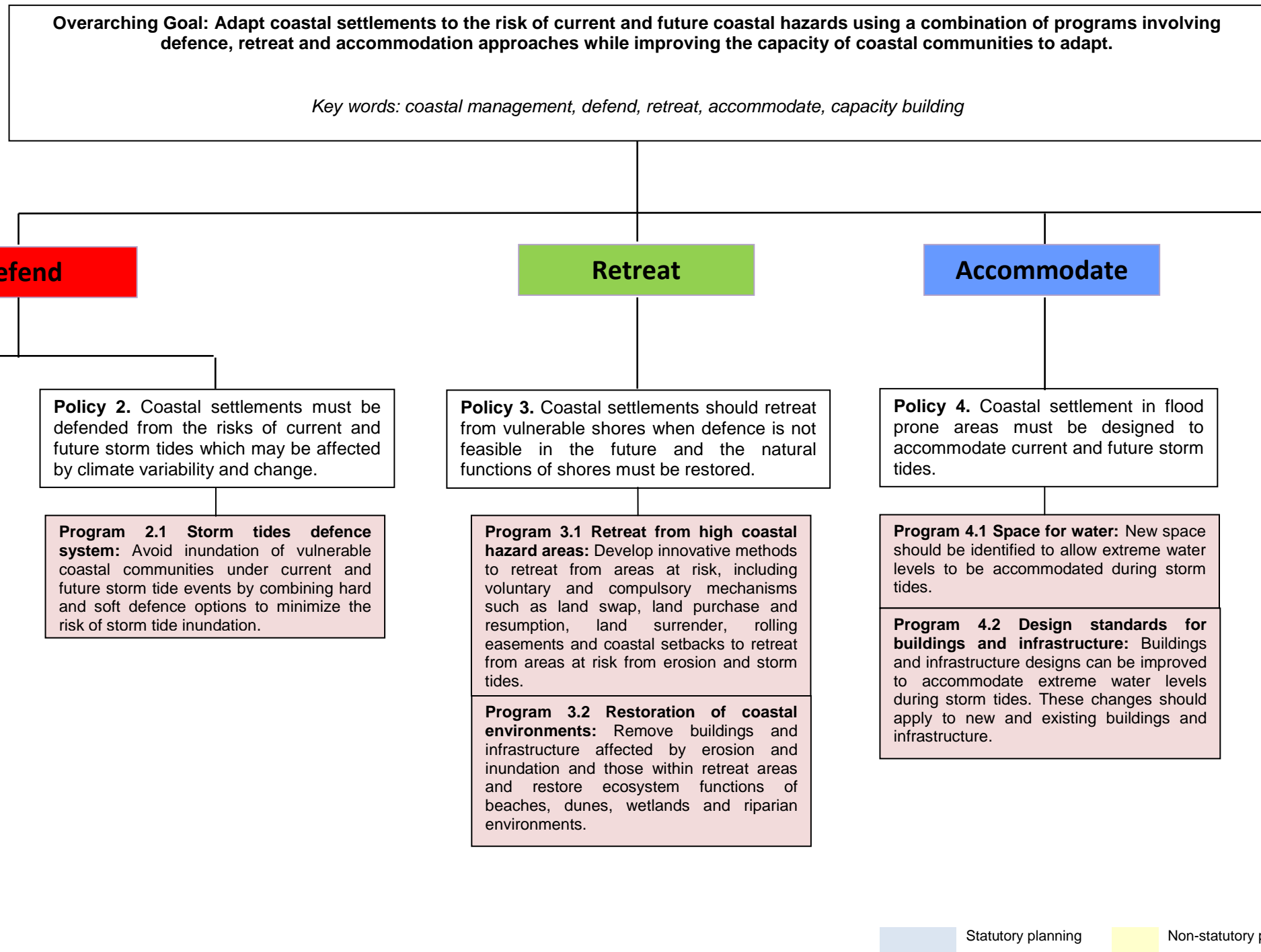
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## **SECTION 2 : COASTAL MANAGEMENT ADAPTATION OPTIONS**

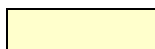




**Figure 2.1: Coastal Management Adaptation Options Framework**

**Legend:**

Statutory planning



Non-statutory planning



Non-statutory and/or statutory planning

### Policy 1. Sandy shorelines must be prepared for future coastal erosion events associated with climate variability and change.

**Program 1.1 Beach nourishment in a changing climate:** Instigate a program to defend the current position of the shoreline through erosion control involving a combination of beach nourishment, dune restoration and (re)construction, and hard coastal defences.

**Action 1.1.1:** Set-up a monitoring system for shoreline position and sand volumes.

**Action 1.1.2:** Identify strategic sand deposits including rivers, offshore and quarries.

**Action 1.1.3:** Identify current and future volumes needed for sand replenishment.

**Action 1.1.4:** Assess the best available option or combination of options for beach nourishment in the future.

**Action 1.1.5:** Couple dune restoration and beach nourishment programs.

**Program 1.2 Innovative erosion control approaches:** Identify and assess innovative approaches to address coastal erosion, including hard structures, beach drainage and emerging technologies.

**Action 1.2.1:** Assess the status and efficiency of current coastal erosion control approaches.

**Action 1.2.2:** Investigate innovative solutions for coastal erosion control, considering the impact of sea level rise and changing wave climate.

**Program 1.3 Dunes restoration in a changing climate:** Identify, restore and maintain coastal dune systems threatened by the impact of sea level rise and extreme erosion.

**Action 1.3.1:** Set-up a monitoring system for dune volumes and ecosystem health.

**Action 1.3.2:** Identify vulnerable dune systems.

**Action 1.3.3:** Promote programs for community dunes restoration.

**Action 1.3.4:** Assess the impact of sea level rise on dune functions, including sediments needs to cope with extreme storms.

**Action 1.3.5:** Couple dune restoration and beach nourishment programs.

### Policy 2. Coastal settlements must be defended from the risks of current and future storm tides which may be affected by climate variability and change.

**Program 2.1 Storm tides defence system:** Protect vulnerable coastal communities threatened by current and future storm tide events by combining hard and soft defence options to minimize the risk of inundation.

**Action 2.1.1:** Assess the vulnerability of existing urban areas to rising sea levels and storm surges.

**Action 2.1.2:** Research and analysis to determine alternative solutions to defence mechanisms by assessing the engineering, economic, social and environmental aspects of whether or not selected sections of the coasts can or should be protected.

**Action 2.1.3:** Identify and define protection zones, i.e. areas with dense urban development that permit coastal armoring.

**Action 2.1.4:** Investigate the feasibility of different mechanisms used to implement coastal defence, including soft and/or hard armoring techniques.

**Action 2.1.5:** Allocate funding to enable the construction and management of coastal defence structures.

**Action 2.1.6:** Establish a staging process for the implementation of coastal defence structures to protect identified areas at risk.

**Action 2.1.7:** Conduct a review of legislative frameworks to identify and conduct necessary amendments to enable implementation of coastal defence program.

**Action 2.1.8:** Improve understanding of future storm tides through funding of research programmes into future cyclone patterns and the impact on storm tide generation and propagation.

### Policy 3. Coastal settlements should retreat from vulnerable shores when defence is not feasible in the future and the natural function of shores must be restored.

**Program 3.1 Retreat from high coastal hazard areas:** Develop innovative methods to retreat from areas at risk, including voluntary and compulsory mechanisms such as land swap, land purchase and resumption, land surrender, rolling easements and coastal setbacks to retreat from areas at risk from erosion and storm tides.

**Action 3.1.1:** Assess the vulnerability of existing urban areas to rising sea levels, erosion and storm surges.

**Action 3.1.2:** Establish a staging process to implement planned retreat from vulnerable areas.

**Action 3.1.3:** Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, rolling easements, transfer of development rights, stronger setbacks and/or tax incentives.

**Action 3.1.4:** Limit or prohibit rebuilding of damaged structures in defined retreat areas.

**Action 3.1.5:** Limit or prohibit rebuilding of damaged structures in defined retreat areas.

**Action 3.1.6:** Identify suitable areas to accommodate the relocation of coastal communities/population at risk.

**Action 3.1.7:** Establish a communication strategy to consult with coastal communities at risk.

**Action 3.1.8:** Encourage land owners to relocate structures through tax benefits, voluntary acquisitions, or conservation easements schemes.

**Action 3.1.9:** Liaise with insurance companies to develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.

**Program 3.2 Restoration of coastal environments:** Remove buildings and infrastructure affected by erosion and inundation and those within retreat areas and restore ecosystem functions of beaches, dunes, wetlands and riparian environments.

**Action 3.2.1:** Assess the potential reuse of settlements and infrastructure for compatible uses.

**Action 3.2.2:** Assess the costs of removal of settlements and infrastructure.

**Action 3.2.3:** Prioritize the removal of settlements and infrastructure.

**Action 3.2.4:** Restore beaches and dunes.

**Action 3.2.5:** Restore wetlands and riparian vegetation.

**Action 3.2.6:** Create recreational areas.



**Policy 4. Coastal settlement in flood prone areas must be designed to accommodate current and future storm tides.**

**Program 4.1 Space for water:** New space should be identified to allow extreme water levels to be accommodated during storm tides.

**Action 4.1.1:** Identify areas at risk from coastal inundation currently and in the future.

**Action 4.1.2** Assess costs and benefits of reserving land for inundation under extreme storms.

**Action 4.1.3** Apply land management techniques (e.g. land purchase) to allow space for water.

**Action 4.1.4** Restore acquired land for low impact uses (e.g. parklands).

**Program 4.2 Design standards for buildings and infrastructure:** Buildings and infrastructure designs can be improved to accommodate extreme water levels during storm tides. These changes should apply to new and existing buildings and infrastructure.

**Action 4.2.1:** Incorporate sea level rise and storm tide criteria in the design standards to retrofit existing buildings and for new developments.

**Action 4.2.2:** Incorporate sea level rise and storm tide criteria in the design standards for new and upgraded stormwater systems and roads.

**Policy 5. The Capacity of the community and institutions to face current and future coastal hazards must be improved.**

**Program 5.1 Community capacity and engagement programs:** Create capacity and engagement programs for coastal rehabilitation and restoration including programs for dunes and wetlands restoration.

**Action 5.1.1:** Enhance community engagement programs for dune restoration (e.g. DuneCare).

**Action 5.2.2:** Enhance community engagement programs for wetland and riparian vegetation restoration (e.g. WetlandCare).

**Action 5.1.3:** Promote training programs for coastal communities in dunes, wetlands and riparian restoration.

**Program 5.2 Enhanced coastal education programmes:** Integrate climate adaptation into existing school education programs (primary and secondary levels).

**Action 5.2.1:** Educational programs – Integrate climate adaptation in primary and secondary schools curricula.

**Program 5.3 Enhanced institutional capacities to manage coastal hazards:** Build capacity of council officers and other relevant organization to manage coastal hazard areas in a changing climate.

**Action 5.3.1:** Create training packages for coastal managers and planners within councils.

**CM POLICY 1:** Sandy shorelines must be prepared for future coastal erosion events associated with climate variability and change.

**Policy Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	Medium	Low

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	Low	Low	High	High	High	Low	High	Low	Low	Low

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (statutory regulation); Shoreline Erosion Management Plans (incentives)	<b>Local government;</b> state government	South East Queensland coastal hazard prone areas as identified by Queensland Government maps	Current coastal communities and assets will be protected from the risks of coastal erosion in the future under rising sea levels and changing storms	The policy is not effective in reducing the risks of erosion; environmental degradation; impacts on tourism	Queensland Coastal Plan (2011); Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding;

**PROGRAM 1.1 BEACH NOURISHMENT IN A CHANGING CLIMATE:** Instigate a program to defend the current position of the shoreline through erosion control involving a combination of beach nourishment, dune restoration and (re)construction, and hard coastal defences.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	Medium	Medium

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	High	High	High	Low	High	Low	Low	Low

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate, deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (statutory); Shoreline Erosion Management Plans (Incentives)	<b>Local government</b> , state government (planning, environment)	South East Queensland erosion prone areas as identified by Queensland Government maps as part of the QCP	Ongoing. Erosion control should be based on continuous monitoring and intervention	Immediate	UPM 1.13 (w) X A1.1.5	Queensland Coastal Plan (2011); Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding; Eurosion Project (2006) Conscience Project (2010)

**Action 1.1.1:** Set-up a monitoring system for shoreline position and sand volumes.

**Action 1.1.2:** Identify strategic sand deposits including rivers, offshore and quarries.

**Action 1.1.3:** Identify current and future volumes needed for sand replenishment.

**Action 1.1.4:** Assess the best available option or combination of options for beach nourishment in the future.

**Action 1.1.5:** Couple dune restoration and beach nourishment programs.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl modified)
<b>Program 1.1 Beach Nourishment in a Changing Climate:</b> Instigate a program to defend the current position of the shoreline through erosion control involving a combination of beach nourishment, dune restoration and (re)construction, and hard coastal defences.					
<b>Action Implementation</b>					
<b>Action 1.1.1:</b> Set-up a monitoring system for shoreline position and sand volumes.	Voluntary action within a Shoreline Erosion Management Plan	<b>Local government,</b> state government	Ongoing; erosion control should be based on continuous monitoring and intervention		Euroion Project (2006) Conscience Project (2010)
<b>Action 1.1.2:</b> Identify strategic sand deposits including rivers, offshore and quarries.	Voluntary action within a Shoreline Erosion Management Plan	<b>State government,</b> local government	Episodic. Strategic sand deposits should be identified once.		Beachmed Project (2003-2008) Euroion Project (2006) Conscience Project (2010)
<b>Action 1.1.3:</b> Identify current and future volumes needed for sand replenishment.	Voluntary action within a Shoreline Erosion Management Plan	<b>Local government</b> state government	One-off. A study is required.		Gordon A. (2009) The Potential for Offshore Sand Sources to Offset Climate Change Impacts on Sydney's Beaches. Coasts & Ports 2009
<b>Action 1.1.4:</b> Assess the best available option or combination of options for beach nourishment in the future.	Voluntary action within a Shoreline Erosion Management Plan	<b>Local government</b> state government	One-off. A study is required.		Gordon A. (2009) The Potential for Offshore Sand Sources to Offset Climate Change Impacts on Sydney's Beaches. Coasts & Ports 2009
<b>Action 1.1.5:</b> Couple dune restoration and beach nourishment programs.	Voluntary action within a Shoreline Erosion Management Plan	<b>Local government</b> state government	One-off. A study is required.		Queensland Coastal Plan (2011); Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding; ;

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.1.1:</b> Set-up a monitoring system for shoreline position and sand volumes.	Number of stations for monitoring; number of surveys carried out; quality of data	Shoreline Erosion Management Plans Review; Shoreline monitoring program	<b>Local government;</b> state government
<b>Action 1.1.2:</b> Identify strategic sand deposits including rivers, offshore and quarries.	Number of surveys carried out; Extension and volume of sand deposits	Shoreline Erosion Management Plans	<b>State government;</b> local government
<b>Action 1.1.3:</b> Identify current and future volumes needed for sand replenishment.	Identified volume needed for future beach maintenance/replenishment		State government and local government
<b>Action 1.1.4:</b> Assess the best available option or combination of options for beach nourishment in the future.	A study is carried out		State government and local government
<b>Action 1.1.5:</b> Couple dune restoration and beach nourishment programs.	Number of actions carried out	Shoreline Erosion Management Plans	Local government

**PROGRAM 1.2 INNOVATIVE EROSION CONTROL APPROACHES:** Identify and assess innovative approaches to address coastal erosion, including hard structures, beach drainage and emerging technologies.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	High	High	High	Low	High	High	Low	High



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off, episodic, ongoing)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (Statutory); Shoreline Erosion Management Plans (Incentives)	<b>Local government</b> , state government (planning, environment)	South East Queensland storm tide prone areas as identified by Queensland Government maps produced under the QCP	episodic; a proactive decision making approach is needed to ensure flood resilience is improved in hazard prone areas	Immediate		Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding; •Delta Commission (2008). Working together with water. A living land builds for its future; THESEUS (2011) Integrated inventory of data and prototype experience on coastal defences and technologies

**Action 1.2.1:** Assess the status and efficiency of current coastal erosion control approaches in place.

**Action 1.2.2:** Investigate innovative solutions for coastal erosion control, considering the impact of sea level rise and changing wave climate.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.2 Innovative erosion control approaches:</b> Identify and assess innovative approaches to address coastal erosion, including hard structures, beach drainage and emerging technologies.					
<b>Action Implementation</b>					
<b>Action 1.2.1:</b> Assess the status and efficiency of current coastal erosion control approaches.	Voluntary action within a Shoreline Erosion Management Plan	<b>Local government,</b> state government	Episodic. To be done once and then repeated periodically	N/A	Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding
<b>Action 1.2.2:</b> Investigate innovative solutions for coastal erosion control, considering the impact of sea level rise and changing wave climate.	Incentive by funding research programs through ARC, NCCARF or other federal or state funded mechanisms	<b>Federal government, state government,</b> local government	Episodic. Investigations should be carried out through research multiannual research programs.	UPM 1.8.2	THESEUS (2011) Integrated inventory of data and prototype experience on coastal defences and technologies

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.2.1:</b> Assess the status and efficiency of current coastal erosion control structures.	Number of erosion control structures identified and assessed; Status of coastal erosion defence structures (effective/non effective)	Shoreline Erosion Management Plans Review; Shoreline monitoring program	<b>Local government</b>
<b>Action 1.2.2:</b> Investigate innovative designs for coastal erosion control structures, including the impact of sea level rise and changing wave climate.	\$ Investment in research programmes Impact of research		<b>Federal Government, state government,</b> local government

**PROGRAM 1.3 DUNES RESTORATION IN A CHANGING CLIMATE:** Identify, restore and maintain coastal dune systems threatened by the impact of sea level rise and extreme erosion.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	Low	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme; Shoreline Erosion Management Plans	Local government supported by state government (planning, environment)	South East Queensland erosion and storm tide prone areas as identified by Queensland Government maps produced under the QCP	Episodic; a proactive decision making approach is needed to ensure flood resilience is improved in hazard prone areas	Deferred	UPM 1.13 X CM 1.3.1	Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding; NSW Department of Land and Water Conservation (2011) Coastal Dune Management - A Manual of Coastal Dune Management and Rehabilitation Techniques

**Action 1.3.1:** Set-up a monitoring system for dune volumes and ecosystem health.

**Action 1.3.2:** Identify vulnerable dune systems.

**Action 1.3.3:** Promote programs for community dunes restoration.

**Action 1.3.4:** Assess the impact of sea level rise on dune functions, including sediments needs to cope with extreme storm.

**Action 1.3.5:** Couple dune restoration and beach nourishment programs.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.3 Dunes Restoration in a Changing Climate:</b> Identify, restore and maintain coastal dune systems threatened by the impact of sea level rise and extreme erosion. <b>Action Implementation</b>					
<b>Action 1.3.1:</b> Set-up a monitoring system for dune volumes and ecosystem health.	Voluntary action within a Shoreline Erosion Management Plan	<b>Local government,</b> state government	Ongoing. Dunes monitoring should be based on ongoing monitoring and intervention		Euroion Project (2006) Conscience Project (2010)
<b>Action 1.3.2:</b> Identify vulnerable dune systems.	Study	<b>Local government,</b> state government	Episodic. Vulnerable dune systems should be identified once and then a periodic re-assessment should be carried out		NSW Department of Land and Water Conservation (2011) Coastal Dune Management - A Manual of Coastal Dune Management and Rehabilitation Techniques
<b>Action 1.3.3:</b> Promote programs for community dunes restoration.	Voluntary actions within CoastCare programs	<b>Local government,</b> state government	Ongoing	UPM 1.17 UPM 1.18	DuneCare/BeachCare programs, GCCM
<b>Action 1.3.4:</b> Assess the impact of sea level rise on dune functions, including sediments needs to cope with extreme storms.	Study	<b>Local government,</b> state government	One-off. A study is required.		Gordon A. (2009) The Potential for Offshore Sand Sources to Offset Climate Change Impacts on Sydney's Beaches. Coasts & Ports 2009
<b>Action 1.3.5:</b> Couple dune restoration and beach nourishment programs.	Voluntary action within a Shoreline Erosion Management Plan	<b>Local government,</b> state government	One-off. A study is required.		Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding; ;

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.3.1:</b> Set-up a monitoring system for dune volumes and ecosystem health.	Number of stations for monitoring  Dune volumes monitoring program; dune ecosystem assessment programs	Shoreline Erosion Management Plans Review; Shoreline monitoring program	<b>Local government</b>
<b>Action 1.3.2:</b> Identify vulnerable dune systems.	Number of studies, \$ investment; % of dunes systems assessed	Shoreline Erosion Management Plans	<b>State government</b>
<b>Action 1.3.3:</b> Promote programs for community dunes restoration.	Number of people involved in programs	DuneCare programs	<b>Local government</b> , state government, federal government
<b>Action 1.3.4:</b> Assess the impact of sea level rise on dune functions, including sediments needs to cope with extreme storms.	A study is carried out		<b>State government; local government</b>
<b>Action 1.3.5:</b> Couple dune restoration and beach nourishment programs.	Number of actions carried out	Shoreline Erosion Management Plans	<b>Local government</b>

**CM POLICY 2:** Coastal settlements must be defended from the risks of current and future storm tides which may be affected by climate variability and change.

**Policy Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
High	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	High	High	High	High	High	High	Low	Low

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (Statutory)	<b>Local government,</b> state government (planning, environment)	South East Queensland coastal hazard prone areas as identified by Queensland Government maps	Communities and assets will be not exposed to the risks of floods in the future under rising sea levels and changing storms	Distortion of property markets. Impacts on local population relocated from their area, especially older people	Queensland Coastal Plan (2011); Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding;



**PROGRAM 2.1 STORM TIDES DEFENCE SYSTEM:** Protect vulnerable coastal communities threatened by current and future storm tide events by combining hard and soft defence options to minimize the risk of inundation.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	Low	Low	High	Low	High	High	Low	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (Statutory); Shoreline Erosion Management Plans (Incentives)	<b>Local government;</b> state government (planning, environment)	South East Queensland erosion and storm tide prone areas as identified by Queensland Government maps produced under the QCP	Episodic; a proactive decision making approach is needed to ensure flood resilience is improved in hazard prone areas	Immediate	UPM 1.8 X whole program  PI 1.1 & PI 2.1	Linham and Nicholls (2010) Technologies for Climate Change Adaptation – Erosion and Flooding; • DERM (2001) Queensland Climate Change and Community Vulnerability to Tropical Cyclones. Oceans Hazards Assessment Stage 1. March 2001; THESEUS (2011) Integrated inventory of data and prototype experience on coastal defences and technologies

**Action 2.2.1** Assess the vulnerability of existing urban areas to rising sea levels and storm surges.

**Action 2.2.2** Research and analysis to determine alternative solutions to defence mechanisms by assessing the engineering, economic, social and environmental aspects of whether or not selected sections of the coasts can or should be protected.

**Action 2.2.3** Identify and define protection zones, i.e. areas with dense urban development that permit coastal armoring.

**Action 2.2.4** Investigate the feasibility of different mechanisms used to implement coastal defence, including soft and/or hard armoring techniques.

**Action 2.2.5** Allocate funding to enable the construction and management of coastal defence structures.

**Action 2.2.6** Establish a staging process for the implementation of coastal defence structures to protect identified areas at risk.

**Action 2.2.7** Conduct a review of legislative frameworks to identify and conduct necessary amendments to enable implementation of coastal defence program.

**Action 2.2.8** Improve understanding of future storm tides through funding of research programmes into future cyclone patterns and the impact on storm tide generation and propagation.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.1 Storm tides defence system:</b> Protect vulnerable coastal communities threatened by current and future storm tide events by combining hard and soft defence options to minimize the risk of inundation.					
<b>Action Implementation</b>					
<b>Action 2.1.1:</b> Asses the vulnerability of existing urban areas to rising sea levels and storm surges.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government</b> (planning, communities, environment), local governments, private sector	Ongoing	UPM 1.1.1, 1.2.1, 1.6.1, 1.7.1, 1.10.1, 1.17.1, 1.18.1	
<b>Action 2.1.2:</b> Research and analysis to determine alternative solutions to defence mechanisms by assessing the engineering, economic, social and environmental aspects of whether or not selected sections of the coasts can or should be protected .	Advice - Cross-agency/ government working group in collaboration with research agencies and universities	<b>State government</b> , local government, research agencies	Ongoing	UPM 3.1.1, 3.2.1, 1.15.4	Center for Climate Strategies (2008) <i>Draft final report</i> , Center for Climate Strategies U.S.
<b>Action 2.1.3:</b> Identify and define protection zones, i.e. areas with dense urban development that permit coastal armoring.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>State government</b> , local government	Episodic	UPM 1.1.4, 1.2.2, 1.17.2, 1.18.2	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center; San Francisco Planning and Urban Research Association (SPUR) (2011) <i>Climate change hits home</i> , SPUR
<b>Action 2.1.4:</b> Investigate the feasibility of different mechanisms used to implement coastal defence, including soft and/or hard armoring techniques.	Advice - Cross-agency/ government working group in collaboration with research agencies and universities, and private sector	<b>State government</b> , local government, research agencies and private sector	Episodic	UPM 1.13, 1.16	
<b>Action 2.1.5:</b> Allocate funding to enable the construction and management of coastal defence structures.	Incentive through funding from federal and state governments, and private sector (PPPs)	<b>State government</b> , local government	Episodic		
<b>Action 2.1.6:</b> Establish a staging process for the implementation of coastal defence structures to protect identified areas at risk.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>Local government (SEQ Council of Mayors)</b> , state government	Ongoing	UPM 1.6.2, 1.7.3, 1.10.5	
<b>Action 2.1.7:</b> Conduct a review of legislative frameworks to identify and conduct necessary amendments to enable implementation of coastal defence program.	Regulation - Statutory through inclusion into SPA	<b>Local government (SEQ Council of Mayors)</b>	One-off		

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.1.8:</b> Improve understanding of future storm tides through funding of research programmes into future cyclone patterns and the impact on storm tide generation and propagation.	Research study	Federal Government/State Government supporting CSIRO/Universities	Ongoing		Department of Climate Change. (2009). Climate Change Risks to Australia's Coast.

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.1.1:</b> Asses the vulnerability of existing urban areas to rising sea levels and storm surges .	Vulnerability assessment completed	Planning schemes, regional plan and SPPs reviews	<b>State government</b> (planning, communities, environment), local governments, private sector
<b>Action 2.1.2:</b> Research and analysis to determine alternative solutions to defence mechanisms by assessing the engineering, economic, social and environmental aspects of whether or not selected sections of the coasts can or should be protected.	Research studies undertaken and prioritised; Number of analyses and research		<b>Research agencies</b> , state government, local government
<b>Action 2.1.3:</b> Identify and define protection zones, i.e. areas with dense urban development that permit coastal armoring.	Areas for protection identified	Planning schemes, regional plan and SPPs reviews	<b>State government</b> , local government
<b>Action 2.1.4:</b> Investigate the feasibility of different mechanisms used to implement coastal defence, including soft and/or hard armoring techniques.	Feasibility studies accomplished	Planning schemes, regional plan and SPPs reviews	<b>State government</b> , local government, research agencies and private sector
<b>Action 2.1.5:</b> Allocate funding to enable the construction and management of coastal defence structures.	Funds allocated		<b>Local government</b> , state government
<b>Action 2.1.6:</b> Establish a staging process for the implementation of coastal defence structures to protect identified areas at risk.	Staging process established	Planning schemes, regional plan reviews	<b>Local government</b> , state government
<b>Action 2.1.7:</b> Conduct a review of legislative frameworks to identify and conduct necessary amendments to enable implementation of coastal defence program.	Review accomplished and amendments implemented		<b>State government</b>
<b>Action 2.1.8:</b> Improve understanding of future storm tides.	\$ invested in the program	None	Federal government and state government

**CM POLICY 3:** Coastal settlements should retreat from vulnerable shores when defence is not feasible in the future and the natural function of shores must be restored.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	High	High	High	High	High	High	Low	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (Statutory)	<b>Local government,</b> state government (planning, environment)	South East Queensland coastal hazard prone areas as identified by Queensland Government maps	Communities and assets will be not exposed to the risks of coastal erosion and floods in the future under rising sea levels and changing storms	Distortion of property markets. Social impacts on relocated population	Queensland Coastal Plan (2011); Abel, N., Gorddard, R., Harman, B., Leitch, A., Langridge, J., Ryan, A., & Heyenga, S. (2011). Sea level rise, coastal development and planned retreat: analytical framework, governance principles and an Australian case study. Environmental Science & Policy, 14(3), 279-288.

**PROGRAM 3.1 RETREAT FROM HIGH COASTAL HAZARD AREAS:** Develop innovative methods to retreat from areas at risk, including voluntary and compulsory mechanisms such as land swap, land purchase and resumption, land surrender, rolling easements and coastal setbacks to retreat from areas at risk from erosion and storm tides

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	High	High	Low	High	High	High	Low	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate, deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (Statutory)	<b>Local government;</b> state government (planning, environment)	South East Queensland erosion and storm tide prone areas as identified by Queensland Government maps produced under the QCP	Ongoing	Immediate	UPM 1.6  UPM 1.7  UPM 3.6  EM 2.3  HH 3.2 (specifically Action 3.2.1)  PI 1.1 PI 2.1	Queensland Coastal Plan (2011);  Abel, N., Gorddard, R., Harman, B., Leitch, A., Langridge, J., Ryan, A., & Heyenga, S. (2011). Sea level rise, coastal development and planned retreat: analytical framework, governance principles and an Australian case study. Environmental Science & Policy, 14(3), 279-288; Titus, J. (2011) EPA: Climate ready estuaries program, Rolling Easements. Available from: <a href="http://www.epa.gov">http://www.epa.gov</a>

**Action 3.1.1:** Assess the vulnerability of existing urban areas to rising sea levels, erosion and storm surges.

**Action 3.1.2:** Establish a staging process to implement planned retreat from vulnerable areas.

**Action 3.1.3:** Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, rolling easements, transfer of development rights, stronger setbacks and/or tax incentives.

**Action 3.1.4:** Limit or prohibit rebuilding of damaged structures in defined retreat areas.

**Action 3.1.5:** Identify suitable areas to accommodate the relocation of coastal communities/population at risk.

**Action 3.1.6:** Establish a communication strategy to consult with coastal communities at risk.

**Action 3.1.7:** Encourage land owners to relocate structures through tax benefits, voluntary acquisitions, or conservation easements schemes.

**Action 3.1.8:** Liaise with insurance companies to develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.1 Retreat from high coastal hazard areas:</b> Develop innovative methods to retreat from areas at risk, including voluntary and compulsory mechanisms such as land swap, land purchase and resumption, land surrender, rolling easements and coastal setbacks to retreat from areas at risk from erosion and storm tides.					
<b>Action Implementation</b>					
<b>Action 3.1.1:</b> Assess the vulnerability of existing urban areas to rising sea levels, erosion and storm surges .	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government,</b> local government	Ongoing	UPM 1.1.1, 1.2.1, 1.5.1,1.5.8, 1.7.1, 1.8.1, 1.10.1, 1.17.1, 1.18.1, 2.1.1, 2.2.1, 2.6.1, 2.7.1, 2.8.1, 2.10.1	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 3.1.2:</b> Establish a staging process to implement planned retreat from vulnerable areas.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>State government,</b> local government, private sector, landowners	Ongoing	UPM 1.7.3, 1.8.6, 1.10.5, 1.10.6, 1.15.2, 2.7.2, 2.8.3, 2.10.5, 2.10.6	(NZ example)
<b>Action 3.1.3:</b> Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, rolling easements, transfer of development rights, stronger setbacks and/or tax incentives.	Advice - Cross-agency/ government working group in collaboration with private sector	<b>State government,</b> local government, private sector, landowners	Episodic	UPM 1.13.6, 1.15.4, 1.17.5, 1.18.5	
<b>Action 3.1.4:</b> Limit or prohibit rebuilding of damaged structures in defined retreat areas.	Regulation - Statutory through inclusion into Regional Plan and planning schemes	<b>Local government (SEQ Council of Mayors),</b> state government	Ongoing	UPM 1.16, 2.7.4, 2.14, 3.4.4	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 3.1.5:</b> Identify suitable areas to accommodate the relocation of coastal communities/population at risk.	Policy - Statutory through inclusion into Regional Plan and planning schemes	<b>Local government (SEQ Council of Mayors),</b> state government, private sector (developers and insurance companies)	Episodic	UPM 1.1, 1.7, 1.10, 2.1, 2.7.5,	

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 3.1.6:</b> Establish a communication strategy to consult with coastal communities at risk.	Policy - Statutory through inclusion into Regional Plan, SPP for coastal protection and planning schemes	<b>Local government</b> , state government, private sector	Ongoing	UPM 1.9.1, 1.7.4, 1.17.7, 1.18.7, 2.7.6, 2.8.4, 3.1.4, 3.4.8	
<b>Action 3.1.7:</b> Encourage land owners to relocate structures through tax benefits, voluntary acquisitions, or conservation easements schemes.	Incentives through funding provided by governments and private sector (tax rebates, rates, state government contributions)	<b>Local government</b> , state government, private sector	Ongoing	UPM 2.7.7	Grannis, J (2011) <i>Adaptation tool kit: sea level rise and coastal land use</i> , Georgetown Climate Center
<b>Action 3.1.8:</b> Liaise with insurance companies to develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.	Regulation - Statutory through inclusion in Regional Plan, SPPs and planning schemes	<b>State government</b>	Episodic	UPM 2.7.8, 3.4.9	California Natural Resources Agency (2009) <i>California Climate Adaptation Strategy</i>

### ***Action Monitoring & Evaluation***

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.1.1:</b> Assess the vulnerability of existing urban areas to rising sea levels, erosion and storm surges .	Vulnerability assessment completed	Planning schemes and regional plan reviews	<b>State government</b> , local government
<b>Action 3.1.2:</b> Establish a staging process to implement planned retreat from vulnerable areas.	Retreat plan established in consultation with community	Planning schemes and regional plan reviews	<b>State government</b> , local government, private sector, landowners
<b>Action 3.1.3:</b> Investigate the effectiveness of different mechanisms to implement planned retreat, including land acquisition, rolling easements, transfer of development rights, stronger setbacks and/or tax incentives .	Cost benefit analysis of different mechanisms completed and disseminated	Planning schemes and regional plan reviews	<b>State government</b> , local government, private sector, landowners
<b>Action 3.1.4:</b> Limit or prohibit rebuilding of damaged structures in defined retreat areas.	Highly vulnerable areas are gradually abandoned and/or converted to different use	Planning schemes and regional plan reviews	<b>Local government</b> , state government, landowners, developers
<b>Action 3.1.5:</b> Identify suitable areas to accommodate the relocation of coastal communities/population at risk.	Suitable areas for relocation are identified and safeguarded for future development	Planning schemes and regional plan reviews	<b>Local government</b> , state government landowners, developers, insurance companies

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.1.6:</b> Establish a communication strategy to consult with coastal communities at risk .	Funds allocated to support schemes	Planning schemes and regional plan reviews	<b>Local government</b> , landowners, developers, insurance companies
<b>Action 3.1.7:</b> Encourage land owners to relocate structures through tax benefits, voluntary acquisitions, or conservation easements schemes .	Insurance premiums and conditions are reviewed to support planned retreat	Planning schemes and regional plan reviews	<b>Local government</b> , state government, landowners, developers, insurance companies
<b>Action 3.1.8:</b> Liaise with insurance companies to develop regulatory policies to guide private insurers in dealing with properties in vulnerable areas.	Regulatory policies developed	SPA review cycle	<b>Local government</b> , state government

**PROGRAM 3.2 RESTORATION OF COASTAL ENVIRONMENTS:** Remove buildings and infrastructure affected by erosion and inundation and those within retreat areas and restore ecosystem functions of beaches, dunes, wetlands and riparian environments.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	High	Low	Low	High	Low	High	High	Low	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (Statutory); Shoreline Erosion Management Plans (Incentives)	<b>Local government;</b> state government (planning, environment)	South East Queensland erosion and storm tide prone areas as identified by Queensland Government maps produced under the QCP	Ongoing	Deferred	UPM 1.6 UPM 1.11 UPM 1.13	Original

**Action 3.2.1:** Assess the potential reuse of settlements and infrastructure for compatible uses.

**Action 3.2.2:** Assess the costs of removal of settlements and infrastructure.

**Action 3.2.3:** Prioritize the removal of settlements and infrastructure.

**Action 3.2.4:** Restore beaches and dunes.

**Action 3.2.5:** Restore wetlands and riparian vegetation.

**Action 3.2.6:** Create recreational areas.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.2 Restoration of coastal environments:</b> Remove buildings and infrastructure affected by erosion and inundation and those within retreat areas and restore ecosystem functions of beaches, dunes, wetlands and riparian environments <b>Action Implementation</b>					
<b>3.2.1:</b> Assess the potential reuse of settlements and infrastructure for compatible uses.	Study	<b>Local government,</b> state government	Episodic. To be done once and then repeated periodically	UPM 1.6.9	Original
<b>3.2.2:</b> Assess the costs of removal of settlements and infrastructure.	Study	<b>Local government,</b> state government	Episodic. To be done once and then repeated when needed	UPM 1.6.9	Original
<b>3.2.3:</b> Prioritize the removal of settlements and infrastructure.	Study	<b>Local government,</b> state government	Episodic. To be done once and then repeated when needed	UPM 1.6.9	Original
<b>Action 3.2.4:</b> Restore beaches and dunes.	Capital works	<b>Local government,</b> state government	Episodic. To be done once and then repeated when needed	UPM 1.6.9	Original
<b>Action 3.2.5:</b> Restore wetlands and riparian vegetation.	Capital works	<b>Local government,</b> state government	Episodic. To be done once and then repeated when needed	UPM 1.6.9	Original
<b>Action 3.2.6:</b> Create recreational areas.	Capital works	<b>Local government,</b> state government	Episodic. To be done once and then repeated when needed	UPM 1.6.9	Original

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.2.1:</b> Assess the potential reuse of settlements and infrastructure for compatible uses.	Number of assets identified; Assessment is carried out	Coastal Hazard Adaptation Strategies	<b>Local government</b>
<b>Action 3.2.2:</b> Assess the costs of removal of settlements and infrastructure.	Number of assets assessed; Assessment is carried out	Coastal Hazard Adaptation Strategies	<b>Local government</b>
<b>Action 3.2.3:</b> Prioritize the removal of settlements and infrastructure.	Number of assets assessed; Assessment is carried out	Coastal Hazard Adaptation Strategies	<b>Local government</b>
<b>Action 3.2.4:</b> Restore beaches and dunes.	% of beaches and dunes restored after retreat	Coastal Hazard Adaptation Strategies	<b>Local government</b> , state government, federal government
<b>Action 3.2.5:</b> Restore wetlands and riparian vegetation.	% of beaches and dunes restored after retreat	Coastal Hazard Adaptation Strategies	<b>Local government</b> , state government, federal government
<b>Action 3.2.6:</b> Create recreational areas.	Size of recreational area; usage by community	Coastal Hazard Adaptation Strategies	<b>Local government</b>

**CM POLICY 4:** Coastal settlement in flood prone areas must be designed to accommodate current and future storm tides.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	High	High	High	High	High	High	Low	High



## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Coastal Hazard Adaptation Strategies as part of the new Planning Scheme (Statutory)	<b>Local government,</b> state government (planning, environment)	South East Queensland coastal hazard prone areas as identified by Queensland Government maps	Communities and assets will be able to cope with storm surges in the future under rising sea levels and changing storms		Queensland Coastal Plan (2012); Australian Building Code Board (ABCB) (2011) Construction of Buildings in Flood Hazard Areas Information Handbook

**PROGRAM 4.1 SPACE FOR WATER:** New space should be identified to allow extreme water levels to be accommodated during storm tides.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate/deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Modification of the planning scheme (Statutory) Land-use change (Statutory, incentives)	<b>Local government;</b> state government (planning, environment)	South East Queensland high coastal hazard areas as identified by Queensland Government maps	One-off. Areas are identified to allow for space for water	Immediate	UPM 1.13 UPM 1.16 UPM 1.11 UPM 1.12 PI 1.1 PI 2.1 HH 4.1 HH 4.2	Department for Environment, Food and Rural Affairs (DEFRA), 2004, Making space for water - Developing a new Government strategy for flood and coastal erosion risk management in England. London. 2004

**Action 4.1.1:** Identify areas at risk from coastal inundation currently and in the future.  
**Action 4.1.2:** Assess costs and benefits of reserving land for inundation under extreme storms.  
**Action 4.1.3:** Apply land management techniques (e.g. land purchase) to allow space for water.  
**Action 4.1.4:** Restore acquired land for low impact uses (e.g. parklands).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl modified)
<b>Program 4.1 Space for water:</b> New space should be identified to allow extreme water levels to be accommodated during storm tides.					
<b>Action Implementation</b>					
<b>Action 4.1.1:</b> Identify areas at risk from coastal inundation currently and in the future.	Flood inundation study	<b>Local government</b> state government	Episodic	UPM 1.18.1 UPM 1.18.2	Gold Coast City Council Storm Inundation Study (2011)
<b>Action 4.1.2:</b> Assess costs and benefits of reserving land for inundation under extreme storms.	Regulatory, Incentives within the Coastal Hazard Adaptation Strategy	<b>Local government</b> state government	Episodic	N/A	CHAS Townsville (2012)
<b>Action 4.1.3:</b> Apply land management techniques (e.g. land purchase) to allow space for water.	Regulatory, Incentives within the Coastal Hazard Adaptation Strategy	<b>Local government</b> state government	Episodic	UPM 1.6.3	CHAS Townsville (2012)
<b>Action 4.1.4:</b> Restore acquired land for low impact uses (e.g. parklands).	Regulatory, Incentives within the Coastal Hazard Adaptation Strategy	<b>Local government</b> state government	One-off	UPM 1.19	Department for Environment, Food and Rural Affairs (DEFRA), 2004, Making space for water - Developing a new Government strategy for flood and coastal erosion risk management in England. London. 2004

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 4.1.1:</b> Identify areas at risk from coastal inundation currently and in the future.	Size of area identified	Coastal Hazard Adaptation Strategies	<b>Local government</b>
<b>Action 4.1.2:</b> Assess costs and benefits of reserving land for inundation under extreme storms.	Assessment is carried out	Coastal Hazard Adaptation Strategies	<b>Local government</b>
<b>Action 4.1.3:</b> Apply land management techniques (e.g. land purchase) to allow space for water.	Land for purchase is identified. Size of identified land	Coastal Hazard Adaptation Strategies	<b>Local government</b>
<b>Action 4.1.4:</b> Restore acquired land for low impact uses (e.g. parklands).	% of areas restored	Coastal Hazard Adaptation Strategies	<b>Local government</b>

**PROGRAM 4.2 DESIGN STANDARDS FOR BUILDINGS AND INFRASTRUCTURE:** Buildings and infrastructure designs can be improved to accommodate extreme water levels during storm tides. These changes should apply to new and existing buildings and infrastructure.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
Low	High	Low	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Modification of the planning scheme (Statutory). Educational programmes and campaigns (such as zero emission) (Incentives)	<b>Local government</b> , state government (planning, environment)	South East Queensland high coastal hazard areas as identified by Queensland Government maps	Ongoing. Opportunities should be given to retrofit or apply new design standards for a period of time	Deferred	PI 1.1 PI 2.1  UPM 1.5  UPM 2.6  If design UPM 1.11 & 1.12	Rosenzweig C, Solecki WD, Blake R, et al. (2011) Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies. Climatic Change. 2011;106(1):1–35. Australian Building Code Board (ABCB) (2011) Construction of Buildings in Flood Hazard Areas Information Handbook

**Action 4.2.1:** Incorporate sea level rise and storm tide criteria in the design standards to retrofit existing buildings and for new developments.

**Action 4.2.2:** Incorporate sea level rise and storm tide criteria in the design standards for new and upgraded stormwater systems and roads.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Timing and Duration (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 4.2 Design standards for buildings and infrastructure:</b> Buildings and infrastructure designs can be improved to accommodate extreme water levels during storm tides. These changes should apply to new and existing buildings and infrastructure.					
<b>Action Implementation</b>					
<b>Action 4.2.1:</b> Incorporate sea level rise and storm tide criteria in the design standards to retrofit existing buildings and for new developments.	Regulation within planning schemes and design standards	Local government	Episodic	UPM 1.4 UPM 1.5 UPM 1.11	Original
<b>Action 4.2.2:</b> Incorporate sea level rise and storm tide criteria in the design standards for new and upgraded stormwater systems and roads.	Regulation within planning schemes and design standards	Local government	Episodic	PI 1.1.2 PI 2.1.2	Original

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 4.2.1:</b> Incorporate sea level rise and storm tide criteria in the design standards to retrofit existing buildings and for new developments.	Modified or new design standard in place	Performance of infrastructure after event	Local government
<b>Action 4.2.2:</b> Incorporate sea level rise and storm tide criteria in the design standards for new and upgraded stormwater systems and roads.	Modified or new design standard in place	Performance of infrastructure after event	Local government

**CM POLICY 5:** The Capacity of the community and institutions to face current and future coastal hazards must be improved.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High



## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Federal/State/Council funded schemes to deliver training and education programs to address climate change adaptation (incentives, advice)	<b>State government,</b> Council of Mayors for SEQ, LGAQ, Federal government	South East Queensland coastal councils	Communities are informed and understand the risks of climate change. Council staff mastering coastal hazard risks and adaptation concepts	Public opinion distortions / Media interference	Victoria Government (2012) Coastal Climate Change and Future Coasts Training Project CoastEd Programme (2012)

**PROGRAM 5.1 COMMUNITY CAPACITY AND ENGAGEMENT PROGRAMS:** create capacity and engagement programs for coastal rehabilitation and restoration including programs for dunes and wetlands restoration.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl modified)
Programs can be funded directly by council or indirectly implemented by council or community groups using dedicated funds similar to LandCare / BeachCare / KinTide (incentives, guidelines)	<b>Local government</b> state government; federal government	South East Queensland coastal councils	Ongoing. A first cycle should be funded and run for i.e. two years	Immediate	EM 3.1  EM 6.1	BeachCare Program CoastEd Program King Tide Program

**Action 5.1.1:** Enhance community engagement programs for dune restoration (e.g. DuneCare).

**Action 5.1.2:** Enhance community engagement programs for wetland and riparian vegetation restoration (e.g. WetlandCare).

**Action 5.1.3:** Promote training programs for coastal communities in dunes, wetlands and riparian restoration.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 5.1 Community capacity and engagement programs:</b> create capacity and engagement programs for coastal rehabilitation and restoration including programs for dunes and wetlands restoration.					
<b>Action Implementation</b>					
<b>Action 5.1.1:</b> Enhance community engagement programs for dune restoration (e.g. DuneCare).	Educational programmes supported by Local/State/Federal Government	Local Government / NGO / Universities (e.g. GCCM)	Ongoing	EM 6.1 EM 6.2	BeachCare Program King Tide Program
<b>Action 5.1.2:</b> Enhance community engagement programs for wetland and riparian vegetation restoration (e.g. WetlandCare).	Educational programmes supported by Local/State/Federal Government	Local Government / NGO / Universities (e.g. GCCM)	Ongoing	EM 6.1 EM 6.2	CoastEd Program
<b>Action 5.1.3:</b> Promote training programs for coastal communities in dunes, wetlands and riparian restoration.	Educational programmes supported by Local/State/Federal Government	Local Government / NGO / Universities (e.g. GCCM)	Ongoing	EM 6.1 EM 6.2	Original

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 5.1.1:</b> Enhance community engagement programs for dune restoration (e.g. DuneCare).	Number of people involved; number of programmes delivered	Annual activities reports of responsible organization	<b>Local government</b> Delivering organization reporting to programme funder
<b>Action 5.1.2:</b> Enhance community engagement programs for wetland and riparian vegetation restoration (e.g. WetlandCare).	Number of people involved; number of programmes delivered	Annual activities reports of responsible organization	<b>Local government</b> Delivering organization reporting to programme funder
<b>Action 5.1.3:</b> Promote training programs for coastal communities in dunes, wetlands and riparian restoration.	Number of people involved; number of programmes delivered	Annual activities reports of responsible organization	<b>Local government</b> Delivering organization reporting to programme funder

**PROGRAM 5.2 ENHANCED COASTAL EDUCATION PROGRAMMES:** integrate climate adaptation into existing school education programs (primary and secondary levels).

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (Immediate; Deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Programs can be funded directly by Councils, State Government or Federal Government (incentives, guidelines, advice)	<b>State government</b> local government	South East Queensland coastal councils	Continuous	Immediate		CoastED program (GCCM, 2012)

**Action 5.2.1:** Integrate climate change adaptation elements in coastal education (e.g. CoastEd).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Timing and Duration (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 5.2 Enhanced coastal education programmes:</b> integrate climate adaptation into existing school education programs (primary and secondary levels).					
<b>Action Implementation</b>					
<b>Action 5.2.1:</b> Educational programs – Integrate climate adaptation in primary and secondary schools curricula.	Educational programmes supported by local/state/federal government	Local Government / NGO / Universities (e.g. GCCM)	Ongoing	EM 3.4	CoastEd Program

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 5.2.1:</b> Educational programs – Integrate climate adaptation in primary and secondary schools curricula.	Number of trained participants; Number of workshops	Annual activities reports of responsible organization	<b>Local government.</b> , state government. Delivering organization reporting to programme funder

**PROGRAM 5.3 ENHANCED INSTITUTIONAL CAPACITIES TO MANAGE COASTAL HAZARDS:** Build capacity of council officers and other relevant organization to manage coastal hazard areas in a changing climate.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Programs can be funded directly by State Government or by Federal Government (incentives, guidelines, advice)	<b>State government</b> local government	South East Queensland coastal councils	One-off. A series of workshops can be run in a few months	Deferred	UPM 3.2 & 3.5 EM 2.4 EM 4.2 EM 5.1 PI 3.1, 3.2 & 3.3	Victoria Government (2012) Coastal Climate Change and Future Coasts Training Project

**Action 5.3.1:** Create training packages for coastal managers and planners within councils.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 5.3 Enhanced institutional capacities to manage coastal hazards:</b> Build capacity of council officers and other relevant organization to manage coastal hazard areas in a changing climate. <b>Action Implementation</b>					
<b>Action 5.3.:</b> Create training packages for coastal managers and planners within councils.	Project funding; Government funding; state or federal funds	<b>State government;</b> subcontractor (e.g. consultant or University)	Episodic, e.g. round of workshops across the State	UPM 3.2 & 3.5 EM 2.4 EM 4.2 EM 5.1 PI 3.1, 3.2 & 3.3	Victoria Government (2012) Coastal Climate Change and Future Coasts Training Project

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 5.3.1:</b> Create training packages for coastal managers and planners within councils.	Number of trained participants; Number of workshops	Annual activities reports of responsible organization	<b>State government.</b> Delivering organization reporting to programme funder

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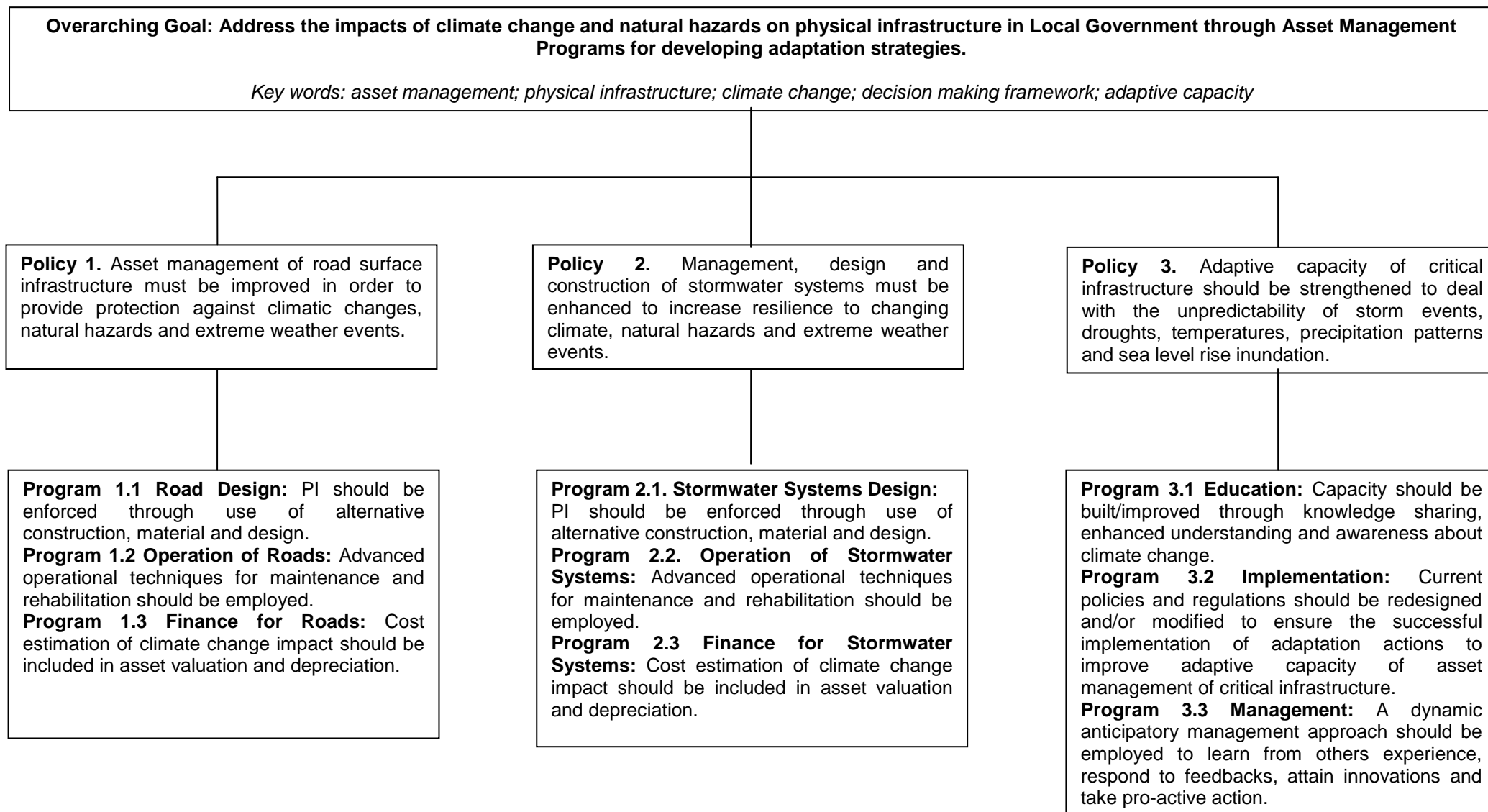
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### **SECTION 3: PHYSICAL INFRASTRUCTURE ADAPTATION OPTIONS**





**Figure 3.1: Physical Infrastructure Adaptation Options Framework**

**Policy 1. Asset management of road surface infrastructure must be improved in order to provide protection against climatic changes, natural hazards and extreme weather events.**

**Program 1.1 Road Design:** PI should be enforced through use of alternative construction, material and design.

**Action 1.1.1:** Further research into impacts of climate change and extreme events on:

- limitations of current practices;
- increased heavy vehicular loading;
- current asset conditions and deterioration hot spots;
  - building and development controls;
  - existing/alternative material properties;
  - maintenance operation; and,
  - alternative tools (e.g. Facebook, twitter) to improve risk communication to/with broader communities.

**Action 1.1.2:** Change design standards and material properties for new constructions, maintenance and rehabilitations works.

**Action 1.1.3:** Retrofitting of existing road infrastructure (e.g. additional water proof surface, improved concrete slab joint filler).

**Action 1.1.4:** Utilise alternative design of road sign and signal to cope with natural hazards (e.g. solar powered signage).

**Action 1.1.5:** Enhance road design standards to cope with uncertainties in rainfall intensity.

**Action 1.1.6:** Integrated infrastructure design approach:

- stormwater linked to roads;
- in order to increase infrastructures' resilience to climate change and natural hazards at the planning and design stage their interdependencies should be considered (e.g. construction of roads away from vulnerable stormwater networks).

**Program 1.2 Operation of Roads:** Advanced operational techniques for maintenance and rehabilitation should be employed.

**Action 1.2.1:** Apply research findings of program 1.1 on construction, maintenance and operational techniques.

**Action 1.2.2:** Investment:

- expected increased maintenance durations/frequencies; and,
- impact of alternative techniques as recommended from research.

**Action 1.2.3:** Increase monitoring of infrastructure condition and deterioration rates.

**Action 1.2.4:** Use technology for improved information management for impact assessment, aggressive maintenance, making real-time information available to stakeholders.

**Action 1.2.5:** Knowledge sharing and risk communication:

- establish partnerships with research agencies (e.g. ARRB and Austroads) to ensure the best available science informs climate adaptation decision-making; and,
- compile and disseminate strategies, tools and information generated through partnerships for use by local governments when updating their local and general plans and to inform public discussion on climate change risks.

**Action 1.2.6:** Improve resilience to flood or re-site infrastructure and plan transport routes and roads to avoid disruption by flooding activities.

**Action 1.2.7:** Develop plans for alternative routes to be used in the event of road failure or inundation for emergency services. Prioritise keeping these roads operational during natural hazards.

**Action 1.2.8:** Minimise sediment from industrial sites to reduce blockage.



**Program 1.3 Finance for Roads:** Cost estimation of climate change impact should be included in asset valuation and depreciation.

**Action 1.3.1:** Asset valuation by evaluating current physical condition of road network to enable identification of required funds.

**Action 1.3.2:** Investigate and establish funding opportunities for increasing investment to support further research and operation activities.

**Action 1.3.3:** Establish redundancy fund for rapid action to re-operationalise damaged or closed roads due to extreme events.

**Action 1.3.4:** Identify funding options to cover cost of deterioration and linked with climate change and prepare for increased required investment.

**Action 1.3.5:** Calculate and allocate funds for roads identified as critical to emergency operations.

## Policy 2. Management, design and construction of stormwater systems must be enhanced to increase resilience to changing climate, natural hazards and extreme weather events.

**Program 2.1 Stormwater Systems Design:** PI should be enforced through use of alternative construction, material and design.

**Action 2.1.1:** Further research into impacts of climate change and extreme events on:

- limitations of current practices;
- current asset conditions and capacity hot spots (drainage/storage etc).
  - building and development controls;
  - Improving water harvesting and quality strategies;
  - existing/alternative material properties;
  - maintenance operation; and,
  - alternative tools (e.g. facebook, twitter) to improve risk communication to/with broader communities.

**Action 2.1.2:** Change design standards and material properties for new constructions, maintenance and rehabilitations works.

**Action 2.1.3:** Redesign/modify stormwater networks that will protect the community and other infrastructures from increased rainfall and runoff.

**Action 2.1.4:** Design/modify existing regulations to increase adaptive capacity.

**Action 2.1.5:** Incorporate the design of localised water storage, treatment and reuse technologies by utilising the application of alternative technologies at lot, neighbourhood or district residential or commercial/industrial scales as part of WSUD approach.

**Action 2.1.6:** Integrated infrastructure design approach:

- stormwater linked to roads;
- in order to increase infrastructures' resilience to climate change and natural hazards at the planning and design stage their interdependencies should be considered (e.g. improvement of stormwater systems to reduce inundation of roads).

**Program 2.2 Operation of Stormwater Systems:** Advanced operational techniques for maintenance and rehabilitation should be employed.

**Action 2.2.1:** Promote use of Water Sensitive Urban Design (WSUD) approaches to integrate the following potential planning and design opportunities into the built environment of cities and towns:

- reuse of stormwater as alternative source of water to conserve potable supplies;
- detention, rather than rapid conveyance, of stormwater;
- reuse, storage and infiltration of stormwater, instead of drainage system augmentation;
- use of vegetation for stormwater filtering purposes;
- treating stormwater to increase water quality for reuse and/or discharge (e.g. swales, wetlands, bioretention, rainwater tanks); and,

- capture or harvest urban stormwater for reuse in order to contribute to water conservation and water quality.
- Action 2.2.2:** Through education and training increase public awareness and knowledge of stakeholders involved in water issues.
- Action 2.2.3:** Set maintenance plans for procedures and schedules of water infrastructure.
- Action 2.2.4:** Use technology for improved information management for: impact assessment, aggressive maintenance; making real-time information available to stakeholders.
- Action 2.1.5:** Consult end users/stakeholders during formulation and implementation.
- Action 2.1.6:** Retrofitting of existing stormwater networks (e.g. corrosion protection, drainage covers).
- Action 2.1.7:** Improve design and construction of water systems to increase monitoring of water infrastructure (e.g. use of remote monitoring and sensing devices).

**Program 2.3 Finance for Stormwater Systems:** Cost estimation of climate change impact should be included in asset valuation and depreciation.

- Action 2.3.1:** Asset valuation, evaluate current physical condition of stormwater network to enable identification of required funds.
- Action 2.3.2:** Investigate and establish funding opportunities for increasing investment to support further research and operation activities.
- Action 2.3.3:** Establish redundancy fund for rapid action to re-operationalise damaged stormwater network due to extreme events.
- Action 2.3.4:** Identify funding options to cover cost of deterioration and linked with climate change and prepare for increased required investment.

### Policy 3. Adaptive capacity of critical infrastructure should be strengthened to deal with the unpredictability of storm events, droughts, temperatures, precipitation patterns and sea level rise inundation.

**Program 3.1 Education:** Capacity should be built/improved through knowledge sharing, enhanced understanding and awareness about climate change.

- Action 3.1.1:** Research to recognise the extent to which adaptive capacity is already being considered in decision-making frameworks and policies.
- Action 3.1.2:** Provide training and educational opportunities to stakeholders to involve in scenario planning processes which stimulate thinking about the future, how different institutions shape it, and how surprises, unexpected consequences and possible responses may unfold.
- Action 3.1.3:** Improve communication of climate change risks and infrastructure vulnerability to decision-makers and wider community thereby changing management from reactive to proactive.
- Action 3.1.4:** Encourage public and private educational institutions to develop programs for professionals with a specific focus on adaptive capacity and vulnerability to climate change and adaptation methodologies.
- Action 3.1.5:** Include training programs about climate change as part of professional membership accreditation/certification.
- Action 3.1.6:** Implement continued professional development programs focused on identifying and evaluating climate risks.
- Action 3.1.7:** Promote climate change awareness through education and training (formal and informal), including integration into curriculum and targeted programs or activities.
- Action 3.1.8:** Establish partnerships with research agencies to ensure the best available science informs climate adaptation decision-making.

**Program 3.2 Implementation:** Current policies and regulations should be redesigned and/or modified to ensure the successful implementation of adaptation actions to improve adaptive capacity of asset management of critical infrastructure.

- Action 3.2.1:** Identify environmental factors threatening infrastructure performance.

**Action 3.2.2:** Identify determinants of and constraints on adaptive capacity.

**Action 3.2.3:** Enhance future adaptive capacity by evaluating interdependencies of and the relationships between current adaptive capacity of design, operations and finance.

**Action 3.2.4:** Consider economic costs associated with compliance and/or enforcement of regulations.

**Action 3.2.5:** Advance and retain state of the art or novel governance by transferring to address complex challenges of resource sharing and availability.

**Action 3.2.6:** Change standards or methods for design, operation and finance to further adaptive capacity.

**Action 3.2.7:** Identify, design and implement monitoring and enhancing techniques of adaptive capacity.

**Action 3.2.8:** Improve knowledge sharing and collaboration across agencies and all levels of governments for effective implementation of adaptation strategies.

**Action 3.2.9:** Develop or advance communication and engagement strategies with vulnerable communities.

**Action 3.2.10:** Implement a hazard avoidance procedure for minimising the adverse effects of climate change when planning and constructing new infrastructure within areas vulnerable to climate change impacts.

**Action 3.2.11:** Define responsibilities for losses or risks across governments, private sector and insurance companies (e.g. fee to cover the costs of potential emergency response, or to improve resilience of infrastructure that services the new development to natural hazards; developer must design the new development and its supporting infrastructure to be more resilient to natural hazards).

**Program 3.3 Management:** A dynamic anticipatory management approach should be employed to learn from others experience, respond to feedbacks, attain innovations and take pro-active action.

**Action 3.3.1:** Embrace national and/or international adaptation practices or cases (i.e. integrating stormwater and road infrastructures).

**Action 3.3.2:** Determine and adopt techniques for transition towards adaptive management methods.

**Action 3.3.3:** Identify and/or develop indicators for infrastructure coping capacity.

**PI POLICY 1.** Asset management of road surface infrastructure must be improved in order to provide protection against climatic changes, natural hazards and extreme weather events.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Policy will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory	<b>Local governments</b> Transport and traffic authorities (e.g. Austroads) State government (regional plan and planning)	All settlement types	Reduced maintenance and rehabilitation costs. Increased maintenance intervals and time. Improved planning and control of budget; increase in available funds. Improved access for emergency services and evacuation. Increased infrastructure adaptive capacity by integrating into future urban design practices to reduce negative impacts of projected climate change.	Underestimation of changes in climate. Lack of funds. Research limitations (software, inspiration).	Gold Coast City Council, 2010; Logan City Council and Scenic Rim Regional Council, 2009; Climate Change and Peak Oil Strategy 2010-2020 (Sunshine Coast Regional Council, 2010); Policy 10.4 - Department of Infrastructure and Planning, 2009; Austroads 2004; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009.

**PROGRAM 1.1 ROAD DESIGN:** PI should be enforced through use of alternative construction, material and design.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory	<b>Local governments</b> Transport and traffic authorities (e.g. Austroads) State government (regional plan and planning)	All settlement types	Ongoing	Immediate	EM 4.1.2 HH1.1; HH3.3 CM2.2; CM3.1; CM4.1; CM4.2 UPM 1.1; UPM 1.2; UPM 2.1; UPM 2.2  Integrate with transport plans Funding applications Program for sealing unsealed roads In general, integrate with critical infrastructure programs, e.g. water, electricity, communication and transport plans CO2 reduction programs/schemes	Austroads 2004; Gold Coast City Council, 2010; Logan City Council and ;Rim Regional Council, 2009; Climate Change and Peak Oil Strategy 2010-2020 (Sunshine Coast Regional Council, 2010); Policy 10.4 - Department of Infrastructure and Planning, 2009.

**Action 1.1.1:** Further research into impacts of climate change and extreme events on:

- limitations of current practices;
- increased heavy vehicular loading;
- current asset conditions and deterioration hot spots;
- building and development controls;
- existing/alternative material properties;
- maintenance operation; and,
- alternative tools (e.g. Facebook, twitter) to improve risk communication to/with broader communities.

**Action 1.1.2:** Change design standards and material properties for new constructions, maintenance and rehabilitations works.

**Action 1.1.3:** Retrofitting of existing road infrastructure (e.g. additional water proof surface, improved concrete slab joint filler).

**Action 1.1.4:** Utilise alternative design of road sign and signal to cope with natural hazards (e.g. solar powered signage).

**Action 1.1.5:** Enhance road design standards to cope with uncertainties in rainfall intensity.

**Action 1.1.6:** Integrated infrastructure design approach:

- stormwater linked to roads;

in order to increase infrastructures resilience to climate change and natural hazards at the planning and design stage their interdependencies should be considered (e.g. construction of roads away from vulnerable stormwater networks).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.1: Road Design</b> - PI should be enforced through use of alternative construction, material and design.					
<b>Action Implementation</b>					
<b>Action 1.1.1:</b> Further research into impacts of climate change and extreme events on: - limitations of current practices; - increased heavy vehicular loading; - current asset conditions and deterioration hot spots; - building and development controls; - existing/alternative material properties; - maintenance operation; and, - alternative tools (e.g. Facebook, twitter) to improve risk communication to/with broader communities.	Regulatory	<b>Local government</b> and state government	Ongoing	EM 4.1.2 HH1.1; HH3.3 CM2.2; CM3.1; CM4.1; CM4.2 UPM 1.1; UPM 1.2; UPM 2.1; UPM 2.2 Integrate with transport plans. Funding applications. Program for sealing unsealed roads. In general, integrate with critical infrastructure programs, eg water, electricity, communication and transport plans. CO2 reduction programs/schemes	Austroads 2004; Gold Coast City Council, 2010; Logan City Council and Scenic Rim Regional Council, 2009; Climate Change and Peak Oil Strategy 2010-2020 (Sunshine Coast Regional Council, 2010)
<b>Action 1.1.2:</b> Change design standards and material properties for new constructions, maintenance and rehabilitations works.	Incentive	<b>Road research agency;</b> Local government	Ongoing		
<b>Action 1.1.3:</b> Retrofitting of existing road infrastructure (e.g. additional water proof surface, improved concrete slab joint filler).	Regulatory	<b>Local government</b> and state government	Ongoing		
<b>Action 1.1.4:</b> Utilise alternative design of road sign and signal to cope with natural disasters (e.g. solar powered signage).			Ongoing		
<b>Action 1.1.5:</b> Enhance road design standards to cope with uncertainties in rainfall intensity.					
<b>Action 1.1.6:</b> Integrated infrastructure design approach: - stormwater linked to roads; - in order to increase infrastructures resilience to climate change and natural hazards at the planning and design stage their interdependencies should be considered (e.g. construction of roads away from vulnerable stormwater networks).	Incentive	<b>Local government</b> and state government	Ongoing		



## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.1.1:</b> Further research into impacts of climate change and extreme events on: <ul style="list-style-type: none"> <li>- limitations of current practices;</li> <li>- increased heavy vehicular loading;</li> <li>- current asset conditions and deterioration hot spots;</li> <li>- building and development controls;</li> <li>- existing/alternative material properties;</li> <li>- maintenance operation; and,</li> <li>- alternative tools (e.g. Facebook, twitter) to improve risk communication to/with broader communities.</li> </ul>	Involvement of private and public sectors in research activities (joint and independent); Ongoing allocation of funding for research	Publications	<b>Private and public research agencies/ organisations</b> (e.g. ARRB and Austroads)
<b>Action 1.1.2:</b> Change design standards and material properties for new constructions, maintenance and rehabilitations works.	Stakeholders understanding of climate change impacts; Modified standard	Performance during event	<b>Governments all levels</b> Commonwealth authorities (e.g. Austroads)
<b>Action 1.1.3:</b> Retrofitting of existing road infrastructure (e.g. additional water proof surface, improved concrete slab joint filler).	Stakeholder engagement to discuss techniques; Structural evaluation; Modified standards		
<b>Action 1.1.4:</b> Utilise alternative design of road sign and signal to cope with natural disasters (e.g. solar powered signage).			
<b>Action 1.1.5:</b> Enhance road design standards to cope with uncertainties in rainfall intensity.		Performance of design after event or change in climate	
<b>Action 1.1.6:</b> Integrated infrastructure design approach: <ul style="list-style-type: none"> <li>- stormwater linked to roads;</li> <li>- in order to increase infrastructures resilience to climate change and natural hazards at the planning and design stage their interdependencies should be considered (e.g. construction of roads away from vulnerable stormwater networks).</li> </ul>			

**PROGRAM 1.2 OPERATION OF ROADS:** Advanced operational techniques for maintenance and rehabilitation should be employed.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Policy will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory and educational	<b>Local governments</b> informed by state and federal governments guidelines	All settlement types	Ongoing	Immediate	EM 1.1, 1.2, 2.1, 2.3, 4.1; HH1.1; HH1.2; HH3.3 UPM 1.2; 1.7; UPM 1.10; UPM 2.2; UPM 2.8; UPM 2.10; UPM 3.3  Integrate with transport plans (e.g. network operations, traffic management); Funding applications; Program for sealing unsealed roads; In general, integrate with critical infrastructure programs, e.g. water, electricity, communication	Austroads 2004; Gold Coast City Council, 2010; Logan City Council and Scenic Rim Regional Council, 2009; Climate Change and Peak Oil Strategy 2010-2020 (Sunshine Coast Regional Council, 2010); Policy 10.4 - Department of Infrastructure and Planning, 2009

**Action 1.2.1:** Apply research findings of program 1.1 on construction, maintenance and operational techniques.

**Action 1.2.2:** Investment:

- expected increased maintenance durations/frequencies; and,
- impact of alternative techniques as recommended from research.

**Action 1.2.3:** Increase monitoring of infrastructure condition and deterioration rates.

**Action 1.2.4:** Use technology for improved information management for impact assessment, aggressive maintenance, making real-time information available to stakeholders.

**Action 1.2.5:** Knowledge sharing and risk communication:

- establish partnerships with research agencies (e.g. ARRB and Austroads) to ensure the best available science informs climate adaptation decision-making; and,
- compile and disseminate strategies, tools and information generated through partnerships for use by local governments when updating their local and general plans and to inform public discussion on climate change risks.

**Action 1.2.6:** Improve resilience to flood or re-site infrastructure and plan transport routes and roads to avoid disruption by flooding activities.

**Action 1.2.7:** Develop plans for alternative routes to be used in the event of road failure or inundation for emergency services. Prioritise keeping these roads operational during natural hazards.

**Action 1.2.8:** Minimise sediment from industrial sites to reduce blockage.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.2: Operation of Roads</b> - Advanced operational techniques for maintenance and rehabilitation should be employed.					
<b>Action Implementation</b>					
<b>Action 1.2.1:</b> Apply research findings of program 1.1 on construction, maintenance and operational techniques.	Training Regulatory	Local government	Ongoing	EM 1.1, 1.2, 2.1, 2.3, 4.1; HH1.1; HH1.2; HH3.3 UPM 1.2; 1.7; UPM 1.10; UPM 2.2; UPM 2.8; UPM 2.10; UPM 3.3  Integrate with transport plans (e.g. network operations, traffic management) Funding applications Program for sealing unsealed roads In general, integrate with critical infrastructure programs, eg water, electricity, communication	Austroads 2004; Gold Coast City Council, 2010; Logan City Council and Scenic Rim Regional Council, 2009; Climate Change and Peak Oil Strategy 2010-2020 (Sunshine Coast Regional Council, 2010);
<b>Action 1.2.2:</b> Investment: - expected increased maintenance durations/frequencies; and, - impact of alternative techniques as recommended from research.	Regulatory				
<b>Action 1.2.3:</b> Increase monitoring of infrastructure condition and deterioration rates.	Training Regulatory				
<b>Action 1.2.4:</b> Use technology for improved information management for impact assessment, aggressive maintenance, making real-time information available to stakeholders.					
<b>Action 1.2.5:</b> Knowledge sharing and risk communication: - establish partnerships with research agencies (e.g. ARRB and Austroads) to ensure the best available science informs climate adaptation decision-making; and, - compile and disseminate strategies, tools and information generated through partnerships for use by local governments when updating their local and general plans and to inform public discussion on climate change risks.	Incentive Training Education				
<b>Action 1.2.6:</b> Improve resilience to flood or re-site infrastructure and plan transport routes and roads to avoid disruption by flooding activities.	Regulatory Training				
<b>Action 1.2.7:</b> Develop plans for alternative routes to be used in the event of road failure or inundation for emergency services. Prioritise keeping these roads operational during natural hazards.					
<b>Action 1.2.8:</b> Minimise sediment from industrial sites to reduce blockage.	Regulatory				

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.2.1:</b> Apply research findings of program 1.1 on construction, maintenance and operational techniques.	Level of satisfaction regarding travel time; Publications; Evaluations during maintenance procedures		<b>Local government</b> and state government
<b>Action 1.2.2:</b> Investment: - expected increased maintenance durations/frequencies; and, - impact of alternative techniques as recommended from research.	Forecast value of road construction/ maintenance costs vs actual costs; Financial reviews; Initial repair costs incurred after a flood event and the possibility of a significant reduction in the overall life of the road surface.		
<b>Action 1.2.3:</b> Increase monitoring of infrastructure condition and deterioration rates.	Forum of industry and community focusing on road management; Structural evaluation of road performance under rainfall.	Mandating monitoring and evaluation; Capabilities into new development areas; Use of new technology (i.e. internet, gps, social media)	
<b>Action 1.2.4:</b> Use technology for improved information management for impact assessment, aggressive maintenance, making real-time information available to stakeholders.	Feedback from community, stakeholders etc; Remote monitoring for real-time performance monitoring		
<b>Action 1.2.5:</b> Knowledge sharing and risk communication: - establish partnerships with research agencies (e.g. ARRB and Austroads) to ensure the best available science informs climate adaptation decision-making; and, - compile and disseminate strategies, tools and information generated through partnerships for use by local governments when updating their local and general plans and to inform public discussion on climate change risks.	Feedback from community, stakeholders etc	Mandating data and knowledge sharing mechanism thereby increasing monitoring and evaluation capabilities	
<b>Action 1.2.6:</b> Improve resilience to flood or re-site infrastructure and plan transport routes and roads to avoid disruption by flooding activities.	Communities rating of road network performance		
<b>Action 1.2.7:</b> Develop plans for alternative routes to be used in the event of road failure or inundation for emergency services. Prioritise keeping these roads operational during natural hazards.	Feedback from community, stakeholders etc	Emergency practices to evaluate road condition prior, during and after event	
<b>Action 1.2.8:</b> Minimise sediment from industrial sites to reduce blockage.	Evaluations during maintenance procedures		

**PROGRAM 1.3 FINANCE FOR ROADS:** Cost estimation of climate change impact should be included in asset valuation and depreciation.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory and training	<b>Local government</b> informed by state and federal government guidelines; Commonwealth authorities (e.g. Austroads)	All settlement types	Ongoing	Immediate	EM 4.1 UPM 1.2; UPM 1.7; UPM 2.2; UPM 1.10; UPM 2.8; UPM 2.10  - Integrate with transport plans - Program for sealing unsealed roads - In general, integrate with critical infrastructure programs, eg water, electricity, communication and transport plans - CO2 reduction programs/schemes	Austroads 2004; Gold Coast City Council, 2010; Logan City Council and Scenic Rim Regional Council, 2009; Climate Change and Peak Oil Strategy 2010-2020 (Sunshine Coast Regional Council, 2010); Policy 10.4 - Department of Infrastructure and Planning, 2009

**Action 1.3.1:** Asset valuation by evaluating current physical condition of road network to enable identification of required funds.

**Action 1.3.2:** Investigate and establish funding opportunities for increasing investment to support further research and operation activities.

**Action 1.3.3:** Establish redundancy fund for rapid action to re-operationalise damaged or closed roads due to extreme events.

**Action 1.3.4:** Identify funding options to cover cost of deterioration and linked with climate change and prepare for increased required investment.

**Action 1.3.5:** Calculate and allocate funds for roads identified as critical to emergency operations.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.3 Finance for Roads:</b> Cost estimation of climate change impact should be included in asset valuation and depreciation.					
<b>Action Implementation</b>					
<b>Action 1.3.1:</b> Asset valuation by evaluating current physical condition of road network to enable identification of required funds.	Regulatory and training	Local government	Ongoing	EM 4.1 UPM 1.2; UPM 1.7; UPM 2.2; UPM 1.10; UPM 2.8; UPM 2.10  Queensland infrastructure plan; Climate change action plans; SEQ road investment program; Asset management strategy; Integrate with transport plans; Program for sealing unsealed roads; In general, integrate with critical infrastructure programs, e.g. water, electricity, communication and transport plans; CO2 reduction programs/schemes	Australian Local Government Association (2011); Department of Infrastructure and Planning (2010c); Department of Local Government and Planning (2011a); Department of Natural Resources and Water (2007); Department of Transport and Main Roads (2011a)
<b>Action 1.3.2:</b> Investigate and establish funding opportunities for increasing investment to support further research and operation activities.					
<b>Action 1.3.3:</b> Establish redundancy fund for rapid action to re-operationalise damaged or closed roads due to extreme events.					
<b>Action 1.3.4:</b> Identify funding options to cover cost of deterioration and linked with climate change and prepare for increased required investment.					
<b>Action 1.3.5:</b> Calculate and allocate funds for roads identified as critical to emergency operations.					



### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.3.1:</b> Asset valuation by evaluating current physical condition of road network to enable identification of required funds.	Published reports outlining impacts of climate change on asset value; Hard data giving asset condition rating; Financial reviews; Reduced demand for funding	Periodic review of asset value ; Re-evaluation after extreme event.	<b>Local government</b>
<b>Action 1.3.2:</b> Investigate and establish funding opportunities for increasing investment to support further research and operation activities.			
<b>Action 1.3.3:</b> Establish redundancy fund for rapid action to re-operationalise damaged or closed roads due to extreme events.			
<b>Action 1.3.4:</b> Identify funding options to cover cost of deterioration and linked with climate change and prepare for increased required investment.			
<b>Action 1.3.5:</b> Calculate and allocate funds for roads identified as critical to emergency operations.			

**PI POLICY 2.** Management, design and construction of stormwater systems must be enhanced to increase resilience to changing climate, natural hazards and extreme weather events.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory	<b>Local governments;</b> state government (regional plan and planning)	All settlement types	Reduced maintenance and rehabilitation costs; Increased maintenance intervals and time; Improved planning and control of budget; increase in available funds; Less interruption in emergency services and evacuation due to improved stormwater system; Increased infrastructure adaptive capacity by integrating into future urban design practices to counteract impacts from climate change.	Underestimation of changes in climate; Lack of funds; Research limitations	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009

**PROGRAM 2.1 STORMWATER SYSTEMS DESIGN:** PI should be enforced through use of alternative construction, material and design.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Policy will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory and Financial incentive/ assistance	<b>Local government</b> informed and assisted by state and federal governments	All settlement types	Ongoing	Immediate	HH1.1; HH1.2; HH3.3 CM2.2; CM3.1; CM4.1; CM4.2 UPM 1.1; UPM 1.2; UPM 1.12; UPM 2.1; UPM 2.2; UPM 2.12  Integrate with other critical infrastructure planning: - funding applications - water supply (quality and quantity) - sewerage - electricity - communication - transport plans	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009

**Action 2.1.1:** Further research into impacts of climate change and extreme events on:

- limitations of current practices;
- current asset conditions and capacity hot spots (drainage/storage etc).
  - building and development controls;
  - Improving water harvesting and quality strategies;
  - existing/alternative material properties;
  - maintenance operation; and,
  - alternative tools (e.g. facebook, twitter) to improve risk communication to/with broader communities.

**Action 2.1.2:** Change design standards and material properties for new constructions, maintenance and rehabilitations works.

**Action 1.1.3:** Redesign/modify stormwater networks that will protect the community and other infrastructures from increased rainfall and runoff.

**Action 2.1.4:** Design/modify existing regulations to increase adaptive capacity.

**Action 2.1.5:** Incorporate the design of localised water storage, treatment and reuse technologies by utilising the application of alternative technologies at lot, neighbourhood or district residential or commercial/industrial scales as part of WSUD approach.

**Action 2.1.6:** Integrated infrastructure design approach:

- stormwater linked to roads;
- in order to increase infrastructures resilience to climate change and natural hazards at the planning and design stage their interdependencies should be considered (e.g. improvement of stormwater systems to reduce inundation of roads).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or “original” (incl. modified)
Program 2.1 Stormwater Systems Design: PI should be enforced through use of alternative construction, material and design.					
Action Implementation					
Action 2.1.1: Further research into impacts of climate change and extreme events on: - limitations of current practices; - current asset conditions and capacity hot spots (drainage/storage etc). - building and development controls; - Improving water harvesting and quality strategies; - existing/alternative material properties; - maintenance operation; and, - alternative tools (e.g. facebook, twitter) to improve risk communication to/with broader communities.	Regulatory and incentives/ financial assistance	Local government informed and/or assisted financially by State and Federal government s <i>(in order to incorporate Local level adaptations into State and Federal level adaptation strategies)</i>	Ongoing	HH1.1; HH1.2; HH3.3 CM2.2; CM3.1; CM4.1; CM4.2 UPM 1.1; UPM 1.2; UPM 1.12; UPM 2.1; UPM 2.2; UPM 2.12  Integrate with other critical infrastructure planning: - funding applications - water supply (quality and quantity) - sewerage - electricity - communication - transport plans	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009
Action 2.1.2: Change design standards and material properties for new constructions, maintenance and rehabilitations works.	Incentive/ financial assistance		Ongoing		
Action 1.1.3: Redesign/modify stormwater networks that will protect the community and other infrastructures from increased rainfall and runoff.	Regulatory and incentives/ financial assistance		Episodic		
Action 2.1.4: Design/modify existing regulations to increase adaptive capacity.					
Action 2.1.5: Incorporate the design of localised water storage, treatment and reuse technologies by utilising the application of alternative technologies at lot, neighbourhood or district residential or commercial/industrial scales as part of WSUD approach.					
Action 2.1.6: Integrated infrastructure design approach: - stormwater linked to roads; - in order to increase infrastructures resilience to climate change and natural hazards at the planning and design stage their interdependencies should be considered (e.g. improvement of stormwater systems to reduce inundation of roads).					

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.1.1:</b> Further research into impacts of climate change and extreme events on: <ul style="list-style-type: none"> <li>- limitations of current practices;</li> <li>- current asset conditions and capacity hot spots (drainage/storage etc). <ul style="list-style-type: none"> <li>- building and development controls;</li> <li>- Improving water harvesting and quality strategies;</li> <li>- existing/alternative material properties;</li> <li>- maintenance operation; and,</li> <li>- alternative tools (e.g. facebook, twitter) to improve risk communication to/with broader communities.</li> </ul> </li> </ul>	Stakeholder feedbacks as a result of interviews/workshops/consultation/survey outcomes etc; Modified standards; Publications; Research funding; Increased system performance; Reduced interruption to other critical infrastructure services due to increased efficiency	Implementation of advanced technology (e. g. wireless monitoring); Performance of design after event or change in climate; Speedy identification of hotspots based on performance reviews	<b>Local government</b> informed and/or assisted financially by State and Federal governments <i>(in order to incorporate Local level adaptations into State and Federal level adaptation strategies)</i>
<b>Action 2.1.2:</b> Change design standards and material properties for new constructions, maintenance and rehabilitations works.			
<b>Action 1.1.3:</b> Redesign/modify stormwater networks that will protect the community and other infrastructures from increased rainfall and runoff.			
<b>Action 2.1.4:</b> Design/modify existing regulations to increase adaptive capacity.			
<b>Action 2.1.5:</b> Incorporate the design of localised water storage, treatment and reuse technologies by utilising the application of alternative technologies at lot, neighbourhood or district residential or commercial/industrial scales as part of WSUD approach.			
<b>Action 2.1.6:</b> Integrated infrastructure design approach: <ul style="list-style-type: none"> <li>- stormwater linked to roads;</li> <li>- in order to increase infrastructures resilience to climate change and natural hazards at the planning and design stage their interdependencies should be considered (e.g. improvement of stormwater systems to reduce inundation of roads).</li> </ul>			

**PROGRAM 2.2 OPERATION OF STORMWATER SYSTEMS:** Advanced operational techniques for maintenance and rehabilitation should be employed.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Policy will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (e.g. one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory; Incentive; Training; Education	<b>Local government</b> informed by state and federal governments	All settlement types	Ongoing	Immediate	HH1.1; HH1.2; HH3.3 UPM 1.1; UPM 2.1  Integrate with other critical infrastructure planning: - funding applications - water supply (quality and quantity) - sewerage - electricity - communication - transport plans	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009

**Action 2.2.1:** Promote use of Water Sensitive Urban Design (WSUD) approaches to integrate the following potential planning and design opportunities into the built environment of cities and towns:

- reuse of stormwater as alternative source of water to conserve potable supplies;
- detention, rather than rapid conveyance, of stormwater;
- reuse, storage and infiltration of stormwater, instead of drainage system augmentation;
- use of vegetation for stormwater filtering purposes;
- treating stormwater to increase water quality for reuse and/or discharge (e.g. swales, wetlands, bioretention, rainwater tanks); and,
- capture or harvest urban stormwater for reuse in order to contribute to water conservation and water quality.

**Action 2.2.2:** Through education and training increase public awareness and knowledge of stakeholders involved in water issues.

**Action 2.2.3:** Set maintenance plans for procedures and schedules of water infrastructure.

**Action 2.2.4:** Use technology for improved information management for: impact assessment, aggressive maintenance; making real-time information available to stakeholders.

**Action 2.1.5:** Consult end users/stakeholders during formulation and implementation.

**Action 2.1.6:** Retrofitting of existing stormwater networks (e.g. corrosion protection, drainage covers).

**Action 2.1.7:** Improve design and construction of water systems to increase monitoring of water infrastructure (e.g. use of remote monitoring and sensing devices).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
Program 2.2 Operation of Stormwater Systems: Advanced operational techniques for maintenance and rehabilitation should be employed.					
Action Implementation					
Action 2.2.1: Promote use of Water Sensitive Urban Design (WSUD) approaches to integrate the following potential planning and design opportunities into the built environment of cities and towns: <ul style="list-style-type: none"><li>reuse of stormwater as alternative source of water to conserve potable supplies;</li><li>detention, rather than rapid conveyance, of stormwater;</li><li>reuse, storage and infiltration of stormwater, instead of drainage system augmentation;</li><li>use of vegetation for stormwater filtering purposes;</li><li>treating stormwater to increase water quality for reuse and/or discharge(e.g. swales, wetlands, bioretention, rainwater tanks); and,</li><li>capture or harvest urban stormwater for reuse in order to contribute to water conservation and water quality.</li></ul>	Regulatory; Incentive; Training; Education	Local government informed and/or assisted financially by State and Federal governments (in order to incorporate Local level adaptations into State and Federal level adaptation strategies)	Ongoing	HH1.1; HH1.2; HH3.3 UPM 1.1; UPM 2.1  Integrate with other critical infrastructure operational planning: - funding applications - water supply (quality and quantity) - sewerage - electricity - communication - transport plans	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009.
Action 2.2.2: Through education and training increase public awareness and knowledge of stakeholders involved in water issues.	Incentive; Training; Education				
Action 2.2.3: Set maintenance plans for procedures and schedules of water infrastructure.	-Regulatory; Incentive; Training; Education				
Action 2.2.4: Use technology for improved information management for: impact assessment, aggressive maintenance; making real-time information available to stakeholders.					
Action 2.1.5: Consult end users/stakeholders during formulation and implementation.					
Action 2.1.6: Retrofitting of existing stormwater networks (e.g. corrosion protection, drainage covers).					
Action 2.1.7: Improve design and construction of water systems to increase monitoring of water infrastructure (e.g. use of remote monitoring and sensing devises).					

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<p><b>Action 2.2.1:</b> Promote use of Water Sensitive Urban Design (WSUD) approaches to integrate the following potential planning and design opportunities into the built environment of cities and towns:</p> <ul style="list-style-type: none"> <li>• reuse of stormwater as alternative source of water to conserve potable supplies;</li> <li>• detention, rather than rapid conveyance, of stormwater;</li> <li>• reuse, storage and infiltration of stormwater, instead of drainage system augmentation;</li> <li>• use of vegetation for stormwater filtering purposes;</li> <li>• treating stormwater to increase water quality for reuse and/or discharge(e.g. swales, wetlands, bioretention, rainwater tanks); and,</li> <li>• capture or harvest urban stormwater for reuse in order to contribute to water conservation and water quality.</li> </ul>	<p>Stakeholder feedbacks as a result of interviews/ workshops/ consultation/survey outcomes etc; Publications; Evaluations during maintenance procedures; Financial reviews; Initial repair costs incurred after a flood event; Reduction in stormwater system failure; Structural evaluation of stormwater performance under extreme event</p>	<p>Mandating monitoring and evaluation capabilities into new development areas; Use of new technology (i.e. internet, gps, social media)</p>	<p><b>Local government</b> informed and/or assisted financially by State and Federal governments <i>(in order to incorporate Local level adaptations into State and Federal level adaptation strategies)</i></p>
<b>Action 2.2.2:</b> Through education and training increase public awareness and knowledge of stakeholders involved in water issues.			
<b>Action 2.2.3:</b> Set maintenance plans for procedures and schedules of water infrastructure.			
<b>Action 2.2.4:</b> Use technology for improved information management for: impact assessment, aggressive maintenance; making real-time information available to stakeholders.			
<b>Action 2.1.5:</b> Consult end users/stakeholders during formulation and implementation.			
<b>Action 2.1.6:</b> Retrofitting of existing stormwater networks (e.g. corrosion protection, drainage covers).			
<b>Action 2.1.7:</b> Improve design and construction of water systems to increase monitoring of water infrastructure (e.g. use of remote monitoring and sensing devices).			

**PROGRAM 2.3 FINANCE FOR STORMWATER SYSTEMS:** Cost estimation of climate change impact should be included in asset valuation and depreciation.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Policy will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory ; Training	<b>Local government</b> informed by state and federal governments	All settlement types	Ongoing	Immediate	UPM 1.2; UPM 1.10; UPM 2.2; UPM 2.10  Integrate with other critical infrastructure financial planning: <ul style="list-style-type: none"> <li>- funding applications</li> <li>- water supply (quality and quantity)</li> <li>- sewerage</li> <li>- electricity</li> <li>- communication</li> <li>- transport plans</li> </ul>	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009.

**Action 2.3.1:** Asset valuation, evaluate current physical condition of stormwater network to enable identification of required funds.

**Action 2.3.2:** Investigate and establish funding opportunities for increasing investment to support further research and operation activities.

**Action 2.3.3:** Establish redundancy fund for rapid action to re-operationalise damaged stormwater network due to extreme events.

**Action 2.3.4:** Identify funding options to cover cost of deterioration and linked with climate change and prepare for increased required investment.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.3 Finance for Stormwater Systems:</b> Cost estimation of climate change impact should be included in asset valuation and depreciation.					
<b>Action Implementation</b>					
<b>Action 2.3.1:</b> Asset valuation, evaluate current physical condition of stormwater network to enable identification of required funds.	Regulatory; Training	Local government	Ongoing	UPM 1.2; UPM 1.10; UPM 2.2; UPM 2.10  Integrate with other critical infrastructure financial planning: - funding applications - water supply (quality and quantity) - sewerage - electricity - communication - transport plans	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009
<b>Action 2.3.2:</b> Investigate and establish funding opportunities for increasing investment to support further research and operation activities.					
<b>Action 2.3.3:</b> Establish redundancy fund for rapid action to re-operationalise damaged stormwater network due to extreme events.					
<b>Action 2.3.4:</b> Identify funding options to cover cost of deterioration and linked with climate change and prepare for increased required investment.					

### **Action Monitoring & Evaluation**

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.3.1:</b> Asset valuation, evaluate current physical condition of stormwater network to enable identification of required funds.	Feedbacks from end users (various departments with governments eg. engineering planning, business etc.); Published reports outlining impacts of climate change on asset value; Hard data giving asset condition rating; Better financial reviews and asset management	Periodic review of asset condition; Re-evaluation after extreme event Improved cooperation; and communication among departments within government	<b>Local governments</b>
<b>Action 2.3.2:</b> Investigate and establish funding opportunities for increasing investment to support further research and operation activities.			
<b>Action 2.3.3:</b> Establish redundancy fund for rapid action to re-operationalise damaged stormwater network due to extreme events.			
<b>Action 2.3.4:</b> Identify funding options to cover cost of deterioration and linked with climate change and prepare for increased required investment.			

**PI POLICY 3.** Adaptive capacity of critical infrastructure should be strengthened to deal with the unpredictability of storm events, droughts, temperatures, precipitation patterns and sea level rise inundation.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High



## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Educational; Regulatory; Incentive	<b>Local governments</b> , state government, community	All settlement types	Improved knowledge about climate change impacts and increasing resilience; Increased infrastructure adaptive capacity by integrating into future planning practices to counteract impacts from climate change; Greater adaptive capacity of asset management methods	Underestimation of changes in climate; Incorrect implementation and/or building of adaptive capacity; Lack of funds and management expertise.	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009

**PROGRAM 3.1 EDUCATION:** Capacity should be built/improved through knowledge sharing, enhanced understanding and awareness about climate change.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Policy will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Educational; Regulatory; Incentive	<b>Local governments</b> , state government, community	All settlement types	Ongoing	Immediate	EM 2.4 CM5.3 UPM 3.2; UPM 3.3; UPM 3.5  Integrate with other critical infrastructure planning: - funding applications - water supply (quality and quantity) - sewerage - electricity - communication - transport plans	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009

**Action 3.1.1:** Research to recognise the extent to which adaptive capacity is already being considered in decision-making frameworks and policies.

**Action 3.1.2:** Provide training and educational opportunities to stakeholders to involve in scenario planning processes which stimulate thinking about the future, how different institutions shape it, and how surprises, unexpected consequences and possible responses may unfold.

**Action 3.1.3:** Improve communication of climate change risks and infrastructure vulnerability to decision-makers and wider community thereby changing management from reactive to proactive.

**Action 3.1.4:** Encourage public and private educational institutions to develop programs for professionals with a specific focus on adaptive capacity and vulnerability to climate change and adaptation methodologies.

**Action 3.1.5:** Include training programs about climate change as part of professional membership accreditation/certification.

**Action 3.1.6:** Implement continued professional development programs focused on identifying and evaluating climate risks.

**Action 3.1.7:** Promote climate change awareness through education and training (formal and informal), including integration into curriculum and targeted programs or activities.

**Action 3.1.8:** Establish partnerships with research agencies to ensure the best available science informs climate adaptation decision-making.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.1 Education:</b> Capacity should be built/improved through knowledge sharing, enhanced understanding and awareness about climate change.					
<b>Action Implementation</b>					
<b>Action 3.1.1:</b> Research to recognise the extent to which adaptive capacity is already being considered in decision-making frameworks and policies.	Regulatory; Incentives/ financial assistance	<b>Local government</b> and community informed and/or assisted financially by State and Federal governments.	Ongoing	EM 2.4 CM5.3 UPM 3.2; UPM 3.3; UPM 3.5  Integrate with other critical infrastructure planning: - funding applications - water supply (quality and quantity) - sewerage - electricity - communication - transport plans	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009
<b>Action 3.1.2:</b> Provide training and educational opportunities to stakeholders to involve in scenario planning processes which stimulate thinking about the future, how different institutions shape it, and how surprises, unexpected consequences and possible responses may unfold.			Ongoing		
<b>Action 3.1.3:</b> Improve communication of climate change risks and infrastructure vulnerability to decision-makers and wider community thereby changing management from reactive to proactive.					
<b>Action 3.1.4:</b> Encourage public and private educational institutions to develop programs for professionals with a specific focus on adaptive capacity and vulnerability to climate change and adaptation methodologies.	Incentives				
<b>Action 3.1.5:</b> Include training programs about climate change as part of professional membership accreditation/certification.	Regulatory				
<b>Action 3.1.6:</b> Implement continued professional development programs focused on identifying and evaluating climate risks.					
<b>Action 3.1.7:</b> Promote climate change awareness through education and training (formal and informal), including integration into curriculum and targeted programs or activities.	Educational				
<b>Action 3.1.8:</b> Establish partnerships with research agencies to ensure the best available science informs climate adaptation decision-making.	Incentives/ financial assistance		Ongoing		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.1.1:</b> Research to recognise the extent to which adaptive capacity is already being considered in decision-making frameworks and policies.	Publications.; Research funding.; Advanced understanding by stakeholder identified through interviews/workshops/consultation/survey outcomes etc; Modified standards and educational curriculum; Increased system resilience; Reduced interruption to other critical infrastructure services due to increased efficiency	Educational review cycles to evaluate curriculum and uptake; Implementation of improved management strategies; Performance of infrastructure after event or change in climate	<b>Local government</b> and community informed and/or assisted financially by State and Federal governments.
<b>Action 3.1.2:</b> Provide training and educational opportunities to stakeholders to involve in scenario planning processes which stimulate thinking about the future, how different institutions shape it, and how surprises, unexpected consequences and possible responses may unfold.			
<b>Action 3.1.3:</b> Improve communication of climate change risks and infrastructure vulnerability to decision-makers and wider community thereby changing management from reactive to proactive.			
<b>Action 3.1.4:</b> Encourage public and private educational institutions to develop programs for professionals with a specific focus on adaptive capacity and vulnerability to climate change and adaptation methodologies.			
<b>Action 3.1.5:</b> Include training programs about climate change as part of professional membership accreditation/certification.			
<b>Action 3.1.6:</b> Implement continued professional development programs focused on identifying and evaluating climate risks.			
<b>Action 3.1.7:</b> Promote climate change awareness through education and training (formal and informal), including integration into curriculum and targeted programs or activities.			
<b>Action 3.1.8:</b> Establish partnerships with research agencies to ensure the best available science informs climate adaptation decision-making.			

**PROGRAM 3.2 IMPLEMENTATION:** Current policies and regulations should be redesigned and/or modified to ensure the successful implementation of adaptation actions to improve adaptive capacity of asset management of critical infrastructure.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Policy will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory; Financial incentive/ assistance	<b>Local governments</b> , state government, community	All settlement types	Ongoing	Immediate	EM 2.1, 3.1, 3.4, 4.2, 4.3 HH1.2; HH2.1; HH3.3 CM5.3 UPM 1.2; UPM 2.2; UPM 3.2; UPM 3.3; UPM 3.4  Education and management strategies about adaptive capacity; Integrate with other critical infrastructure planning: - funding applications. - water supply (quality and quantity). - sewerage. - electricity. - communication. - transport plans.	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009

**Action 3.2.1:** Identify environmental factors threatening infrastructure performance.

**Action 3.2.2:** Identify determinants of and constraints on adaptive capacity.

**Action 3.2.3:** Enhance future adaptive capacity by evaluating interdependencies of and the relationships between current adaptive capacity of design, operations and finance.

**Action 3.2.4:** Consider economic costs associated with compliance and/or enforcement of regulations.

**Action 3.2.5:** Advance and retain state of the art or novel governance by transferring to address complex challenges of resource sharing and availability.

**Action 3.2.6:** Change standards or methods for design, operation and finance to further adaptive capacity.

**Action 3.2.7:** Identify, design and implement monitoring and enhancing techniques of adaptive capacity.

**Action 3.2.8:** Improve knowledge sharing and collaboration across agencies and all levels of governments for effective implementation of adaptation strategies.

**Action 3.2.9:** Develop or advance communication and engagement strategies with vulnerable communities.

**Action 3.2.10:** Implement a hazard avoidance procedure for minimising the adverse effects of climate change when planning and constructing new infrastructure within areas vulnerable to climate change impacts.

**Action 3.2.11:** Define responsibilities for losses or risks across governments, private sector and insurance companies (e.g. fee to cover the costs of potential emergency response, or to improve resilience of infrastructure that services the new development to natural hazards; developer must design the new development and its supporting infrastructure to be more resilient to natural hazards).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or “original” (incl. modified)
<b>Program 3.2 Implementation:</b> Current policies and regulations should be redesigned and/or modified to ensure the successful implementation of adaptation actions to improve adaptive capacity of asset management of critical infrastructure.					
<b>Action Implementation</b>					
<b>Action 3.2.1:</b> Identify environmental factors threatening infrastructure performance.	Regulatory	<b>Local government</b> and community informed and/or assisted financially by State and Federal governments.	Episodic	EM 2.1, 3.1, 3.4, 4.2, 4.3 HH1.2; HH2.1; HH3.3 CM5.3 UPM 1.2; UPM 2.2; UPM 3.2; UPM 3.3; UPM 3.4  Education and management strategies about adaptive capacity; Integrate with other critical infrastructure planning: - funding applications. - water supply (quality and quantity). - sewerage. - electricity. - communication. - transport plans.	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009
<b>Action 3.2.2:</b> Identify determinants of and constraints on adaptive capacity.			Ongoing		
<b>Action 3.2.3:</b> Enhance future adaptive capacity by evaluating interdependencies of and the relationships between current adaptive capacity of design, operations and finance.			Ongoing		
<b>Action 3.2.4:</b> Consider economic costs associated with compliance and/or enforcement of regulations.					
<b>Action 3.2.5:</b> Advance and retain state of the art or novel governance by transferring to address complex challenges of resource sharing and availability.	Incentives				
<b>Action 3.2.6:</b> Change standards or methods for design, operation and finance to further adaptive capacity.	Regulatory				
<b>Action 3.2.7:</b> Identify, design and implement monitoring and enhancing techniques of adaptive capacity.					
<b>Action 3.2.8:</b> Improve knowledge sharing and collaboration across agencies and all levels of governments for effective implementation of adaptation strategies.			Ongoing		
<b>Action 3.2.9:</b> Develop or advance communication and engagement strategies with vulnerable communities.	Educational Incentives				
<b>Action 3.2.10:</b> Implement a hazard avoidance procedure for minimising the adverse effects of climate change when planning and constructing new infrastructure within areas vulnerable to climate change impacts.	Regulatory				
<b>Action 3.2.11:</b> Define responsibilities for losses or risks across governments, private sector and insurance companies (e.g. fee to cover the costs of potential emergency response, or to improve resilience of infrastructure that services the new development to natural hazards; developer must design the new development and its supporting infrastructure to be more resilient to natural hazards).			Episodic		

## Action Monitoring & Evaluation



Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.2.1:</b> Identify environmental factors threatening infrastructure performance.	Modified or new design and operational standards; Increased system resilience; Reduced interruption to other critical infrastructure services due to increased efficiency; Stakeholder feedbacks as a result of interviews/workshops/consultation/survey outcomes etc	Implementation of improved management strategies and alternative standards; Performance of infrastructure after event or change in climate	<b>Local government</b> and community informed and/or assisted financially by State and Federal governments.
<b>Action 3.2.2:</b> Identify determinants of and constraints on adaptive capacity.			
<b>Action 3.2.3:</b> Enhance future adaptive capacity by evaluating interdependencies of and the relationships between current adaptive capacity of design, operations and finance.			
<b>Action 3.2.4:</b> Consider economic costs associated with compliance and/or enforcement of regulations.			
<b>Action 3.2.5:</b> Advance and retain state of the art or novel governance by transferring to address complex challenges of resource sharing and availability.			
<b>Action 3.2.6:</b> Change standards or methods for design, operation and finance to further adaptive capacity.			
<b>Action 3.2.7:</b> Identify, design and implement monitoring and enhancing techniques of adaptive capacity.			
<b>Action 3.2.8:</b> Improve knowledge sharing and collaboration across agencies and all levels of governments for effective implementation of adaptation strategies.			
<b>Action 3.2.9:</b> Develop or advance communication and engagement strategies with vulnerable communities.			
<b>Action 3.2.10:</b> Implement a hazard avoidance procedure for minimising the adverse effects of climate change when planning and constructing new infrastructure within areas vulnerable to climate change impacts.			
<b>Action 3.2.11:</b> Define responsibilities for losses or risks across governments, private sector and insurance companies (e.g. fee to cover the costs of potential emergency response, or to improve resilience of infrastructure that services the new development to natural hazards; developer must design the new development and its supporting infrastructure to be more resilient to natural hazards).			

**PROGRAM 3.3 MANAGEMENT:** A dynamic anticipatory management approach should be employed to learn from others experience, respond to feedbacks, attain innovations and take pro-active action.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory; Financial incentive/ assistance	<b>Local government</b> informed and assisted by state and federal governments	All settlement types	Ongoing	Immediate	HH3.3 CM5.3 UPM 3.2.5 Education and implementation strategies about adaptive capacity; Integrate with other critical infrastructure management methods: - funding applications. - water supply (quality and quantity). - sewerage. - electricity. - communication. - transport plans.	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009

**Action 3.3.1:** Embrace national and/or international adaptation practices or cases (i.e. integrating stormwater and road infrastructures).

**Action 3.3.2:** Determine and adopt techniques for transition towards adaptive management methods.

**Action 3.3.3:** Identify and/or develop indicators for infrastructure coping capacity.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.3 Management:</b> A dynamic anticipatory management approach should be employed to learn from others experience, respond to feedbacks, attain innovations and take pro-active action.					
<b>Action Implementation</b>					
<b>Action 3.3.1:</b> Embrace national and/or international adaptation practices or cases (i.e. integrating stormwater and road infrastructures).	Financial incentive/ assistance	<b>Local government</b> informed and assisted by State and Federal	Ongoing	HH3.3 CM5.3 UPM 3.2.5 Education and implementation strategies about adaptive capacity; Integrate with other critical infrastructure management methods: - funding applications. - water supply (quality and quantity). - sewerage. - electricity. - communication. - transport plans.	Department of Infrastructure and Planning, 2009; ARMCANZ, 2000; DNRW, 2008; DEFRA, 2011; EPD, 2009
<b>Action 3.3.2:</b> Determine and adopt techniques for transition towards adaptive management methods.	Regulatory; Incentives				
<b>Action 3.3.3:</b> Identify and/or develop indicators for infrastructure coping capacity.					

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.3.1:</b> Embrace national and/or international adaptation practices or cases (i.e. integrating stormwater and road infrastructures).	Modified or new management techniques; Increased infrastructure resilience; Reduced interruption to other critical infrastructure services due to increased efficiency; Stakeholder feedbacks as a result of interviews/ workshops/ consultation/ survey outcomes etc	Implementation of improved management strategies and alternative standards; Performance of infrastructure after event or change in climate	<b>Local government</b> and community informed and/or assisted financially by state and federal governments.
<b>Action 3.3.2:</b> Determine and adopt techniques for transition towards adaptive management methods.			
<b>Action 3.3.3:</b> Identify and/or develop indicators for infrastructure coping capacity.			

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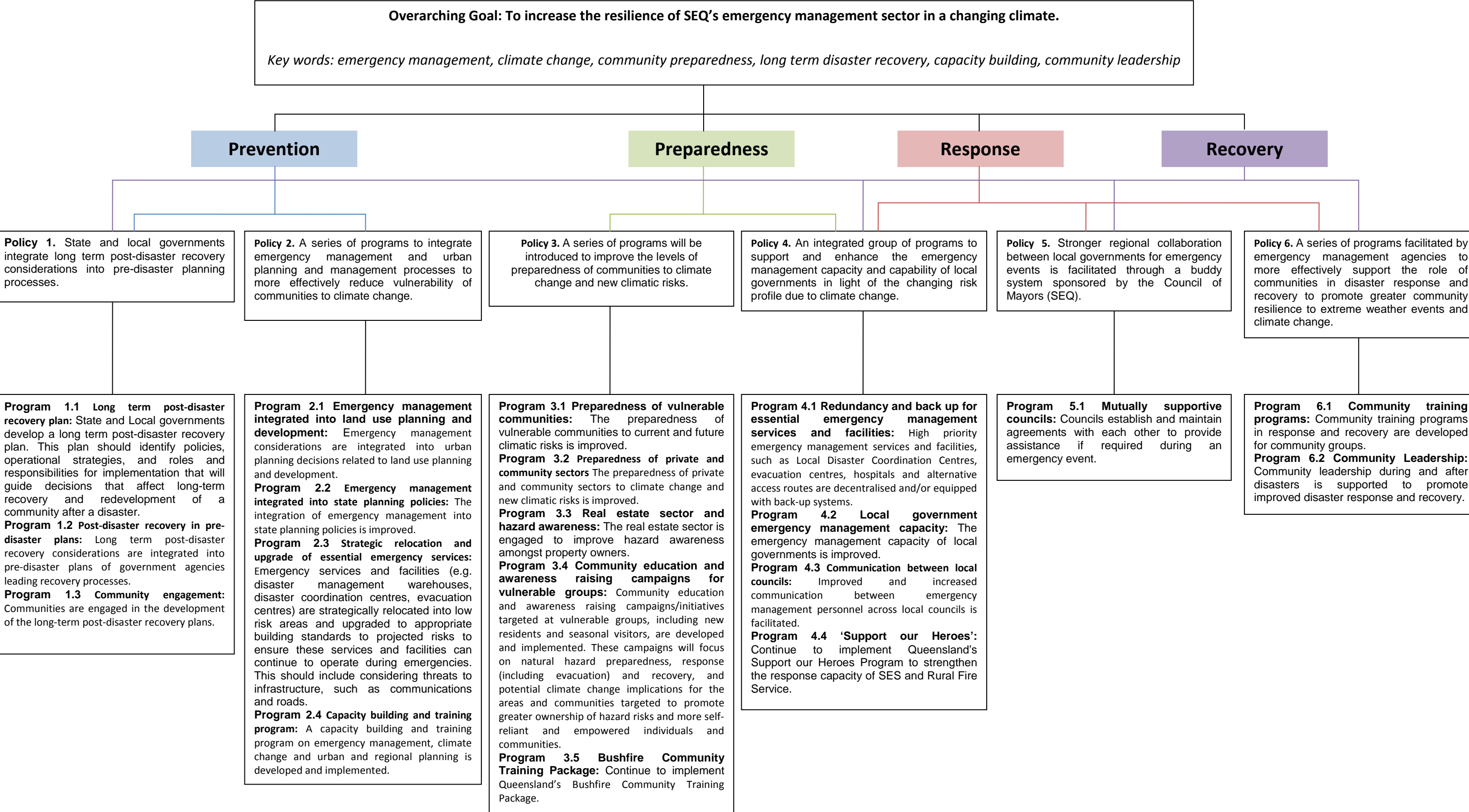
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## **SECTION 4: EMERGENCY MANAGEMENT ADAPTATION OPTIONS**







**Figure 4.1: Emergency Management Adaptation Options Framework**

## Policy 1. State and local governments integrate long term post-disaster recovery considerations into pre-disaster planning processes.

**Program 1.1 Long term post-disaster recovery plan:** State and Local governments develop a long term post-disaster recovery plan. This plan should identify policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of a community after a disaster.

**Action 1.1.1:** Identify appropriate structure, process and stakeholders for development of this plan.

**Action 1.1.2:** Organise a multi-stakeholder sub-group to be responsible for the development of this plan.

**Action 1.1.3:** Use scenario planning as one of the tools to determine long-term post-disaster recovery and redevelopment needs.

**Action 1.1.4:** Conduct annual testing exercises to rehearse pre and post disaster decision making and update plan when necessary.

**Action 1.1.5:** Ensure the plan emphasises seizing opportunities in post-disaster phase for hazard mitigation and community improvement.

**Action 1.1.6:** Local governments to investigate in pre-disaster phase different funding options, in addition to NDRRA and SDRA, for redevelopment and recovery activities.

**Program 1.2 Post-disaster recovery in pre-disaster plans:** Long term post-disaster recovery considerations are integrated into pre-disaster plans of government agencies leading recovery processes.

**Action 1.2.1:** Integrate long term post-disaster recovery considerations in State, regional and local statutory plans and policies (e.g. SPPs, SEQ Regional Plan, planning schemes, corporate plans, community plans).

**Action 1.2.2:** Integrate long term post-disaster recovery considerations into non-statutory plans (e.g. Local Disaster Management Plan, Queensland Health strategic plan).

**Program 1.3 Community engagement:** Communities are engaged in the development of the long-term post-disaster recovery plans.

**Action 1.3.1:** Pilot test the development of a long term post-disaster recovery plan with a few communities to inform the process of developing the long term recovery plan before expanding the process to a wider number of communities.

**Action 1.3.2:** Engage communities by holding community forums and workshops at the start and throughout the process of plan development.

## Policy 2. A series of programs to integrate emergency management and urban planning and management processes to more effectively reduce vulnerability of communities to climate change.

**Program 2.1 Emergency management integrated into land use planning and development:** Emergency management considerations are integrated into urban planning decisions related to land use planning and development.

**Action 2.1.1:** Ensure EMQ has a concurrence agency role in development applications (DAs) within the Integrated Development Assessment System (IDAS).

**Action 2.1.2:** Integrate emergency management considerations in Structure Plans when implementing urban consolidation and urban renewal programs, and in master planned communities.

**Action 2.1.3:** Integrate emergency management considerations into local Statutory Plans (e.g. Planning schemes, corporate plans).

**Action 2.1.4:** Integrate emergency management considerations into local non-Statutory Plans (e.g. Transport Plans).

**Action 2.1.5:** Agencies responsible for emergency management and planning to develop an internal education program for state and local government planners on emergency management issues and requirements with regard to climate change adaptation (e.g. workshops).

**Action 2.1.6:** Review and modify the National planning systems principles to consider emergency management.

**Program 2.2 Emergency management integrated into state planning policies:** The integration of emergency management into state planning policies is improved.

**Action 2.2.1:** Review and revise the SPP 1/03 to incorporate emergency management and climate change adaptation considerations.

**Action 2.2.2:** Review the SPP 3/11 to incorporate emergency management considerations for developments in the coastal zone.

**Program 2.3 Strategic relocation and upgrade of essential emergency services:** Emergency services and facilities (e.g. disaster management warehouses, disaster coordination centres, evacuation centres) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks to ensure these services and facilities can continue to operate during emergencies. This should include considering threats to infrastructure, such as communications and roads.

**Action 2.3.1:** Assess the vulnerability of essential emergency management services to natural hazards and conduct an inventory to determine which ones require upgrade and/or strategic relocation.

**Action 2.3.2:** Calculate and allocate funds for relocation and upgrading of essential emergency management services.

**Action 2.3.3:** Establish staging process to implement relocation and upgrade of essential emergency management services.

**Action 2.3.4:** Engage community on decentralisation of essential emergency management services to ensure communities do not get disadvantaged.

**Action 2.3.5:** Investigate feasibility of decentralisation of essential emergency management services and facilities as a retreat option.

**Program 2.4 Capacity building and training program:** A capacity building and training program on emergency management, climate change and urban and regional planning is developed and implemented.

**Action 2.4.1:** Work with tertiary institutions, PIA, EIANZ and TAFE to incorporate consideration of climate change adaptation and emergency management as a consistent theme in professional development training modules for land use planners, both at Certified Practicing Planner level and for other planning professionals.

**Action 2.4.2:** Develop National Guide to climate change and emergency management in land use planning to ensure consideration of disaster risk implications of CC in development of future policies, codes and standards to do with the built environment and land use planning.

**Action 2.4.3:** Implement training and continuing professional development (CPD) programs on emergency management for sectors involved in land use planning and development decisions.

**Action 2.4.4:** Implement training and capacity building programs on urban and regional planning for emergency management staff in local and state governments.

**Policy 3. A series of programs will be introduced to improve the levels of preparedness of communities to climate change and new climatic risks.**

**Program 3.1 Preparedness of vulnerable communities:** The preparedness of vulnerable communities to current and future climatic risks is improved.

**Action 3.1.1:** Continue to implement Queensland's Disaster Preparedness in vulnerable communities program to develop community awareness and improve individual, household and business capacity.

**Action 3.1.2:** Build capacity of disadvantaged communities to effectively respond to the potential social and economic impacts of climate change.

**Action 3.1.3:** Extend 'preparedness and awareness' programs to communities where risk of extreme climatic events has increased.

**Action 3.1.4:** Provide community safety programs that factor in climate change.

**Action 3.1.5:** Establish information sharing and collaborative partnerships with community service providers to manage risks of climate change.

**Program 3.2 Preparedness of private and community sectors:** The preparedness of private and community sectors to climate change and new climatic risks is improved.

**Action 3.2.1:** Provide emergency management and climate change adaptation training programs for private and community sector.

**Action 3.2.2:** Private and community sector organisations to develop and frequently revise their disaster management plan.

**Action 3.2.3:** Private and community sector to assess climate change implications on their operations.

**Program 3.3 Real estate sector and hazard awareness:** The real estate sector is engaged to improve hazard awareness amongst property owners.

**Action 3.3.1:** Establish State and Federal full disclosure laws to require sellers of real estate to disclose information on natural hazards that can put property at risk.

**Action 3.3.2:** Establish stronger requirements/ regulations for real estate disclosure to provide coastal property buyers information of the potential perils associated with developing or purchasing property seaward of the [state's] oceanfront setback line.

**Program 3.4 Community education and awareness raising campaigns for vulnerable groups:** Community education and awareness raising campaigns/initiatives targeted at vulnerable groups, including new residents and seasonal visitors, are developed and implemented. These campaigns will focus on natural hazard preparedness, response (including evacuation) and recovery, and potential climate change implications for the areas and communities targeted to promote greater ownership of hazard risks and more self-reliant and empowered individuals and communities.

**Action 3.4.1:** Identify the different socio-economic profiles and possible vulnerable groups in communities.

**Action 3.4.2:** Organise forums and develop information specifically targeted at the different vulnerable groups identified.

**Action 3.4.3:** Develop community education and awareness raising programs targeted at new migrant communities.

**Program 3.5 Bushfire Community Training Package:** Continue to implement Queensland's Bushfire Community Training Package.

**Action 3.5.1:** Use best available science to determine changing profile of bushfire risks to communities due to climate change.

**Action 3.5.2:** Support and develop a network of Volunteer Community Education Officers to deliver bushfire education to their local communities.

**Action 3.5.3:** Build community awareness of nature and risk of bushfires, including the changing risks due to climate change, and measures to prepare and protect lives, property and the environment.

**Policy 4. An integrated group of programs to support and enhance the emergency management capacity and capability of local governments in light of the changing risk profile due to climate change.**

**Program 4.1 Redundancy and back up for essential emergency management services and facilities:** High priority emergency management services and facilities, such as Local Disaster Coordination Centres, evacuation centres, hospitals and alternative access routes are decentralised and/or equipped with back-up systems.

**Action 4.1.1:** Assess vulnerability of essential emergency management services and facilities to extreme weather events and conduct an inventory to determine which ones require redundancy and back-up.

**Action 4.1.2:** Identify alternative evacuation and access routes in an emergency event.

**Action 4.1.3:** Calculate and allocate funds for construction and implementation of additional essential emergency management services and facilities in low risk areas.

**Action 4.1.4:** Establish a staging process to implement redundancy and back-up for essential emergency management services and facilities.

**Program 4.2 Local government emergency management capacity:** The emergency management capacity of local governments is improved.

**Action 4.2.1:** Provide local government emergency management personnel with greater access to information on climate change.

**Action 4.2.2:** Conduct emergency exercises (including recovery) based on worst case scenarios (includes use of best available science on CC), including consideration of multiple events, involving the community and all agencies to test out the emergency management arrangements under extreme cases.

**Action 4.2.3:** Identify limits to local government response capacity and support required from EMQ and/or other local councils.

**Action 4.2.4:** Increase budget available to local government emergency management units.

**Action 4.2.5:** Implement Queensland's Disaster Management Warehouses and Caches Initiative to store stockpiles of emergency equipment.

**Action 4.2.6:** Establish information sharing and collaborative partnerships with community service providers to improve management of climate change risks and targeting of vulnerable populations.

**Program 4.3 Communication between local councils:** Improved and increased communication between emergency management personnel across local councils is facilitated.

**Action 4.3.1:** Establish an SEQ emergency management forum (e.g. Working group of the SEQ Council of Mayors) to encourage greater sharing of information and experience between local government emergency management personnel.

**Program 4.4 Support our Heroes:** Continue to implement Queensland's Support our Heroes Program to strengthen the response capacity of SES and Rural Fire Service.

**Action 4.4.1:** Provision of greater incentives, recognition and training to volunteers.

**Action 4.4.2:** Provide additional equipment and resources to strengthen response capacity of SES and Rural Fire Service.

**Policy 5. Stronger regional collaboration between local governments for emergency events is facilitated through a buddy system sponsored by the Council of Mayors (SEQ).**

**Program 5.1 Mutually supportive councils:** Councils establish and maintain agreements with each other to provide assistance if required during an emergency event.

**Action 5.1.1:** Identify most appropriate process for this collaboration (e.g. Council to Council program, MoUs, Councils forming a joint board under the Local Government Act).

**Action 5.1.2:** Review State Disaster Management Arrangements to recognise, include and support this assistance system between local governments.

**Policy 6. A series of programs facilitated by emergency management agencies to more effectively support the role of communities in disaster response and recovery to promote greater community resilience to extreme weather events and climate change.**

**Program 6.1 Community training programs:** Community training programs in response and recovery are developed for community groups.

**Action 6.1.1:** Work with community to identify key community groups to train in disaster response and recovery.

**Action 6.1.2:** Provide ongoing disaster response and recovery training to identified community groups.

**Program 6.2 Community Leadership:** Community leadership during and after disasters is supported to promote improved disaster response and recovery.

**Action 6.2.1:** Work with the community to identify key contact points within communities to ensure improved communication between community and emergency services during and after a disaster, especially if community is isolated.

**Action 6.2.2:** Work with the community to identify and/or establish community group(s) responsible for disaster response and recovery within the community.

**Action 6.2.3:** Investigate whether an amendment of the DM Act 2003 would be required to allow for nominated community groups to have a role in disaster response and recovery activities.

**Sub-action:** State Disaster Management Plan and Local Government Disaster Management Plans to align with this amendment and recognise new disaster response and recovery role played by these nominated community groups.

**Action 6.2.4:** Identify, record and integrate community disaster response and recovery groups into local disaster management plans.

**Action 6.2.5:** Investigate whether community leadership during disaster response and recovery should be encouraged for all communities or only those isolated during and after disasters.

## EM POLICY 1: State and local governments integrate long term post-disaster recovery considerations into pre-disaster planning processes.

### Policy Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High/Low	N/A	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive	<b>State government</b> (emergency management and planning) and local governments	Queensland, SEQ and all settlement types	Improved and more effective disaster recovery which promotes community resilience and mitigation of future hazards; reduced vulnerability to future natural hazards.	Vulnerable, poorer and 'hard to reach' communities may be negatively impacted by recovery and redevelopment processes if not effectively engaged in the process of plan development.	Meyer et al 2010; Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )



**PROGRAM 1.1 LONG TERM POST-DISASTER RECOVERY PLAN:** State and local governments develop a long term post-disaster recovery plan. This plan should identify policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of a community after a disaster.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Program will address climate change** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "Climate change adaptation options appraisal criteria"

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	N/A	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive	<b>State government and local governments</b>	State, SEQ, all settlement types	Ongoing	Immediate	HH 3.1.8 PI 1.1, 1.2, 2.1, 2.2 UPM 3.6.8	Meyer et al 2010; Florida Division of Emergency Management (www.floridadisaster.org)

**Action 1.1.1:** Identify appropriate structure, process and stakeholders for development of this plan.

**Action 1.1.2:** Organise a multi-stakeholder sub-group to be responsible for the development of this plan.

**Action 1.1.3:** Use scenario planning as one of the tools to determine long-term post-disaster recovery and redevelopment needs.

**Action 1.1.4:** Conduct annual testing exercises to rehearse pre and post disaster decision making and update plan when necessary.

**Action 1.1.5:** Ensure the plan emphasises seizing opportunities in post-disaster phase for hazard mitigation and community improvement.

**Action 1.1.6:** Local governments to investigate in pre-disaster phase different funding options, in addition to NDRRA and SDRA, for redevelopment and recovery activities.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.1 Long term post-disaster recovery plan:</b> State and local governments develop a long term post-disaster recovery plan. This plan should identify policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of a community after a disaster.					
<b>Action Implementation</b>					
<b>Action 1.1.1:</b> Identify appropriate structure, process and stakeholders for development of this plan.	Guidelines	<b>EMQ for a State plan and local government for a local plan</b> supported by other lead agencies in recovery	Ongoing		Based on Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )
<b>Action 1.1.2:</b> Organise a multi-stakeholder sub-group to be responsible for the development of this plan.	Guidelines	<b>EMQ for State plan and local government for local plan</b> supported by other lead agencies in recovery	For duration of plan development		Based on Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )
<b>Action 1.1.3:</b> Use scenario planning as one of the tools to determine long-term post-disaster recovery and redevelopment needs.	Guidelines	<b>Chair of multi-stakeholder group responsible for plan</b>	For duration of plan development		Comments from stakeholders
<b>Action 1.1.4:</b> Conduct annual testing exercises to rehearse pre and post disaster decision making and update plan when necessary.	Financial Incentive (e.g. Tied grant)	<b>EMQ for State plan and Local government for local plan,</b> lead agencies in recovery	Annual		Adapted from Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )
<b>Action 1.1.5:</b> Ensure the plan emphasises seizing opportunities in post-disaster phase for hazard mitigation and community improvement.	Guidelines	<b>Chair of Multi-stakeholder group responsible for plan</b>	Ongoing (as will need to be considered when plan is revised)		Based on Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )
<b>Action 1.1.6:</b> Local governments to investigate in pre-disaster phase different funding options, in addition to NDRRA and SDRA, for redevelopment and recovery activities.		<b>LDMG</b> supported by local government	Ongoing		Adapted from Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.1.1:</b> Identify appropriate structure, process and stakeholders for development of this plan.	Structure and process established, stakeholders selected and confirmed		State emergency management agency
<b>Action 1.1.2:</b> Organise a multi-stakeholder sub-group to be responsible for the development of this plan.	Group organised, Terms of reference developed, schedule of meetings developed, minutes from meetings;  % of recovery phase lead agencies involved in this group		state emergency management agency (for State plan); state emergency management agency and LDMG (for local plan)
<b>Action 1.1.3:</b> Use scenario planning as one of the tools to determine long-term post-disaster recovery and redevelopment needs.	Scenario planning exercises undertaken, Summary of key findings from exercises, incorporation of findings into plan		Multi-stakeholder group responsible for plan development
<b>Action 1.1.4:</b> Conduct annual testing exercises to rehearse pre and post disaster decision making and update plan when necessary.	Revisions made to the plan		State emergency management agency (state plan) and LDMG (local plan)
<b>Action 1.1.5:</b> Ensure the plan emphasises seizing opportunities in post-disaster phase for hazard mitigation and community improvement	Disaster mitigation initiatives included in the Plan, Community betterment initiatives included in the plan	Regular review of State DM plans, Annual review of local DM plans	SDMG (State plan); LDMG (Local plan)
<b>Action 1.1.6:</b> Local governments to investigate in pre-disaster phase different funding options, in addition to NDRRA and SDRA, for redevelopment and recovery activities.	List of funding options available;  Amount of funding requested from non-NDRRA and SDRA sources following a disaster		LDMG

**PROGRAM 1.2 POST-DISASTER RECOVERY IN PRE-DISASTER PLANS:** Long term post-disaster recovery considerations are integrated into pre-disaster plans of government agencies leading recovery processes.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High/Low	N/A	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive	<b>State government agencies</b> with a lead agency role in recovery processes (e.g. emergency management, planning, health) supported by local governments	State, SEQ, all settlement types	Ongoing	Immediate	HH 3.1.8 PI 1.1, 2.1 UPM 3.6.9	Meyer et al 2010; Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )

**Action 1.2.1:** Integrate long term post-disaster recovery considerations in State, regional and local statutory plans and policies (e.g. SPPs, SEQ Regional Plan, planning schemes, corporate plans, community plans).

**Action 1.2.2:** Integrate long term post-disaster recovery considerations into non-statutory plans (e.g. Local Disaster Management Plan, Queensland Health strategic plan).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl.modified)
<b>Program 1.2 Post-disaster recovery in pre-disaster plans:</b> Long term post-disaster recovery considerations are integrated into pre-disaster plans of government agencies leading recovery processes. <b>Action Implementation</b>					
<b>Action 1.2.1:</b> Integrate long term post-disaster recovery considerations in State, regional and local statutory plans and policies (e.g. SPPs, SEQ Regional Plan, planning schemes, corporate plans, community plans).	Directive	<b>State government agencies responsible for the statutory plans and policies</b> (e.g. planning, emergency management) <b>and local government (for local statutory plans)</b>	Ongoing		Adapted from Florida Division of Emergency Management (www.floridadisaster.org)
<b>Action 1.2.2:</b> Integrate long term post-disaster recovery considerations into non-statutory plans (e.g. Local Disaster Management Plan, Queensland Health strategic plan).	Directive	<b>State government agencies responsible for the non-statutory plans and local government for local plans (e.g. LDMG for LDMP)</b>	Ongoing		Adapted from Florida Division of Emergency Management (www.floridadisaster.org)

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.2.1:</b> Integrate long term post-disaster recovery considerations in State, regional and local statutory plans and policies (e.g. SPPs, SEQ Regional Plan, planning schemes, corporate plans, community plans).	Relevant goals and actions from the long-term recovery plan included in the statutory plans (e.g. in SEQ Regional Plan they could form a new Desired Regional Outcome)	Review cycles of the statutory plans	Agencies responsible for the statutory plans
<b>Action 1.2.2:</b> Integrate long term post-disaster recovery considerations into non-statutory plans (e.g. Local Disaster Management Plan, Queensland Health strategic plan).	Relevant goals and actions from the long-term recovery plan included in these non-statutory plans	Review cycles of the non-statutory plans	Agencies responsible for the non-statutory plans

**PROGRAM 1.3 COMMUNITY ENGAGEMENT:** Communities are engaged in the development of the long-term post-disaster recovery plans.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	N/A	High	High	High	High



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Guidelines	<b>Local government agencies leading the planning process</b> supported by all other agencies involved in development of this long-term post-disaster recovery plan	State, SEQ, local government authority areas, settlement types	Ongoing	Immediate		Stakeholder workshops; Meyer et al 2010; Florida Division of Emergency Management ( <a href="http://www.floridadisaster.org">www.floridadisaster.org</a> )

**Action 1.3.1:** Pilot test the development of a long term post-disaster recovery plan with a few communities to inform the process of developing the long term recovery plan before expanding the process to a wider number of communities.

**Action 1.3.2:** Engage communities by holding community forums and workshops at the start and throughout the process of plan development.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.3 Community engagement:</b> Communities are engaged in the development of the long-term post-disaster recovery plans.					
<b>Action Implementation</b>					
<b>Action 1.3.1:</b> Pilot test the development of a long term post-disaster recovery plan with a few communities to inform the process of developing the long term recovery plan before expanding the process to a wider number of communities.	Guidelines	<b>Chair of Multi-stakeholder group responsible for development of the Plan</b>	When developing the first plan and during plan review		Florida Division of Emergency Management (www.floridadisaster.org)
<b>Action 1.3.2:</b> Engage communities by holding community forums and workshops at the start and throughout the process of plan development.	Guidelines	<b>Chair of Multi-stakeholder group responsible for development of the Plan</b>	Throughout the process of plan development and during review of the plan		Florida Division of Emergency Management (www.floridadisaster.org)

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.3.1:</b> Pilot test the development of a long term post-disaster recovery plan with communities.	Feedback from community on plan development; Number of communities involved in process		State emergency management agency (for State plans) and LDMG (for local plans)
<b>Action 1.3.2:</b> Engage communities by holding community forums and workshops at the start and throughout the process of plan development.	Feedback from community on the workshops, inclusion of community feedback/suggestions into the Plan  Number of community forums and workshops held throughout process; Number of community members attending workshops		State emergency management agency (for State plans) and LDMG (for local plans)

**EM POLICY 2:** A series of programs to integrate emergency management and urban planning and management processes to more effectively reduce vulnerability of communities to climate change.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence / alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	N/A	High	High	High	High

## Outline of Policy 2

<b>Implementation Mechanisms</b> (eg regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive	<b>State agency responsible for planning</b> supported by emergency management and local governments	Queensland, SEQ, all settlement types	Reduced exposure and vulnerability of communities, improved prevention of disasters, improved planning decisions.	Additional layer of complexity that may lengthen decision making process.	Supported by stakeholders; Boullé et al 1997; Pearce, 2003; Siembieda et al, 2004; Norman, 2009; Yates and Bergin, 2009; Buxton et al, 2011

**PROGRAM 2.1 EMERGENCY MANAGEMENT INTEGRATED INTO LAND USE PLANNING AND DEVELOPMENT:** Emergency management considerations are integrated into urban planning decisions related to land use planning and development.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High/Low	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl modified)
Directive	<b>State agency responsible for planning</b> supported by emergency management and local governments	Queensland, SEQ, all settlement types	Ongoing	Immediate	PI 1.1, 1.2, 2.1, 2.2 UPM 1.1, 2.1	

**Action 2.1.1:** Ensure EMERGENCY MANAGEMENT has a concurrence agency role in development applications (DAs) within the Integrated Development Assessment System (IDAS).

**Action 2.1.2:** Integrate emergency management considerations in Structure Plans when implementing urban consolidation and urban renewal programs, and master planned communities.

**Action 2.1.3:** Integrate emergency management considerations into local Statutory Plans (e.g. Planning schemes, corporate plans).

**Action 2.1.4:** Integrate emergency management considerations into local non-Statutory Plans (e.g. Transport Plans).

**Action 2.1.5:** EMERGENCY MANAGEMENT and PLANNING to develop an internal education program for state and local government planners on emergency management issues and requirements with regard to climate change adaptation (e.g. workshops).

**Action 2.1.6:** Review and modify the National planning systems principles to consider emergency management.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.1 Emergency Management integrated into land use planning and development:</b> Emergency management considerations are integrated into urban planning decisions related to land use planning and development.					
<b>Action Implementation</b>					
<b>Action 2.1.1:</b> Ensure State Agency for EM has a concurrence agency role in development applications (DAs) within the Integrated Development Assessment System (IDAS).	Regulatory	<b>State agency responsible for planning</b>	Ongoing	UPM 1.1, 2.1	
<b>Action 2.1.2:</b> Integrate emergency management considerations in Structure Plans when implementing urban consolidation and urban renewal programs, and in master planned communities.	Policy	<b>Local government,</b>  PLANNING to have an overseeing role	Ongoing	UPM 1.1, 2.1	
<b>Action 2.1.3:</b> Integrate emergency management considerations into local Statutory Plans (e.g. Planning schemes, corporate plans).	Policy	<b>Local government</b>	Ongoing		
<b>Action 2.1.4:</b> Integrate emergency management considerations into local non-Statutory Plans (e.g. Transport Plans).	Policy	<b>Local government unit responsible for development of those plan</b>	Ongoing		
<b>Action 2.1.5:</b> State agencies for emergency management and planning to develop an internal education program for state and local government planners on emergency management issues and requirements with regard to climate change adaptation (e.g. workshops).	Policy	<b>State (emergency management and planning)</b> in association with Council of Mayors and LGAQ	Ongoing		Adapted from the <i>Climate Change Adaptation Action Plan</i> endorsed by the Ministerial Council for Police and Emergency Management – Emergency Management
<b>Action 2.1.6:</b> Review and modify the National planning systems principles to consider emergency management.	Policy	<b>Local Government and Planning Ministers' Council</b>	In line with existing review cycles		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.1.1:</b> Ensure EMERGENCY MANAGEMENT has a concurrence agency role in development applications (DAs) within the Integrated Development Assessment System (IDAS).	Record number of consultation requests for development applications (before a DA is formally lodged);  Proportion of DAs referred to State Agency for emergency management for assessment at both the information request and assessment stages	IDAS review	<b>State agencies for planning and emergency management</b>
<b>Action 2.1.2:</b> Integrate emergency management considerations in Structure Plans when implementing urban consolidation and urban renewal programs, and in master planned communities	Emergency management considerations specifically addressed in Structure Plans.  Disaster risk management included as a Strategic Outcome in Structure Plans	Planning scheme and regional plan reviews	<b>Local governments</b> supported by LGAQ
<b>Action 2.1.3:</b> Integrate emergency management considerations into local Statutory Plans (e.g. Planning schemes, corporate plans)	Emergency management considerations specifically addressed in local Statutory Plans (e.g. Disaster risk management (DRM) incorporated as one of the key themes/focus areas of Corporate Plans, DRM incorporated as a Desired Environmental Outcome in Planning schemes)	Reviews of Statutory Plans: e.g. Planning scheme reviews; Corporate plan reviews	<b>Local government</b>
<b>Action 2.1.4:</b> Integrate emergency management considerations into local non-Statutory Plans (e.g. Transport Plans).	Emergency management considerations specifically addressed in local non-Statutory plans	Review process of non-Statutory Plans	<b>Local government</b>
<b>Action 2.1.5:</b> EMERGENCY MANAGEMENT and PLANNING to develop an internal education program for state and local government planners on emergency management issues and requirements with regard to climate change adaptation (e.g. workshops).	Consultation mechanisms put in place;  Annual frequency of consultation		<b>State and local government</b>
<b>Action 2.1.6:</b> Review and modify the National planning systems principles to consider emergency management.	Emergency management considerations integrated into revised National planning systems principles. EM considerations could be included as Purpose and/or Issues Principles	Review of National planning systems principles	<b>ALGA</b> supported by Planning Ministers' Council



**PROGRAM 2.2 EMERGENCY MANAGEMENT INTEGRATED INTO STATE PLANNING POLICIES:** The integration of emergency management into state planning policies is improved.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	N/A	High	High	High	N/A	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State government – (planning, emergency management, environment)</b>	Queensland, SEQ, all settlement types	Ongoing	Immediate		

**Action 2.2.1:** Review and revise the SPP 1/03 to incorporate emergency management and climate change adaptation considerations.

**Action 2.2.2:** Review the SPP 3/11 to incorporate emergency management considerations for developments in the coastal zone.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.2 Emergency management integrated into state planning policies:</b> The integration of emergency management into state planning policies is improved.					
<b>Action Implementation</b>					
<b>Action 2.2.1:</b> Review and revise the SPP 1/03 to incorporate emergency management and climate change adaptation considerations.	Policy	<b>State agencies for planning and emergency management</b>	Current review process		
<b>Action 2.2.2:</b> Review the SPP 3/11 to incorporate emergency management considerations for developments in the coastal zone.	Policy	<b>State agencies for environment and emergency management</b>	Now and ongoing		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.2.1:</b> Review and revise the SPP 1/03 to incorporate emergency management and climate change adaptation considerations.	Emergency management and climate change adaptation considerations specifically addressed in the SPP 1/03	SPP 1/03 review cycle	<b>State agencies for planning and emergency management</b>
<b>Action 2.2.2:</b> Review the SPP 3/11 to incorporate emergency management considerations for developments in the coastal zone.	Emergency management considerations for the coastal zone specifically addressed in SPP 3/11 (e.g. disaster risk management could form an addition policy outcome)	SPP 3/11 Review cycle	<b>State agency for environment</b> supported by emergency management

**PROGRAM 2.3 STRATEGIC RELOCATION AND UPGRADE OF ESSENTIAL EMERGENCY SERVICES:** Emergency services and facilities (e.g. disaster management warehouses, disaster coordination centres, evacuation centres) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks to ensure these services and facilities can continue to operate during emergencies. This should include considering threats to infrastructure, such as communications and roads.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Medium	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	N/A	N/A	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State and local government</b>	All settlement types	Ongoing	Immediate	PI 1.1, 2.1 UPM 1.7, 1.10, 2.8, 2.10 CM 3.1 HH 3.2	Climate Risk Register

**Action 2.3.1:** Assess the vulnerability of essential emergency management services to natural hazards and conduct an inventory to determine which ones require upgrade and/or strategic relocation.

**Action 2.3.2:** Calculate and allocate funds for relocation and upgrading of essential emergency management services.

**Action 2.3.3:** Establish staging process to implement relocation and upgrade of essential emergency management services.

**Action 2.3.4:** Engage community on decentralisation of essential emergency management services to ensure communities do not get disadvantaged.

**Action 2.3.5:** Investigate feasibility of decentralisation of essential emergency management services and facilities as a retreat option.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.3 Strategic relocation and upgrade of essential emergency services:</b> Emergency services and facilities (e.g. disaster management warehouses, disaster coordination centres, evacuation centres) are strategically relocated into low risk areas and upgraded to appropriate building standards to projected risks to ensure these services and facilities can continue to operate during emergencies. This should include considering threats to infrastructure, such as communications and roads.					
<b>Action Implementation</b>					
<b>Action 2.3.1:</b> Assess the vulnerability of essential emergency management services to natural hazards and conduct an inventory to determine which ones require upgrade and/or strategic relocation.	Directive	<b>State agency for emergency management</b> supported by local government	Ongoing	UPM 1.7, 2.8	
<b>Action 2.3.2:</b> Calculate and allocate funds for relocation and upgrading of essential emergency management services.	Directive	<b>State agency for emergency management,</b> planning and local government	Ongoing	UPM 1.7.2, 2.8.2	
<b>Action 2.3.3:</b> Establish staging process to implement relocation and upgrade of essential emergency management services.	Directive	<b>State agency for emergency management,</b> planning and local government	Ongoing	UPM 1.7.3, 2.8.3	
<b>Action 2.3.4:</b> Engage community on decentralisation of essential emergency management services to ensure communities do not get disadvantaged.	Policy and Guidelines	<b>State agency for emergency management</b> and local government	Ongoing	UPM 1.7.4, 2.8.4	Stakeholder workshop
<b>Action 2.3.5:</b> Investigate feasibility of decentralisation of essential emergency management services and facilities as a retreat option.	Policy	<b>State agency for emergency management</b> and local government	Ongoing		Stakeholder workshop

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.3.1:</b> Assess the vulnerability of essential emergency management services to natural hazards and conduct an inventory to determine which ones require upgrade and/or strategic relocation.	Vulnerability assessment completed; Inventory conducted	Planning schemes and regional plan reviews; LDMP reviews	<b>State agencies for emergency management</b> and local government
<b>Action 2.3.2:</b> Calculate and allocate funds for relocation and upgrading of essential emergency management services.	Amount of funds allocated for relocation and upgrade of services		<b>State agencies for emergency management</b> , planning and local government
<b>Action 2.3.3:</b> Establish staging process to implement relocation and upgrade of essential emergency management services.	Staging process developed	Planning schemes and regional plan reviews	<b>State agencies for emergency management</b> , planning and local government
<b>Action 2.3.4:</b> Engage community on decentralisation of essential emergency management services to ensure communities are not negatively affected by the decentralisation process.	Community workshops and forums held; List of communities where workshops/forums held;  Number of community workshops and forums held	Planning schemes and regional plan reviews	<b>State agencies for emergency management</b> and local government
<b>Action 2.3.5:</b> Investigate feasibility of decentralisation of essential emergency management services and facilities as a retreat option.	Feasibility study performed		<b>State agencies for emergency management</b> , planning and local government

**PROGRAM 2.4 CAPACITY BUILDING AND TRAINING PROGRAM:** A capacity building and training program on emergency management, climate change and urban and regional planning is developed and implemented.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	N/A	N/A	High	High	N/A	High	High	High	High



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentive and Training courses	<b>Federal government</b> , state government	All settlement types	Ongoing	Immediate	UPM 3.5 CM 5.3	Modified from Climate Change Adaptation Action Plan

**Action 2.4.1:** Work with tertiary institutions, PIA, EIANZ and TAFE to incorporate consideration of climate change adaptation and emergency management as a consistent theme in professional development training modules for land use planners, both at Certified Practicing Planner level and for other planning professionals.

**Action 2.4.2:** Develop National Guide to climate change and emergency management in land use planning to ensure consideration of disaster risk implications of CC in development of future policies, codes and standards to do with the built environment and land use planning.

**Action 2.4.3:** Implement training and continuing professional development (CPD) programs on emergency management for sectors involved in land use planning and development decisions.

**Action 2.4.4:** Implement training and capacity building programs on urban and regional planning for emergency management staff in local and state governments.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.4 Capacity building and training program:</b> A capacity building and training program on emergency management, climate change and urban and regional planning is developed and implemented.					
<b>Action Implementation</b>					
<b>Action 2.4.1:</b> Work with tertiary institutions, PIA, EIANZ and TAFE to incorporate consideration of climate change adaptation and emergency management as a consistent theme in professional development training modules for land use planners, both at Certified Practicing Planner level and for other planning professionals.	Educational program, training courses	<b>Commonwealth and State governments</b> with support from PIA	Ongoing	UPM 3.5	Modified from Climate Change Adaptation Action Plan
<b>Action 2.4.2:</b> Develop National Guide to climate change and emergency management in land use planning to ensure consideration of disaster risk implications of climate change in development of future policies, codes and standards to do with the built environment and land use planning.	Guidelines	<b>Commonwealth government</b> with support from Australian Emergency Management Institute (AEMI) and PIA	Ongoing		Climate Change Adaptation Action Plan
<b>Action 2.4.3:</b> Implement training and continuing professional development (CPD) programs on emergency management for sectors involved in land use planning and development decisions.	Educational program, training courses	<b>PIA with support from Commonwealth and State governments</b>	Ongoing		
<b>Action 2.4.4:</b> Implement training and capacity building programs on urban and regional planning for emergency management staff in local and state governments.	Training courses	<b>State agencies for communities with support from planning and local governments</b>	Ongoing	UPM 3.5	

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.4.1:</b> Work with tertiary institutions, PIA, EIANZ and TAFE to incorporate consideration of climate change adaptation and emergency management as a consistent theme in professional development training modules for land use planners, both at Certified Practising Planner level and for other planning professionals.	Professional development modules integrating emergency management and climate change adaptation developed;  Proportion of professional development training modules for land use planners that incorporate emergency management and climate change adaptation considerations		<b>Commonwealth government and PIA</b>
<b>Action 2.4.2:</b> Develop National Guide to climate change and emergency management in land use planning to ensure consideration of disaster risk implications of climate change in development of future policies, codes and standards to do with the built environment and land use planning.	National guide developed and distributed to State and local government agencies ;  Number of government agencies using the National Guide		<b>AEMI</b> with support from Attorney-General's Department - Australian Emergency Management
<b>Action 2.4.3:</b> Implement training and continuing professional development (CPD) programs on emergency management for sectors involved in land use planning and development decisions.	Training and CPD programs on emergency management developed, survey participants on their evaluation of these training and CPD programs;  Number of agencies who provide these programs to their staff, number of staff who attend or have attended these training and CPD programs.		<b>LGAQ and State agencies for planning</b> with support from communities
<b>Action 2.4.4:</b> Implement training and capacity building programs on urban and regional planning for emergency management staff in local and state governments.	Training and capacity building programs developed and made available to emergency management staff, survey emergency management staff on their evaluation of these programs;  Number of emergency management agencies that provide these programs to their staff, number of staff who attend/have attended these programs		<b>LGAQ (including the Disaster Alliance) and State agency for communities</b>

**EM POLICY 3:** A series of programs will be introduced to improve the levels of preparedness of communities to climate change and new climatic risks.

**Policy Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

*“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”*

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive	<b>State agencies for communities and local governments</b>	All settlement types	Communities will be better prepared to deal with changing climatic risks; reduced impacts from extreme weather events; improved adaptive capacity of communities; greater empowerment of communities; communities taking increased responsibility.		

**PROGRAM 3.1 PREPAREDNESS OF VULNERABLE COMMUNITIES:** The preparedness of vulnerable communities to current and future climatic risks is improved.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State agencies for communities and local government emergency management units</b>	All settlement types	Ongoing	Immediate	HH 1.2, 1.3, 2.1, 2.2 PI 1.2, 2.2 UPM 1.17, 1.18, 2.15, 2.16, 2.17 CM 5.1	

**Action 3.1.1:** Continue to implement Queensland's Disaster Preparedness in vulnerable communities program to develop community awareness and improve individual, household and business capacity.

**Action 3.1.2:** Build capacity of disadvantaged communities to effectively respond to the potential social and economic impacts of climate change.

**Action 3.1.3:** Extend 'preparedness and awareness' programs to communities where risk of extreme climatic events has increased.

**Action 3.1.4:** Provide community safety programs that factor in climate change.

**Action 3.1.5:** Establish information sharing and collaborative partnerships with community service providers to manage risks of climate change.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.1 Preparedness of vulnerable communities:</b> The preparedness of vulnerable communities to current and future climatic risks is improved.					
<b>Action Implementation</b>					
<b>Action 3.1.1:</b> Continue to implement Queensland's Disaster Preparedness in vulnerable communities program to develop community awareness and improve individual, household and business capacity.	Directive which is associated with \$7.7million funding from the State	<b>State agency for emergency management</b>	5 year funding		ClimateQ: Towards a greener Queensland 2009
<b>Action 3.1.2:</b> Build capacity of disadvantaged communities to effectively respond to the potential social and economic impacts of climate change.	Policy and Financial Incentives	<b>State (emergency management and community and disability services) and local governments</b> supported by NGOs (e.g. Red Cross)	Ongoing		ClimateSmart Adaptation 2007-2012
<b>Action 3.1.3:</b> Extend 'preparedness and awareness' programs to communities where risk of extreme climatic events has increased.	Financial incentives	<b>State agency for communities and local government emergency management units</b> supported by Green Cross Australia and the Red Cross	Ongoing		ClimateSmart Adaptation 2007-2012
<b>Action 3.1.4:</b> Provide community safety programs that factor in climate change.	Guidelines, Educational program	<b>State agency for communities and local government emergency management units</b> supported by Red Cross	Ongoing		Sunshine Coast Climate Change and Peak Oil Strategy 2010-2020
<b>Action 3.1.5:</b> Establish information sharing and collaborative partnerships with community service providers to manage risks of climate change.	Policy	<b>Local government and community service providers</b>	Ongoing		Gold Coast City Council Climate Change Strategy



## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.1.1:</b> Implement Queensland's Disaster Preparedness in vulnerable communities program to develop community awareness and improve individual, household and business capacity.	Education programs for community and businesses implemented, workshops held, evacuation plans developed, evacuation exercises conducted		<b>State agency for communities</b>
<b>Action 3.1.2:</b> Build capacity of disadvantaged communities to effectively respond to the potential social and economic impacts of climate change.	Community engagement exercises organised, community education and awareness programs delivered, types of initiatives launched in communities.  Number of communities engaged in process		<b>State agencies for emergency management and local government emergency management units</b> supported by the Red Cross
<b>Action 3.1.3:</b> Extend 'preparedness and awareness' programs to communities where risk of extreme climatic events has increased.	Preparedness and awareness programs developed, community engagement exercises organised, assessment exercise performed to determine areas where risks of extreme climatic events will increase.  Number of communities targeted by the preparedness and awareness programs		<b>State agencies for emergency management and local government emergency management units</b> supported by Green Cross Australia
<b>Action 3.1.4:</b> Provide community safety programs that factor in climate change.	Climate change explicitly considered and addressed in community safety programs		<b>State agencies for communities and local government emergency management units, Red Cross</b>
<b>Action 3.1.5:</b> Establish information sharing and collaborative partnerships with community service providers to manage risks of climate change.	Information sharing and collaborative partnerships with community service providers established		<b>Local government</b>

**PROGRAM 3.2 PREPAREDNESS OF PRIVATE AND COMMUNITY SECTORS:** The preparedness of private and community sectors to climate change and new climatic risks is improved.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (eg regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State agencies for communities</b> and local government	All settlement types	Ongoing	Immediate	HH 1.1 (1.1.5)  UPM 1.17, 1.18, 2.15, 2.16, 2.17	

**Action 3.2.1:** Provide emergency management and climate change adaptation training programs for private and community sector.

**Action 3.2.2:** Private and community sector organisations to develop and frequently revise their disaster management plan.

**Action 3.2.3:** Private and community sector to assess climate change implications on their operations.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.2 Preparedness of private and community sectors:</b> The preparedness of private and community sectors to climate change and new climatic risks is improved.					
<b>Action Implementation</b>					
<b>Action 3.2.1:</b> Provide emergency management and climate change adaptation training programs for private and community sector.	Training courses	<b>Communities</b>	Ongoing		
<b>Action 3.2.2:</b> Private and community sector organisations to develop and frequently revise their disaster management plan.	Incentives	<b>Private and community sector organisations</b>	Ongoing		
<b>Action 3.2.3:</b> Private and community sector to assess climate change implications on their operations .	Incentives	<b>Private and community sector organisations</b>	Ongoing		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.2.1:</b> Provide emergency management and climate change adaptation training programs for private and community sector.	Training programs developed; Number of private and community sector organisations that have taken part in the training programs		<b>State agency for communities</b> supported by ACOSS/ QCOSS (for community sector)
<b>Action 3.2.2:</b> Private and community sector organisations to develop and frequently revise their disaster management plan.	Disaster management plans developed by 2015 and revised annually		<b>State agency for communities</b>
<b>Action 3.2.3:</b> Private and community sector to assess climate change implications on their operations.	climate change risk assessment performed by 2014, reports on climate change risks to the organisation developed by 2015, or organisation-specific operational reports considering climate change risks developed by 2015		<b>State agency for communities</b>

**PROGRAM 3.3: REAL ESTATE SECTOR AND HAZARD AWARENESS:** The real estate sector is engaged to improve hazard awareness amongst property owners.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	N/A	N/A	High	High/Low	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory and Financial incentives	<b>State government</b> supported by local government	All settlement types	Ongoing	Immediate	PI 1.2, 2.2 UPM 1.9, 2.9	

**Action 3.3.1:** Establish State and Federal full disclosure laws to require sellers of real estate to disclose information on natural hazards that can put property at risk.

**Action 3.3.2:** Establish stronger requirements/ regulations for real estate disclosure to provide coastal property buyers information of the potential perils associated with developing or purchasing property seaward of the [state's] oceanfront setback line.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.3 Real estate sector and hazard awareness:</b> The real estate sector is engaged to improve hazard awareness amongst property owners.					
<b>Action Implementation</b>					
<b>Action 3.3.1:</b> Establish State and Federal full disclosure laws to require sellers of real estate to disclose information on natural hazards that can put property at risk.	Regulatory	<b>Commonwealth and State governments</b>	Ongoing		US Centre for Climate Strategies, 2008 (Florida); Adaptation tool kit – actions
<b>Action 3.3.2:</b> Establish stronger requirements/ regulations for real estate disclosure to provide coastal property buyers information of the potential perils associated with developing or purchasing property seaward of the [state's] oceanfront setback line.	Regulatory	<b>State government</b> supported by local government and private sector (real estate and developers)	Ongoing		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.3.1:</b> Establish State and Federal full disclosure laws to require sellers of real estate to disclose information on natural hazards that can put property at risk.	Laws reviewed by 2016.		<b>Commonwealth and State governments</b>
<b>Action 3.3.2:</b> Establish stronger requirements/regulations for real estate disclosure to provide coastal property buyers information of the potential perils associated with developing or purchasing property seaward of the [state's] oceanfront setback line	New requirements/regulations for real estate industry developed by 2016.		<b>State and local governments</b>

**PROGRAM 3.4: COMMUNITY EDUCATION AND AWARENESS RAISING CAMPAIGNS FOR VULNERABLE GROUPS:** Community education and awareness raising campaigns/initiatives targeted at vulnerable groups, including new residents and seasonal visitors, are developed and implemented. These campaigns will focus on natural hazard preparedness, response (including evacuation) and recovery, and potential climate change implications for the areas and communities targeted to promote greater ownership of hazard risks and more self-reliant and empowered individuals and communities.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>Local government emergency management units</b> supported by the Red Cross and Green Cross Australia	All settlement types, in particular Sandy Shores (seasonal visitors) and Greenhaven (new migrant communities)	Ongoing	Immediate	HH 2.2 UPM 1.17, 1.18, 2.15, 2.16, 2.17	Modified: National Strategy for Disaster Resilience, National Disaster Resilience Framework, State Disaster Management Plan, Disaster Management Strategic Policy Framework; Climate Risk Register

**Action 3.4.1:** Identify the different socio-economic profiles and possible vulnerable groups in communities.

**Action 3.4.2:** Organise forums and develop information specifically targeted at the different vulnerable groups identified.

**Action 3.4.3:** Develop community education and awareness raising programs targeted at new migrant communities.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<p><b>Program 3.4 Community education and awareness raising campaigns for vulnerable groups:</b> Community education and awareness raising campaigns/initiatives targeted at vulnerable groups, including new residents and seasonal visitors, are developed and implemented. These campaigns will focus on natural hazard preparedness, response (including evacuation) and recovery, and potential climate change implications for the areas and communities targeted to promote greater ownership of hazard risks and more self-reliant and empowered individuals and communities.</p> <p><b>Action Implementation</b></p>					
<b>Action 3.4.1:</b> Identify the different socio-economic profiles and possible vulnerable groups in communities.	Advice	<b>Local government emergency management unit</b> with support from the Agencies for community disability services, as well as Red Cross	Ongoing		
<b>Action 3.4.2:</b> Organise forums and develop information specifically targeted at the different vulnerable groups identified.	Guidelines	<b>Local government emergency management unit</b> with support from Red Cross and Green Cross Australia	Ongoing		
<b>Action 3.4.3:</b> Develop community education and awareness raising programs targeted at new migrant communities.	Guidelines, Educational program	<b>Local government emergency management unit</b> with support from Red Cross and Green Cross Australia	Ongoing		

### ***Action Monitoring & Evaluation***

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.4.1:</b> Identify the different socio-economic profiles and possible vulnerable groups in communities.	Socio-economic/ community profiles undertaken		<b>LDMG</b> , Local government
<b>Action 3.4.2:</b> Organise forums and develop information specifically targeted at the different vulnerable groups identified.	Forums organised, targeted preparedness and awareness information products developed and distributed to relevant groups		<b>Red Cross</b> with support from LDMG and local government
<b>Action 3.4.3:</b> Develop community education and awareness raising programs targeted at new migrant communities.	Programs developed, engagement/participation of new migrant communities in these programs		<b>Green Cross Australia</b> with support from LDMG and local government

**PROGRAM 3.5: BUSHFIRE COMMUNITY TRAINING PACKAGE:** Continue to implement Queensland's Bushfire Community Training Package.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent "value for money" (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** "Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks."

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

***How well Program will address climate change*** (Appraisal Criteria: "high" = favourable; "low" = unfavourable) – refer "**Climate change adaptation options appraisal criteria**"

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive supported by \$4.6million funding from State government	<b>Queensland Fire and Rescue Service's Rural Operations</b>	Inland settlements, in particular Utopia and Alphaville	5 years, ongoing	Immediate	UPM 2.16	ClimateQ: Towards a greener Queensland 2009

**Action 3.5.1:** Use best available science to determine changing profile of bushfire risks to communities due to climate change.

**Action 3.5.2:** Support and develop a network of Volunteer Community Education Officers to deliver bushfire education to their local communities.

**Action 3.5.3:** Build community awareness of nature and risk of bushfires, including the changing risks due to climate change, and measures to prepare and protect lives, property and the environment.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.5 Bushfire Community Training Package:</b> Continue to implement Queensland's Bushfire Community Training Package.					
<b>Action Implementation</b>					
<b>Action 3.5.1:</b> Use best available science to determine changing profile of bushfire risks to communities due to climate change	Advice	<b>QFRS</b> supported by research organisations	Ongoing		
<b>Action 3.5.2:</b> Support and develop a network of Volunteer Community Education Officers to deliver bushfire education to their local communities	Incentives, Educational program	<b>QFRS</b> with support from SES and Rural Fire Service volunteers, Volunteering Queensland	Ongoing		ClimateQ: Towards a greener Queensland 2009
<b>Action 3.5.3:</b> Build community awareness of nature and risk of bushfires, including the changing risks due to climate change, and measures to prepare and protect lives, property and the environment	Incentives, Educational program	<b>QFRS</b> with support from local government, SES and Rural Fire Service volunteers, Red Cross and Green Cross Australia	Ongoing		ClimateQ: Towards a greener Queensland 2009

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.5.1:</b> Use best available science to determine changing profile of bushfire risks to communities due to climate change	Bushfire risk profile developed and updated		<b>QFRS</b>
<b>Action 3.5.2:</b> Support and develop a network of Volunteer Community Education Officers to deliver bushfire education to their local communities	Enrolment of volunteer community education officers; Bushfire education programs developed and delivered to communities; workshops/forums organised.  Number of volunteer community education officers enrolled (updated yearly); Number of community education workshops/forums held		<b>Rural Fire Service Volunteers;</b> Volunteering Queensland
<b>Action 3.5.3:</b> Build community awareness of nature and risk of bushfires, including the changing risks due to climate change, and measures to prepare and protect lives, property and the environment	Community awareness programs and products developed; Workshops/forums organised; Survey community on their awareness of bushfires		<b>QFRS</b> with support from Red Cross and local government

**EM POLICY 4.** An integrated group of programs to support and enhance the emergency management capacity and capability of local governments in light of the changing risk profile due to climate change.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	N/A	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State agency for communities</b> supported by the SEQ Council of Mayors and LGAQ	All settlement types	Improved capacity of local governments to prepare, respond to and recover from disasters.		Interviews



**PROGRAM 4.1 REDUNDANCY AND BACK UP FOR ESSENTIAL EMERGENCY MANAGEMENT SERVICES AND FACILITIES:** High priority emergency management services and facilities, such as Local Disaster Coordination Centres, evacuation centres, hospitals and alternative access routes are decentralised and/or equipped with back-up systems.

### Program Evaluation

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High/Low <sup>1</sup>	High	High	High	N/A	High	High	High	High

1. The High/Low rating for Equity is dependent on the process used in the decentralisation of emergency management services and facilities. The engagement of communities in this process is critical to ensuring that communities do not get negatively impacted by the decentralisation of services. Without strong community engagement, there is a risk that communities may lose out and be left with diminished and inadequate access to these services.

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Incentives through assistance (financial and capacity) provided to local governments	<b>State government (planning and emergency management)</b> , local government	All settlement types	Ongoing	Immediate	HH 1.1 (1.1.4) UPM 1.10, 2.10	Climate Risk Register

**Action 4.1.1:** Assess vulnerability of essential emergency management services and facilities to extreme weather events and conduct an inventory to determine which ones require redundancy and back-up.

**Action 4.1.2:** Identify alternative evacuation and access routes in an emergency event.

**Action 4.1.3:** Calculate and allocate funds for construction and implementation of additional essential emergency management services and facilities in low risk areas.

**Action 4.1.4:** Establish a staging process to implement redundancy and back-up for essential emergency management services and facilities.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc.)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 4.1 Redundancy and back up for essential emergency management services and facilities:</b> High priority emergency management services and facilities, such as Local Disaster Coordination Centres, evacuation centres, hospitals and alternative access routes are decentralised and/or equipped with back-up systems.					
<b>Action Implementation</b>					
<b>Action 4.1.1:</b> Assess vulnerability of essential emergency management services and facilities to extreme weather events and conduct an inventory to determine which ones require redundancy and back-up.	Advice	<b>State government (including planning and emergency management)</b> with support from local government	Ongoing	UPM 1.10.1, 2.10.1	Rosenzweig, C. et al (2011) 'Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies', <i>Climatic Change</i> , 106: 93-127.
<b>Action 4.1.2:</b> Identify alternative evacuation and access routes in an emergency event.	Policy	<b>State government (emergency management and transport)</b> with support from Queensland Police and local government	Ongoing		Climate Risk Register
<b>Action 4.1.3:</b> Calculate and allocate funds for construction and implementation of additional essential emergency management services and facilities in low risk areas.	Incentives funded by private sector and government contributions (state government contributions)	<b>State government (including emergency management)</b> with support from local governments and private sector	Ongoing	UPM 1.10.2, 2.10.2	
<b>Action 4.1.4:</b> Establish a staging process to implement redundancy and back-up for essential emergency management services and facilities.	Policy - Statutory through inclusion into Regional Plan, SPPs and planning scheme	<b>State government (including emergency management)</b> and local government	Ongoing	UPM 1.10.5, 2.10.5	

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance Indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 4.1.1:</b> Assess vulnerability of essential emergency management services and facilities to extreme weather events and conduct an inventory to determine which ones require redundancy and back-up.	Vulnerability assessment completed, Inventory completed	Planning schemes and regional plan reviews	<b>State agency for emergency management</b> with support from SDMG and local government
<b>Action 4.1.2:</b> Identify alternative evacuation and access routes in an emergency event.	Alternative evacuation and access routes identified	Review of LDMP	<b>State agency for emergency management</b> with support from Queensland Police, SDMG and LDMG
<b>Action 4.1.3:</b> Calculate and allocate funds for construction and implementation of additional essential emergency management services and facilities in low risk areas.	Amount of funds allocated	Planning schemes and regional plan reviews	<b>State government</b> , Local government
<b>Action 4.1.4:</b> Establish a staging process to implement redundancy and back-up for essential emergency management services and facilities.	Staging process established	Planning schemes and regional plan reviews	<b>State government</b> , Local government

**PROGRAM 4.2 LOCAL GOVERNMENT EMERGENCY MANAGEMENT CAPACITY:** The emergency management capacity of local governments is improved.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

*“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”*

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	N/A	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Financial Incentives	<b>Local governments</b> with support from LGAQ and State agency for communities	All settlement types	Ongoing	Immediate	PI 1.2 UPM 3.2 CM 5.3	Interviews

**Action 4.2.1:** Provide local government emergency management personnel with greater access to information on climate change.

**Action 4.2.2:** Conduct emergency exercises (including recovery) based on worst case scenarios (includes use of best available science on CC), including consideration of multiple events, involving the community and all agencies to test out the emergency management arrangements under extreme cases.

**Action 4.2.3:** Identify limits to local government response capacity and support required from EMERGENCY MANAGEMENT and/or other local councils.

**Action 4.2.4:** Increase budget available to local government emergency management units.

**Action 4.2.5:** Implement Queensland's Disaster Management Warehouses and Caches Initiative to store stockpiles of emergency equipment.

**Action 4.2.6:** Establish information sharing and collaborative partnerships with community service providers to improve management of climate change risks and targeting of vulnerable populations.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 4.2 Local government emergency management capacity:</b> The emergency management capacity of local governments is improved.					
<b>Action Implementation</b>					
<b>Action 4.2.1:</b> Provide local government emergency management personnel with greater access to information on climate change.	Advice	<b>Local government</b> with support from SEQ Council of Mayors, LGAQ (incl. Disaster Management Alliance), State government, CSIRO and research organisations	Ongoing		Interviews
<b>Action 4.2.2:</b> Conduct emergency exercises (including recovery) based on worst case scenarios (includes use of best available science on CC), including consideration of multiple events, involving the community and all agencies to test out the emergency management arrangements under extreme cases.	Guidelines and Financial incentives	<b>Local government with LDMG;</b> support provided by DDMG, SDMG, state agencies for emergency management, health, communities and disability services and Queensland Police	Annually		ClimateQ: Towards a greener Queensland 2009; HCCREMS, 2010, Coastal Councils – Climate Change Adaptation Plan
<b>Action 4.2.3:</b> Identify limits to local government response capacity and support required from EMERGENCY MANAGEMENT and/or other local councils.	Financial incentives	<b>Local government</b> with support from State agency for emergency management and LGAQ/Disaster Management Alliance	Ongoing		Interviews
<b>Action 4.2.4:</b> Increase budget available to local government emergency management units.	Policy	<b>Local government</b> with financial support from State government	Ongoing		Interviews
<b>Action 4.2.5:</b> Implement Queensland's Disaster Management Warehouses and Caches Initiative to store stockpiles of emergency equipment.	Directive associated with \$3.4million funding from State government	<b>State agency for emergency management;</b> supported by SDMG, local government, SES and Rural Fire Brigades	3 years		ClimateQ: Towards a greener Queensland 2009
<b>Action 4.2.6:</b> Establish information sharing and collaborative partnerships with community service providers to improve management of climate change risks and targeting of vulnerable populations.	Financial Incentives	<b>Local government</b> with support from QCOSS and community service providers	Ongoing		Gold Coast City Council Climate Change Strategy

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 4.2.1:</b> Provide local government emergency management personnel with greater access to information on climate change.			<b>LGAQ</b> with support from LDMG and local government
<b>Action 4.2.2:</b> Conduct emergency exercises (including recovery) based on worst case scenarios (includes use of best available science on CC), including consideration of multiple events, involving the community and all agencies to test out the emergency management arrangements under extreme cases.	Emergency exercises conducted		<b>LDMG</b> with support from State agency for emergency management
<b>Action 4.2.3:</b> Identify limits to local government response capacity and support required from EMERGENCY MANAGEMENT and/or other local councils.	Assessment of local government response capacity undertaken		<b>LDMG</b> with support from LGAQ/Disaster Management Alliance and State agency for emergency management
<b>Action 4.2.4:</b> Increase budget available to local government emergency management units.	Budget calculated; Increased funds received by emergency management units;  Total budget allocated to emergency management units		<b>LGAQ/Disaster Management Alliance</b>
<b>Action 4.2.5:</b> Implement Queensland's Disaster Management Warehouses and Caches Initiative to store stockpiles of emergency equipment.	New warehouses established and stocked		<b>State agency for emergency management</b> with support from SDMG
<b>Action 4.2.6:</b> Establish information sharing and collaborative partnerships with community service providers to improve management of climate change risks and targeting of vulnerable populations.	Information sharing and collaborative partnerships with community service providers established		<b>Local government</b>



**PROGRAM 4.3 COMMUNICATION BETWEEN LOCAL COUNCILS:** Improved and increased communication between emergency management personnel across local councils is facilitated.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	Low	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl.modified)
Incentives	<b>Local government</b> with support from SEQ Council of Mayors and LGAQ	All settlement types	Ongoing	Immediate		Interviews

**Action 4.3.1:** Establish an SEQ emergency management forum (e.g. Working group of the SEQ Council of Mayors) to encourage greater sharing of information and experience between local government emergency management personnel.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 4.3 Communication between local councils:</b> Improved and increased communication between emergency management personnel across local councils is facilitated.					
<b>Action Implementation</b>					
<b>Action 4.3.1:</b> Establish an SEQ emergency management forum (e.g. Working group of the SEQ Council of Mayors) to encourage greater sharing of information and experience between local government emergency management personnel.	Policy	<b>Local government and SEQ Council of Mayors</b>	Ongoing		Interviews

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 4.3.1:</b> Establish an SEQ emergency management forum (e.g. Working group of the SEQ Council of Mayors) to encourage greater sharing of information and experience between local government emergency management personnel.	SEQ Emergency management forum established; Regular meetings held (e.g. annual, twice a year)		<b>LGAQ</b>

**PROGRAM 4.4 ‘SUPPORT OUR HEROES’:** Continue to implement Queensland’s Support our Heroes Programme to strengthen the response capacity of SES and Rural Fire Service.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	N/A	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive supported by \$13million funding from State government	<b>QFRS Rural Operations</b> with support from state agency for emergency management	All settlement types	5 years	Immediate	HH 2.3	ClimateQ: Towards a greener Queensland 2009

**Action 4.4.1:** Provision of greater incentives, recognition and training to volunteers.

**Action 4.4.2:** Provide additional equipment and resources to strengthen response capacity of SES and Rural Fire Service.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 4.4 Support our Heroes:</b> Continue to implement Queensland's Support our Heroes Program to strengthen the response capacity of SES and Rural Fire Service.					
<b>Action Implementation</b>					
<b>Action 4.4.1:</b> Provision of greater incentives, recognition and training to volunteers.	Financial incentives	<b>QFRS and State agency for emergency management</b> with support from Volunteering Queensland and the Red Cross	Ongoing		
<b>Action 4.4.2:</b> Provide additional equipment and resources to strengthen response capacity of SES and Rural Fire Service.	Financial incentives provided by State government	<b>QFRS Rural Operations and State agency for emergency management</b>	5 years		ClimateQ: Towards a greener Queensland 2009

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 4.4.1:</b> Provision of greater incentives, recognition and training to volunteers.	Training program for volunteers established, incentives identified and implemented;  Number of volunteers enrolling each year, total annual number of volunteers, total number of volunteers during disasters		<b>Volunteering Queensland</b>
<b>Action 4.4.2:</b> Provide additional equipment and resources to strengthen response capacity of SES and Rural Fire Service.	Additional equipment and resources provided to the SES and Rural Fire Service;  Number of physical equipment provided to SES and Rural Fire Service		<b>State agency for communities</b>

**EM POLICY 5.** Stronger regional collaboration between local governments for emergency events is facilitated through a buddy system sponsored by the Council of Mayors (SEQ).

**Policy Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

*“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”*

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence / alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	Low	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive	<b>Council of Mayors</b> supported by LGAQ and local governments	All settlement types	Improved capacity and knowledge of councils; councils learning from each other; greater sharing of information, knowledge and resources between councils.		Interviews, Climate Risk Register, Queensland Floods Commission of Inquiry



**PROGRAM 5.1 MUTUALLY SUPPORTIVE COUNCILS:** Councils establish and maintain agreements with each other to provide assistance if required during an emergency event.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

*“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”*

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	N/A	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Financial Incentives	<b>Council of Mayors (SEQ)</b> with support from LGAQ and local governments	All settlement types	Ongoing (agreements need to be in place before extreme weather events occur)	Immediate	UPM 3.1, 3.2 CM 5.3	Interviews; Queensland Floods Commission of Inquiry

**Action 5.1.1:** Identify most appropriate process for this collaboration (e.g. Council to Council program, MoUs, Councils forming a joint board under the Local Government Act).  
**Action 5.1.2:** Review State Disaster Management Arrangements to recognise, include and support this assistance system between local governments.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 5.1 Mutually supportive councils:</b> Councils establish and maintain agreements with each other to provide assistance if required during an emergency event.					
<b>Action Implementation</b>					
<b>Action 5.1.1:</b> Identify most appropriate process for this collaboration (e.g. Council to Council program, MoUs, Councils forming a joint board under the Local Government Act).	Advice	<b>Local governments</b> with assistance from Council of Mayors (SEQ) and LGAQ	Ongoing		
<b>Action 5.1.2:</b> Review State Disaster Management Arrangements to recognise, include and support this assistance system between local governments.	Directive	<b>State agency for communities</b> with support from SDMG	Ongoing		Interviews; Gold Coast response to interim report from Queensland Floods Commission of Inquiry

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 5.1.1:</b> Identify most appropriate process for this collaboration (e.g. Council to Council program, MoUs, Councils forming a joint board under the Local Government Act).	Collaboration agreements between councils developed and signed		<b>LGAQ</b>
<b>Action 5.1.2:</b> Review State Disaster Management Arrangements to recognise, include and support this assistance system between local governments.	Changes to State Disaster Management Arrangements	Review of State Disaster Management Arrangements	<b>SDMG</b>

**EM POLICY 6.** A series of programs facilitated by emergency management agencies to more effectively support the role of communities in disaster response and recovery to promote greater community resilience to extreme weather events and climate change.

**Policy Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence / alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High/Low	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State agency for emergency management</b> supported by state agencies for communities and disability services as well as NGOs and community service providers involved in disaster response and recovery	All settlement types	Greater resilience of communities; communities taking greater responsibility.	Confusion between role of community and role of government in disaster response and recovery; duplication of efforts; liability problems, litigation risks.	Interviews

**PROGRAM 6.1 COMMUNITY TRAINING PROGRAMS:** Community training programs in response and recovery are developed for community groups.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Guidelines and Financial Incentives	<b>Red Cross</b> supported by local government emergency management units, SES, State agency for emergency management, communities, and disability services	All settlement types	Ongoing	Immediate	HH 1.3 (1.3.1, 1.3.5, 1.3.6), 2.1 PI 3.1, 3.2 CM 5.1	

**Action 6.1.1:** Work with community to identify key community groups to train in disaster response and recovery.

**Action 6.1.2:** Provide ongoing disaster response and recovery training to identified community groups.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 6.1 Community training programs:</b> Community training programs in response and recovery are developed for community groups.					
<b>Action Implementation</b>					
<b>Action 6.1.1:</b> Work with community to identify key community groups to train in disaster response and recovery.	Guidelines and Financial Incentives	<b>Red Cross</b> supported by local government emergency management units and community service providers	Ongoing		
<b>Action 6.1.2:</b> Provide ongoing disaster response and recovery training to identified community groups.	Guidelines and Financial incentives	<b>Red Cross</b> supported by Local government emergency management unit and SES	Ongoing		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 6.1.1:</b> Work with community to identify key community groups to train in disaster response and recovery.	Community groups identified		<b>Local government emergency management units</b> with support from Red Cross
<b>Action 6.1.2:</b> Provide ongoing disaster response and recovery training to identified community groups.	Training programs/workshops organised		<b>Local government emergency management units</b> with support from Red Cross



**PROGRAM 6.2 COMMUNITY LEADERSHIP:** Community leadership during and after disasters is supported to promote improved disaster response and recovery.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High/Low	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of implementation response</b> (one-off; ongoing; episodic)	<b>Timing of implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Directive	<b>State agency for emergency management</b> with support from QFRS and local governments	All settlement types	Ongoing	Immediate	HH 1.3, 2.1	Interviews

**Action 6.2.1:** Work with the community to identify key contact points within communities to ensure improved communication between community and emergency services during and after a disaster, especially if community is isolated.

**Action 6.2.2:** Work with the community to identify and/or establish community group(s) responsible for disaster response and recovery within the community.

**Action 6.2.3:** Investigate whether an amendment of the DM Act 2003 would be required to allow for nominated community groups to have a role in disaster response and recovery activities.

**Sub-action:** State Disaster Management Plan and Local Government Disaster Management Plans to align with this amendment and recognise new disaster response and recovery role played by these nominated community groups.

**Action 6.2.4:** Identify, record and integrate community disaster response and recovery groups into local disaster management plans.

**Action 6.2.5:** Investigate whether community leadership during disaster response and recovery should be encouraged for all communities or only those isolated during and after disasters.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of implementation response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 6.2 Community Leadership:</b> Community leadership during and after disasters is supported to promote improved disaster response and recovery.					
<b>Action Implementation</b>					
<b>Action 6.2.1:</b> Work with the community to identify key contact points within communities to ensure improved communication between community and emergency services during and after a disaster, especially if community is isolated.	Guidelines and Financial Incentives	<b>Local government emergency management unit</b> supported by Red Cross and the community	Ongoing		
<b>Action 6.2.2:</b> Work with the community to identify and/or establish community group(s) responsible for disaster response and recovery within the community.	Guidelines and Financial Incentives	<b>Local government emergency management unit</b> supported by Red Cross and the community	Ongoing		
<b>Action 6.2.3:</b> Investigate whether an amendment of the DM Act 2003 would be required to allow for nominated community groups to have a role in disaster response and recovery activities.  <b>Sub-action:</b> State Disaster Management Plan and Local Government Disaster Management Plans to align with this amendment and recognise new disaster response and recovery role played by these nominated community groups.	Regulatory	<b>State agency for communities</b>	Short-term, one-off investigation		
<b>Action 6.2.4:</b> Identify, record and integrate community disaster response and recovery groups into local disaster management plans.	Guidelines	<b>LDMG</b> with support from local government emergency management unit	Annual		
<b>Action 6.2.5:</b> Investigate whether community leadership during disaster response and recovery should be encouraged for all communities or only those isolated during and after disasters.	Advice	<b>State agency for communities</b> with support from the Red Cross, QCOSS and local governments	Ongoing		

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 6.2.1:</b> Work with the community to identify key contact points within communities to ensure improved communication between community and emergency services during and after a disaster, especially if community is isolated.	Key contact points identified, communication approach/process established		<b>Red Cross</b>
<b>Action 6.2.2:</b> Work with the community to identify and/or establish community group(s) responsible for disaster response and recovery within the community.	Community groups identified		<b>Red Cross</b>
<b>Action 6.2.3:</b> Investigate whether an amendment of the DM Act 2003 would be required to allow for nominated community groups to have a role in disaster response and recovery activities.  <b>Sub-action:</b> State Disaster Management Plan and Local Government Disaster Management Plans to align with this amendment and recognise new disaster response and recovery role played by these nominated community groups.	Review of DM Act 2003 undertaken, amendment made if required	DM Act Review	<b>SDMG</b>
<b>Action 6.2.4:</b> Identify, record and integrate community disaster response and recovery groups into local disaster management plans.	Community groups listed in LDMP	LDMP Review	<b>LDMG</b>
<b>Action 6.2.5:</b> Investigate whether community leadership during disaster response and recovery should be encouraged for all communities or only those isolated during and after disasters.	Study performed		<b>LDMG</b> with support from <b>local government emergency management units</b> and Red Cross

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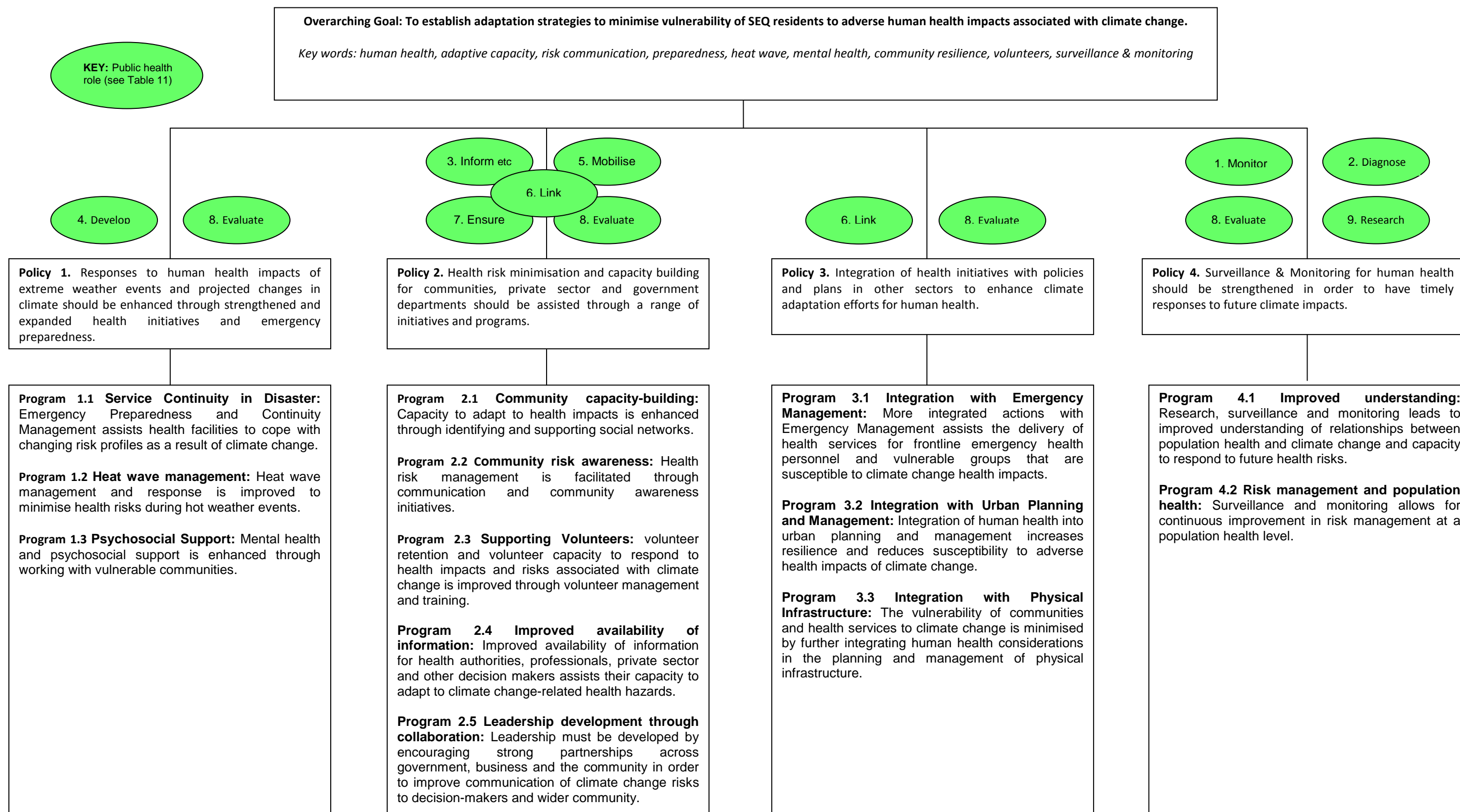
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## **SECTION 5: HUMAN HEALTH ADAPTATION OPTIONS**







**Figure 5.1: Human Health Adaptation Options Framework**

**Policy 1. Responses to human health impacts of extreme weather events and projected changes in climate should be enhanced through strengthened and expanded health initiatives and emergency preparedness.**

**Program 1.1 Service Continuity in Disaster:** Emergency Preparedness and Continuity Management assists health facilities to cope with changing risk profiles as a result of climate change

**Action 1.1.1:** Use best available science on climate projections to evaluate natural hazards (flood risk, heat wave risk, bushfire risk), possible spatial distribution of risks and vulnerability, and develop hypothetical worst case scenarios of surges in demand for health services and assess the capacity of those services.

**Action 1.1.2:** Continue to explore triage measures to reduce demand surges in hospitals or other essential/critical health facilities during extreme weather events. (For example, through treatment in public cool spaces or evacuation centres, and house visits or phone calls to vulnerable individuals).

**Action 1.1.3:** Include assessment of climate change threats to health facilities (e.g. increasing frequency of extreme weather events and drought) in environmental analyses of Emergency Preparedness and Continuity Management plans and Business Continuity Plans, using best available science and mapping of climate change exposures.

**Action 1.1.4:** Continue to ensure essential health facilities have multiple sources of power and communications; water storage; contingency plans, and independent critical services to complement their Emergency Preparedness and Continuity Management plans.

**Action 1.1.5:** Make amendments to the Quality of Care Principles in the Aged Care Act 1997 for stronger requirements for aged care facilities to prepare emergency preparedness and business continuity plans for flood, cyclone, storms and bushfires.

**Program 1.2 Heat wave management:** Heat wave management and response is improved to minimise health risks during hot weather events.

**Action 1.2.1:** Use thermal imaging and best available regional climate projections to assess spatial vulnerability (including social vulnerability and adaptive capacity) to current and future heat wave hazards.

**Action 1.2.2:** Ensure heat wave management plans (or sub-plans) are incorporated in Local Disaster Management Plans and required through Local Disaster Management Guidelines.

**Action 1.2.3:** Ensure Local Disaster Management Group members tasked with heat wave response have access to relevant organisations (such as the Red Cross) that coordinate periodically updated registers of contact details of vulnerable individuals.

**Action 1.2.4:** Continue to check the health of vulnerable individuals during heat waves through house visits, buddy systems or phone calls as part of a scheme to ensure the health of vulnerable individuals is monitored during heat waves.

**Action 1.2.5:** Ensure transport is provided for vulnerable individuals and/or neighbourhoods to public cool spaces during hot weather events.

**Action 1.2.6:** Enhance the SEQ Heatwave Response Plan, for instance through:

- Including measures to identify, locate, and communicate with groups vulnerable to heat events during and in preparation of heat waves;
- Reviewing initiatives to promote awareness of health impacts of heat waves amongst vulnerable groups, and involving networks of vulnerable groups in heat wave response. This may involve carrying out interviews, focus groups, workshops or meetings with members of organisations that work closely with, or represent vulnerable groups;
- Ensuring that local government and other organisations involved in UHIE reduction, transport planning, and the mapping of areas vulnerable to heat collaborate with organisations responsible for heat wave response planning at the regional level, to assist in targeting heat stress prevention initiatives; and
- Ensuring that critical infrastructure operators receive alerts through heat wave early warning systems.

**Action 1.2.7:** Ensure heat event risks are considered in capital and operational planning and management for transport and electricity infrastructure.

**Action 1.2.8:** Reduce heat wave health risks associated with electricity grid failure through energy demand management initiatives and diversified power sources.

<p><b>Action 1.2.9:</b> Establish heat exposure thresholds for working environments to inform safety standards, accompanied by measures to ensure compliance.</p> <p><b>Action 1.2.10:</b> Ensure that procurement of workplace protective clothing and policies for their adoption accommodate thermal comfort to avoid worker heat stress and reduction in work capacity in hot environments.</p>
<p><b>Program 1.3 Psychosocial Support:</b> Mental health and psychosocial support is enhanced through working with vulnerable communities.</p> <p><b>Action 1.3.1:</b> Target mental health and psychosocial support initiatives to identified vulnerable populations and/or neighbourhoods.</p> <p><b>Action 1.3.2:</b> Increase funding for mental health support and psychosocial health initiatives in areas where mental health services are under-resourced and where the mental health effects of climate change may become heightened.</p> <p><b>Action 1.3.3:</b> Provide additional financial counselling support, and psychosocial and mental health support to affected communities over the medium to long-term disaster recovery phase (up to 3 years or even more in some cases).</p> <p><b>Action 1.3.4:</b> Support early introduction of debriefing and counselling post-disaster, with follow-ups as required.</p> <p><b>Action 1.3.5:</b> Continue to work with social networks and community leaders to ensure their involvement enhances targeted and tailored mental health interventions (including preventive health interventions) for identified vulnerable populations and/or neighbourhoods.</p> <p><b>Action: 1.3.6:</b> Extend 'Skills for Psychological Recovery' training to social networks and community organisations in communities that are adversely affected by extreme weather events or considered vulnerable to climate change impact and ensure they have access to resources and information to increase community awareness of symptoms of mental health problems, and support for people experiencing mental health problems during disaster recovery.</p>

## Policy 2. Health risk minimisation and capacity building for communities, private sector and government departments should be assisted through a range of initiatives and programs.

<p><b>Program 2.1 Community capacity-building:</b> Capacity to adapt to health impacts is enhanced through identifying and supporting social networks.</p> <p><b>Action 2.1.1:</b> Assess the spatial distribution of vulnerability to natural hazards and climate change, and target community resilience initiatives to vulnerable areas.</p> <p><b>Action 2.1.2:</b> Work with health authorities, social networks and community organisations to ensure cohesion and consistency in their health messages regarding climate-related health impacts.</p> <p><b>Action 2.1.3:</b> Identify current support networks for vulnerable groups and strengthen programs that build the capacity of community-based organisations and local level initiatives working with these groups to plan for future extreme weather events and associated health impacts.</p> <p><b>Action 2.1.4:</b> Local government continue to keep and regularly update a directory of community networks and organisations and liaise with these groups in matters relating to health impacts associated with climate change.</p> <p><b>Action 2.1.5:</b> Increase the adaptive capacity of social networks and community organisations by ensuring they have access to information and avenues for collaboration around climate adaptation for human health.</p> <p><b>Action 2.1.6:</b> Provide local case workers during disaster recovery to support people in mediating through multiple entitlements, social services and processes involved in their rebuilding and recovery. Case workers should work alongside and in collaboration with local government and state government departments involved in disaster recovery.</p> <p><b>Action 2.1.7:</b> Maintain social spaces and support for social gatherings that may contribute to community resilience to mental health impacts associated with extreme</p>
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weather events and community capacity to organise around issues of health risk management relating to disaster prevention.

**Program 2.2 Community risk awareness:** Health risk management is facilitated through communication and community awareness initiatives.

**Action 2.2.1:** Strengthen intra and inter-organisational communication plans for health messaging regarding health impacts associated with climate change and extreme weather events to the public and vulnerable groups.

**Action 2.2.2:** Review communication methods for public health and safety messaging during disaster response and recovery. Include media providers in the development of communication plans to ensure important public health messages are prioritised in radio, television and local newspapers.

**Action 2.2.3:** Work with social networks and community organisations to ensure cohesion and consistency between social networks and health authorities in health messages relating to health risks associated with extreme weather events and climate change.

**Action 2.2.4:** Engage separately with different vulnerable groups to enhance understanding of their perceptions of risk, and identify appropriate tailored methods and content for health messaging and communications aimed at reducing health risks during extreme weather events.

**Action 2.2.5:** Provide information and resources to encourage public participation in initiatives for the prevention of health risks associated with climate change. This may involve initiatives such as:

- Health campaigns or provision of grey water reuse devices to ensure grey water reuse does not impose health risks or environmental risks;
- Maintenance and strengthening of food handling awareness campaigns for hot weather and electricity supply disruption;
- Public awareness campaigns for monitoring of rainwater tanks and other forms of rainwater storage in general to reduce risks of vector borne disease;
- Public awareness campaigns for maintenance and monitoring of air-conditioners to reduce the risk of Legionnaire's disease;
- Campaigns to promote awareness among employers and workers of the hazards of working in hot environments, including recognition of heat-related illness symptoms and implementation of appropriate heat stress management measures that do not cause significant income loss for working people; and
- Early warning systems regarding smog alerts, dust storms (e.g. for asthma and sufferers of other respiratory problems), and high aeroallergen periods.

**Action 2.2.6:** Ensure that local authority and state government programs encouraging the use of rainwater tanks and water demand management are implemented alongside initiatives aimed at reducing health risks associated with vector-borne diseases, grey water usage, water reuse and other potential adverse health outcomes.

**Program 2.3 Supporting Volunteers:** volunteer retention and volunteer capacity to respond to health impacts and risks associated with climate change is improved through volunteer management and training.

**Action 2.3.1:** Periodically seek feedback and input from existing and past volunteers assisting emergency health and disaster recovery to guide future volunteer recruitment, recognition and retention initiatives.

**Action 2.3.2:** Provide training opportunities where possible for volunteers assisting health services during disaster recovery to increase incentives for ongoing volunteering. Types of training provided should simultaneously enhance volunteer roles and volunteer satisfaction and retention, and should relate to volunteer feedback and input.

**Action 2.3.3:** Provide first aid training in vulnerable areas to increase the value of volunteer efforts. This includes training for special needs of vulnerable and disabled people during times of disaster.

**Action 2.3.4:** Review efforts for health protection and health prevention for volunteers and frontline recovery workers during disaster recovery.

**Action 2.3.5:** Establish a volunteering service to assist general practitioners and other health professionals wishing to volunteer their skills during times of disaster.

**Action 2.3.6:** Ensure continued adequate resourcing of volunteer-based organisations assisting or ancillary to emergency health services and preventative health services.

**Program 2.4 Improved availability of information:** Improved availability of information for health authorities, professionals, private sector and other decision-makers to assist their capacity to adapt to climate change-related health hazards.

**Action 2.4.1:** Identify priority health risks for SEQ associated with climate change impacts and differential vulnerability between populations, and share this information with various health authorities.

**Action 2.4.2:** Ensure suitable information resources and collaborative links between Queensland, BoM, research institutions, and other sectors and industries affecting determinants of health to enhance the capacity of health authorities to recognise and respond to health risks associated with climate change in the region.

**Action 2.4.3:** Develop a regional Health Decision Support System based on mapping of community health profiles, social and environmental determinants of health, infrastructure, health-related services and facilities, exposure to climate change impacts, and environmental features that increase health risks associated with climate change. Ensure that community representatives are able to give contextual input to the development and maintenance of Health Decision Support Systems, and that government and non-government organisations, private sector, and community groups have access to this system<sup>3</sup>.

**Action 2.4.4:** Provide Early Warning Systems (for events such as dust storms and extreme weather events) for aged care facilities and facilities housing people with disabilities, with appropriate methods of alert for people with hearing or vision impairments.

**Action 2.4.5:** Provide training on health impacts of climate change for current and future health professionals. This can be implemented through:

- Addition of climate change to undergraduate medical curricula;
- General Practitioner registrar training; and
- Continued Professional Development programs for Environmental Health Officers and other health professionals.

**Program 2.5 Leadership development through collaboration:** Leadership must be developed by encouraging strong partnerships across government, business and the community in order to improve communication of climate change risks to decision-makers and wider community.

**Action 2.5.1:** Strengthen public health input into existing water policy, regulation and surveillance infrastructure in order to reduce potential health risks associated with water scarcity and waterborne infections in recreational waters.

**Action 2.5.2:** Ensure databases related to health impacts associated with climate change are accessible and shared across health departments of local government, Queensland Health, and other relevant organisations where possible to facilitate improved understandings of risks.

**Action 2.5.3:** Establish a coalition/network for health professionals, industry bodies, non-government organisations and government agencies interested in issues of human health and climate change.

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<sup>3</sup> This Health Decision Support System may incorporate information from climate change vulnerability assessments and resemble the HDSS developed by the Logan Beaudesert Health Coalition

### Policy 3. Integration of health initiatives with policies and plans in other sectors to enhance climate adaptation efforts for human health.

**Program 3.1 Integration with Emergency Management:** More integrated actions with Emergency Management assists the delivery of health services for frontline emergency health personnel and vulnerable groups that are susceptible to climate change health impacts.

**Action 3.1.1:** Improve health messaging during disaster preparedness and recovery through increased integration with emergency management communications.

**Action 3.1.2:** Provide emotional support and counselling to protect the wellbeing of health and emergency response staff that are both disaster victims as well as key workers required for emergency response.

**Action 3.1.3:** Continue to link Emergency Preparedness measures of health facilities and services with Early Warning Systems and seasonal forecasts of extreme weather events.

**Action 3.1.4:** Ensure Local Disaster Management Groups have access to organisations coordinating periodically updated registers of contact details of people with chronic health conditions and other vulnerable individuals (such as the Red Cross, or other relevant organisation).

**Action 3.1.5:** Volunteer and/or paid staff tasked with running evacuation centres are given food safety guidelines, and training is offered to ensure at least one food safety supervisor with appropriate competency standards is present at evacuation centres.

**Action 3.1.6:** Ensure aged care organisations (residential care, retirement villages and community care) play an active role in local government disaster management planning, and have representatives on Local Disaster Management Groups.

**Action 3.1.7:** Ensure that evacuation centres are equipped with appropriate facilities and supplies required to meet the needs of people with disabilities and vulnerable older people, (such as accessible toilets and showers, privacy screens and suitable bedding).

**Action 3.1.8:** Include community resilience and health prevention considerations in long-term post-disaster recovery plans and disaster mitigation plans.

**Program 3.2 Integration with Urban Planning and Management:** Integration of human health into urban planning and management increases resilience and reduces susceptibility to adverse health impacts of climate change.

**Action 3.2.1:** Strategically relocate/retreat and/or upgrade essential health facilities to ensure appropriate standards for building design, backup of and siting of essential infrastructure. This may involve strategic relocation and/or upgrade of health services and facilities into low risk areas so they can continue to operate during emergencies.

**Action 3.2.2:** Ensure climate change vulnerability assessments and mapping contribute to reviews of Emergency Preparedness and Continuity Management plans to prepare health facilities in areas with elevated risks are prepared for disruption in infrastructure from natural hazards.

**Action 3.2.3:** Ensure transport planning provides access to health services, evacuation centres, and public cool spaces, prioritising neighbourhoods whose residents are more likely to have limited access to private transport and limited transport options.

**Action 3.2.4:** Encourage active and sustainable transport through urban design.

**Action 3.2.5:** Encourage innovative urban planning and design to minimise communities' exposure to extreme heat events and urban heat island effect (UHIE) through improved parkland design guidelines, and building design and performance standards that improve indoor thermal comfort and reduce energy demand.

**Action 3.2.6:** Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure. This may include grants and resources for community-based tree planting and urban greening initiatives that reduce UHIE and sun exposure.

**Action 3.2.7:** Continue to encourage active and sustainable transport through health campaigns and infrastructure provision.

**Action 3.2.8:** Improve parkland design guidelines to encourage reduced UHIE, and facilitate physical activity and active transport.

**Action 3.2.9:** Implement environmental/landuse interventions to maximise local food security and minimise adverse impacts of climate change on accessibility to affordable local food and nutrition. This may include actions such as:

- Identifying and amending local government bylaws and/or local laws and town planning scheme attributes that may unintentionally deter urban food production;

- Integrating food production into urban design and parkland design guidelines; and
- Provision of resources in open space planning to facilitate local food security (such as resources for edible planting, city farms and farmers markets).

**Program 3.3 Integration with Physical Infrastructure:** The vulnerability of communities and health services to climate change is minimised by integrating human health considerations in the planning and management of physical infrastructure.

**Action 3.3.1:** Ensure health facility Emergency Preparedness and Continuity Management plans and associated redundancy plans are matched with multiple sources of power, water storage, communications, and contingency plans in the event of blocked access routes and/or disrupted infrastructure.

**Action 3.3.2:** Reduce heat wave health risks associated with electricity grid failure by diversifying and decentralising power sources, and improving demand management during heat wave events.

**Action 3.3.3:** Evaluate water sanitation infrastructure in the context of increased health risk from flood/drought, and incorporate this information into infrastructure planning, water management, and disaster preparedness measures for health protection.

**Action 3.3.4:** Ensure monitoring of sanitation infrastructure during disaster to prevent and/or manage health risks and hazards, and promptly trigger communication plans for public health messages.

#### Policy 4. Surveillance & Monitoring for human health should be strengthened in order to have timely responses to future climate impacts.

**Program 4.1 Improved understanding:** Research, surveillance and monitoring leads to improved understanding of relationships between population health and climate change and capacity to respond to future health risks.

**Action 4.1.1:** Support research to increase understanding of impacts of climate change on the health of different communities. This may include analysis of hospital admissions and doctor visits, laboratory reports, excess deaths, sentinel records, and epidemiological data in relation to climate phenomena. Research could also include investigation into the impacts of climate change on social determinants of health.

**Action 4.1.2:** Combine epidemiological surveys and studies of epidemiological, environmental and social determinants of health in a comprehensive Risk Assessment Surveillance System (RASS) to guide public health interventions for climate change adaptation.

**Action 4.1.3:** Research the relationship between air pollutants and climate parameters, and potential health risks under projected population increases and changes in climate for metropolitan areas of SEQ<sup>4</sup>.

**Action 4.1.4:** Research health implications of sea level rise, storm surges and changing rainfall patterns with regard to algae and water contamination in recreational waters, and mosquito breeding habitats.

**Program 4.2 Risk management and population health:** Surveillance and monitoring allows for continuous improvement in risk management at a population health level.

**Action 4.2.1:** Periodically assess and update health surveillance systems and health alert systems with best available science and knowledge of links between climate and health to ensure that they are capable of detecting and responding to changes in disease patterns that may result from climate change.

**Action 4.2.2:** Expand environmental health and health equity programs to ensure they include newly identified at-risk areas.

<sup>4</sup> This could include incorporate considerations of health risks of increased particulate matter following dust storms and/or bushfires as well as from industrial air pollutants.



**Action 4.2.3:** Identify and develop indicators to monitor climate change-related health outcomes within health surveillance systems and health alert systems.  
**Action 4.2.4:** Incorporate social indicators of health and health equity in systems of surveillance and monitoring for climate change adaptation for human health.

**HH POLICY 1.** Responses to human health impacts of extreme weather events and projected changes in climate should be enhanced through strengthened and expanded health initiatives and emergency preparedness.

**Policy Evaluation**

**What if questions (Assess on a threefold scale: low; medium; and high)**

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

"Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation."

**How well Policy will address climate change (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “Climate change adaptation options appraisal criteria”**

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State agency for health</b>	Local Health & Hospital Network Areas; and the SEQ region as expressed in Disaster Management Plans (such as the SEQ Heatwave Response Plan)	<p>Health facilities and services continue to cope with surges in demand and disrupted infrastructure and services associated with extreme weather events as they increase in frequency and/or severity;</p> <p>Heatwave response and planning is enhanced;</p> <p>Mental health and psychosocial support regarding problems associated with extreme weather events is more proactive and prevention-focused, and more targeted to vulnerable groups and neighbourhoods</p>		Abrahamson et al 2008; Aged Care Qld 2011:5; Berger & Newman, Berry 2009; Blashki et al 2010; Blum 1998; Caniglia & Trotman 2011; Carthey et al 2009; Fritze et al 2008; DDAG 2009; Hanna et al 2011; Hick et al 2004; Iersel & Bi 2009; Kirch et al 2005; Kristie 2006; Livesley & Aye 2011; McMichael et al 2009; Mersereau & Penney 2008; PWC 2011; QCOSS 2011; Spickett et al 2007; Wilhelmi et al 2004; Yardley et al 2010; stakeholder interviews

**PROGRAM 1.1 SERVICE CONTINUITY IN DISASTER:** Emergency Preparedness and Continuity Management assists health facilities to cope with changing risk profiles as a result of climate change.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	Medium

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Self-regulation	<b>State agency for health</b> with assistance from Aged Care Queensland; & state agency for community safety	Local Health & Hospital Network Areas	Ongoing	Immediate (upon annual review of Emergency Preparedness and Continuity Management plans)	UPM 1.10 UPM 2.10 (specific to HH 1.1.4) PI 1.1 PI 1.2 PI 2.1 PI 2.2 EM 4.1 (specific to HH 1.1.4) EM 3.2 (specific to HH 1.1.5)	Berger & Newman; Blashki et al 2011; Carthey et al 2009; Hick et al 2004; Kristie 2006; Niska & Shimizu 2011; NGO respondent

**Action 1.1.1:** Use best available science on climate projections to evaluate natural hazards (flood risk, heat wave risk, bushfire risk), possible spatial distribution of risks and vulnerability, and develop hypothetical worst case scenarios of surges in demand for health services and assess the capacity of those services.

**Action 1.1.2:** Continue to explore triage measures to reduce demand surges in hospitals or other essential/critical health facilities during extreme weather events. (For example, through treatment in public cool spaces or evacuation centres, and house visits or phone calls to vulnerable individuals).

**Action 1.1.3:** Include assessment of climate change threats to health facilities (e.g. increasing frequency of extreme weather events and drought) in environmental analyses of Emergency Preparedness and Continuity Management plans and Business Continuity Plans, using best available science and mapping of climate change exposures.

**Action 1.1.4:** Continue to ensure essential health facilities have multiple sources of power and communications; water storage; contingency plans, and independent critical services to complement their Emergency Preparedness and Continuity Management plans.

**Action 1.1.5:** Make amendments to the Quality of Care Principles in the Aged Care Act 1997 for stronger requirements for aged care facilities to prepare emergency preparedness and business continuity plans for flood, cyclone, storms and bushfires.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.1 Service Continuity in Disaster.</b> Emergency Preparedness and Continuity Management assists health facilities to cope with changing risk profiles as a result of climate change.					
<b>Action Implementation</b>					
<b>Action 1.1.1:</b> Use best available science on climate projections to evaluate natural hazards (flood risk, heat wave risk, bushfire risk), possible spatial distribution of risks and vulnerability, and develop hypothetical worst case scenarios of surges in demand for health services and assess the capacity of those services.	Self-regulation	<b>State agency for health,</b> with assistance from climate research institutions	Ongoing	Precedes 1.1.3 Coupled with 1.2.1 Follows 2.4.1 Coupled with 2.4.2 Follows 2.4.3 Precedes 2.4.5 Coupled with 4.1.1	Kristie 2006; Hick et al 2004
<b>Action 1.1.2:</b> Continue to explore triage measures to reduce demand surges in hospitals or other essential/critical health facilities during extreme weather events. (For example, through treatment in public cool spaces or evacuation centres, and house visits or phone calls to vulnerable individuals).	Self-regulation	<b>State agency for health</b>	Ongoing		Hick et al 2004
<b>Action 1.1.3:</b> Include assessment of climate change threats to health facilities (e.g. increasing frequency of extreme weather events and drought) in environmental analyses of Emergency Preparedness and Continuity Management plans and Business Continuity Plans, using best available science and mapping of climate change exposures.	Self-regulation	<b>Health facility Emergency Planning Committees,</b> with assistance from State agency for health	Ongoing	Follows 1.1.1 Follows 2.4.1 & 2.4.2 Assisted by 4.1.1 & 4.1.4	Carthey et al 2009
<b>Action 1.1.4:</b> Continue to ensure essential health facilities have multiple sources of power and communications; water storage; contingency plans, and independent critical services to complement their Emergency Preparedness and Continuity Management plans.	Self-regulation	<b>State agency for health Deputy Director General, Policy, Strategy and Resourcing Division</b>	Ongoing	Coupled with 3.3.1 & 3.3.2	Blashki et al 2011; Carthey et al 2009; Berger & Newman
<b>Action 1.1.5:</b> Make amendments to the Quality of Care Principles in the Aged Care Act 1997 for stronger requirements for aged care facilities to prepare emergency preparedness and business continuity plans for flood, cyclone, storms and bushfires.	Self-regulation	<b>State agency for health,</b> with input from Aged Care Queensland and the Department of Community Safety	Ongoing		Stakeholder interview

## Action Monitoring & Evaluation

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.1.1:</b> Use best available science on climate projections to evaluate natural hazards (flood risk, heat wave risk, bushfire risk), possible spatial distribution of risks and vulnerability, and develop hypothetical worst case scenarios of surges in demand for health services and assess the capacity of those services.	Degree of integration of climate projections into hazard and risk assessments;  Degree to which 2.3.2 facilitates or enhances other strategic objectives, initiatives, measures, policy goals;  Number of policies or plans updated as a result of natural hazard evaluations	SEQ Climate Change Management Plan review in conjunction with review of the SEQRP, taking into account updated scientific evidence and policy decisions	<b>State agency for health</b>
<b>Action 1.1.2:</b> Continue to explore triage measures to reduce demand surges in hospitals or other essential/critical health facilities during extreme weather events. (For example, through treatment in public cool spaces or evacuation centres, and house visits or phone calls to vulnerable individuals).	Number of people treated for minor health problems outside of hospitals and other critical health facilities	Annual review of Queensland Health Disaster Plan	<b>State agency for health</b>
<b>Action 1.1.3:</b> Include assessment of climate change threats to health facilities (e.g. increasing frequency of extreme weather events and drought) in environmental analyses of Emergency Preparedness and Continuity Management plans and Business Continuity Plans, using best available science and mapping of climate change exposures.	Feedback from health facility Emergency Planning Committees	Annual review of Emergency Preparedness and Continuity Management plans	<b>State agency for health</b>
<b>Action 1.1.4:</b> Continue to ensure essential health facilities have multiple sources of power and communications; water storage; contingency plans, and independent critical services to complement their Emergency Preparedness and Continuity Management plans.	Frequency of challenges to business continuity due to disrupted infrastructure or damaged equipment at or near health facilities	Annual review of district disaster management plans;  Review of the Queensland Health Disaster Plan;  Annual review of health facility emergency preparedness and continuity management plans	<b>State agency for health</b>
<b>Action 1.1.5:</b> Make amendments to the Quality of Care Principles in the Aged Care Act 1997 for stronger requirements for aged care facilities to prepare emergency preparedness and business continuity plans for flood, cyclone, storms and bushfires.	Feedback from members of local and district disaster management groups	Annual review of district or local disaster management plans,	<b>Aged Care Queensland</b> in collaboration with State agency for emergency management

**PROGRAM 1.2 HEAT WAVE MANAGEMENT:** Heat wave management and response is improved to minimise health risks during hot weather events.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Regulatory	<b>Local government</b> , state agencies for health, transport, energy and water supply, workplace health and safety and electricity providers	Regional	Ongoing	Immediate	UPM 2.17 EM 3.1 PI 1.2 PI 2.1 PI 2.2 PI 3.2	Abrahamson et al 2008; Aged Care Qld 2011:5; Blashki et al 2011; Blum 1998; DDAG 2009; Hanna et al 2011; Iersel & Bi 2009; Kiem et al; Kirch et al 2005; Mersereau & Penney 2008; McMichael et al 2009; PWC 2011; QUT 2010; Spickett et al 2007; Wilhelmi et al 2004; Yardley et al 2010; stakeholder interview

**Action 1.2.1:** Use thermal imaging and best available regional climate projections to assess spatial vulnerability (including social vulnerability and adaptive capacity) to current and future heat wave hazards.

**Action 1.2.2:** Ensure heat wave management plans (or sub-plans) are incorporated in Local Disaster Management Plans and required through Local Disaster Management Guidelines.

**Action 1.2.3:** Ensure Local Disaster Management Group members tasked with heat wave response have access to relevant organisations (such as the Red Cross) that coordinate periodically updated registers of contact details of vulnerable individuals.

**Action 1.2.4:** Continue to check the health of vulnerable individuals during heat waves through house visits, buddy systems or phone calls as part of a scheme to ensure the health of vulnerable individuals is monitored during heat waves.

**Action 1.2.5:** Ensure transport is provided for vulnerable individuals and/or neighbourhoods to public cool spaces during hot weather events.

**Action 1.2.6:** Enhance the SEQ Heatwave Response Plan, for instance through:

- Including measures to identify, locate, and communicate with groups vulnerable to heat events during and in preparation of heat waves;
- Reviewing initiatives to promote awareness of health impacts of heat waves amongst vulnerable groups, and involving networks of vulnerable groups in heat wave response. This may involve carrying out interviews, focus groups, workshops or meetings with members of organisations that work closely with, or represent vulnerable groups;
- Ensuring that local government and other organisations involved in UHIE reduction, transport planning, and the mapping of areas vulnerable to heat collaborate with organisations responsible for heat wave response planning at the regional level, to assist in targeting heat stress prevention initiatives; and
- Ensuring that critical infrastructure operators receive alerts through heat wave early warning systems.

**Action 1.2.7:** Ensure heat event risks are considered in capital and operational planning and management for transport and electricity infrastructure.

**Action 1.2.8:** Reduce heat wave health risks associated with electricity grid failure through energy demand management initiatives and diversified power sources.

**Action 1.2.9:** Establish heat exposure thresholds for working environments to inform safety standards, accompanied by measures to ensure compliance.

**Action 1.2.10:** Ensure that procurement of workplace protective clothing and policies for their adoption accommodate thermal comfort to avoid worker heat stress and reduction in work capacity in hot environments.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.2 Heat wave management:</b> Heat wave management and response is improved to minimise health risks during hot weather events.					
<b>Action Implementation</b>					
<b>Action 1.2.1:</b> Use thermal imaging and best available regional climate projections to assess spatial vulnerability (including social vulnerability and adaptive capacity) to current and future heat wave hazards.	Standard Operating Procedure	<b>Local government</b>	Episodic	Coupled with 2.4.2 & 2.4.5  Followed by 2.4.3	Mersereau & Penney 2008; Wilhelmi et al 2004
<b>Action 1.2.2:</b> Ensure heat wave management plans (or sub-plans) are incorporated in Local Disaster Management Plans and required through Local Disaster Management Guidelines.	Regulatory, through Disaster Management Act 2003 requirements (3.1.s57) for Local Disaster Management Plans	<b>State government</b>	Ongoing		Blashki et al 2011
<b>Action 1.2.3:</b> Ensure Local Disaster Management Group members tasked with heat wave response have access to relevant organisations (such as the Red Cross) that coordinate periodically updated registers of contact details of vulnerable individuals.	Self-regulation	<b>Local Disaster Management Groups</b>	Ongoing	Coupled with 2.1.4  Coupled with 3.1.4	Spickett et al 2007; Aged Care Qld 2011:5
<b>Action 1.2.4:</b> Continue to check the health of vulnerable individuals during heat waves through house visits, buddy systems or phone calls as part of a scheme to ensure the health of vulnerable individuals is monitored during heat waves.	Standard Operating Procedure	<b>Australian Red Cross Queensland</b> , with support from state government	Episodic	Follows 1.2.3  Follows 2.1.3	Kirch et al 2005; stakeholder interview
<b>Action 1.2.5:</b> Ensure transport is provided for vulnerable individuals and/or neighbourhoods to public cool spaces during hot weather events.	Self-regulation	<b>Local government</b>	Episodic transport service provision, or ongoing transport program	Coupled with 3.2.3	DDAG 2009; Blum 1998

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 1.2.6:</b> Enhance the SEQ Heatwave Response Plan, for instance through: <ul style="list-style-type: none"> <li>- Including measures to identify, locate, and communicate with groups vulnerable to heat events during and in preparation of heat waves;</li> <li>- Reviewing initiatives to promote awareness of health impacts of heat waves amongst vulnerable groups, and involving networks of vulnerable groups in heat wave response. This may involve carrying out interviews, focus groups, workshops or meetings with members of organisations that work closely with, or represent vulnerable groups;</li> <li>- Ensuring that local government and other organisations involved in UHIE reduction, transport planning, and the mapping of areas vulnerable to heat collaborate with organisations responsible for heat wave response planning at the regional level, to assist in targeting heat stress prevention initiatives; and</li> <li>- Ensuring that critical infrastructure operators receive alerts through heat wave early warning systems.</li> </ul>	Self-regulation	<b>State agency for health</b> , with assistance from organisations that work closely with or represent groups vulnerable to heat waves, local government (through the Council of Mayors), and critical infrastructure operators	One-off	Coupled with 2.1.3  Follows 2.1.4  Coupled with 2.2.1, 2.2.2, 2.2.4, & 2.2.5  Coupled with 3.3.2	Yardley et al 2010; Iersel & Bi 2009; Abrahamson et al 2008; Blashki et al 2010; McMichael et al 2009; stakeholder interview
<b>Action 1.2.7:</b> Ensure heat event risks are considered in capital and operational planning and management for transport and electricity infrastructure.	Standard Operating Procedure	<b>Transport and electricity providers</b> (such as Queensland Rail, Translink, Powerlink, Energex)	Ongoing	Coupled with 3.2.3 Coupled with 3.3.2	Original
<b>Action 1.2.8:</b> Reduce heat wave health risks associated with electricity grid failure through energy demand management initiatives and diversified power sources.	Incentive / Educational,  Incentives (such as higher electricity prices during peak usage times and rebates/subsidies for renewable energy and energy efficiency technologies; and Educational initiatives for energy demand management	<b>State agencies for energy and water supply</b>	Ongoing	Coupled with 3.3.2	Spickett et al 2007; PWC 2011

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or “original” (incl. modified)
<b>Action 1.2.9:</b> Establish heat exposure thresholds for working environments to inform safety standards, accompanied by measures to ensure compliance.	Code, through Workplace Health and Safety Code of Practice	<b>Agency for workplace health and safety</b>	Episodic		Spickett et al 2007; Hanna et al 2011; Kiem et al
<b>Action 1.2.10:</b> Ensure that procurement of workplace protective clothing and policies for their adoption accommodate thermal comfort to avoid worker heat stress and reduction in work capacity in hot environments.	Code, through Workplace Health and Safety Code of Practice	<b>Agency for workplace health and safety</b>	Ongoing		Hanna et al 2011

### ***Action Monitoring & Evaluation***

<b>Action</b>	<b>Key performance indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 1.2.1:</b> Use thermal imaging and best available regional climate projections to assess spatial vulnerability (including social vulnerability and adaptive capacity) to current and future heat wave hazards.	Feedback from researchers and other groups experienced in inter-disciplinary vulnerability assessments regarding climate-related hazards; Inclusion of different aspects of vulnerability and sources of information in vulnerability assessment.	Periodic thermal imaging undertaken by some local government	<b>Local government</b>
<b>Action 1.2.2:</b> Ensure heat wave management plans (or sub-plans) are incorporated in Local Disaster Management Plans and required through Local Disaster Management Guidelines.	Feedback obtained during post-disaster or annual review of disaster management plans; Extent of input from organisations representing the interests of groups or neighbourhoods identified as being vulnerable to heat waves.	Annual review and post disaster review of disaster management plans	<b>Local and district disaster management groups</b>
<b>Action 1.2.3:</b> Ensure Local Disaster Management Group members tasked with heat wave response have access to relevant organisations (such as the Red Cross) that coordinate periodically updated registers of contact details of vulnerable individuals.	Presence of at least one person who is available at all times for this purpose	Annual review and post disaster review of disaster management plans	
<b>Action 1.2.4:</b> Continue to check the health of vulnerable individuals during heat waves through house visits, buddy systems or phone calls as part of a scheme to ensure the health of vulnerable individuals is monitored during heat waves.	Feedback from members of organisations representing the interests of groups or neighbourhoods vulnerable to heat waves	Annual review and post disaster review of disaster management plans	<b>Local disaster management groups</b> and organisations representing the interests of groups or neighbourhoods vulnerable to heat waves

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.2.5:</b> Ensure transport is provided for vulnerable individuals and/or neighbourhoods to public cool spaces during hot weather events.	Feedback from members of organisations representing the interests of groups or neighbourhoods vulnerable to heat waves; Number of individuals using transport offered during heat wave events.	Annual review and post disaster review of disaster management plans	<b>Local disaster management groups</b>
<b>Action 1.2.6:</b> Enhance the SEQ Heatwave Response Plan, for instance through: <ul style="list-style-type: none"> <li>- Including measures to identify, locate, and communicate with groups vulnerable to heat events during and in preparation of heat waves;</li> <li>- Reviewing initiatives to promote awareness of health impacts of heat waves amongst vulnerable groups, and involving networks of vulnerable groups in heat wave response. This may involve carrying out interviews, focus groups, workshops or meetings with members of organisations that work closely with, or represent vulnerable groups;</li> <li>- Ensuring that local government and other organisations involved in UHIE reduction, transport planning, and the mapping of areas vulnerable to heat collaborate with organisations responsible for heat wave response planning at the regional level, to assist in targeting heat stress prevention initiatives; and</li> <li>- Ensuring that critical infrastructure operators receive alerts through heat wave early warning systems.</li> </ul>	Feedback from members of organisations representing the interests of groups or neighbourhoods vulnerable to heat waves; Number of sectors and organisations involved in review of the SEQ Regional Heatwave Response Plan; Excess morbidity and mortality observed during heat wave events		<b>State agency for health</b>
<b>Action 1.2.7:</b> Ensure heat event risks are considered in capital and operational planning and management for transport and electricity infrastructure.	Presence of heat event risk considerations in operational plans for transport and electricity infrastructure provision	Review of the SEQ Infrastructure Plan and Program 2010-2031	<b>Transport and electricity providers</b>
<b>Action 1.2.8:</b> Reduce heat wave health risks associated with electricity grid failure through energy demand management initiatives and diversified power sources.	Number of new power sources established; Extent of reduction in energy use per capita during hot weather.		<b>State government</b>
<b>Action 1.2.9:</b> Establish heat exposure thresholds for working environments to inform safety standards, accompanied by measures to ensure compliance.	Feedback from industry bodies and employees of heat-exposed work environments; Reduction in reported incidences of heat stress in work environments		<b>WHSQ</b>
<b>Action 1.2.10:</b> Ensure that procurement of workplace protective clothing and policies for their adoption accommodate thermal comfort to avoid worker heat stress and reduction in work capacity in hot environments.	Reduction in reported incidences of heat stress in work environments		<b>WHSQ</b>

**PROGRAM 1.3 PSYCHOSOCIAL SUPPORT:** Mental health and psychosocial support is enhanced through working with vulnerable communities.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation on Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy; Educational	<b>State agency for health</b> , with assistance from State agency for community and disabilities	State-wide	Ongoing, with some actions to be carried out during disaster recovery periods	Immediate	EM 6.1 x HH 1.3.5 & 1.3.1  EM 6.2 x HH 1.3.1, 1.3.5 & 1.3.6  EM 3.1	Berry 2009; Blashki et al 2011; Caniglia & Trotman 2011; Fritze et al 2008; QCOSS 2011; Yardley et al 2010

**Action 1.3.1:** Target mental health and psychosocial support initiatives to identified vulnerable populations and/or neighbourhoods.

**Action 1.3.2:** Increase funding for mental health support and psychosocial health initiatives in areas where mental health services are under-resourced and where the mental health effects of climate change may become heightened.

**Action 1.3.3:** Provide additional financial counselling support, and psychosocial and mental health support to affected communities over the medium to long-term disaster recovery phase (up to 3 years or even more in some cases).

**Action 1.3.4:** Support early introduction of debriefing and counselling post-disaster, with follow-ups as required.

**Action 1.3.5:** Continue to work with social networks and community leaders to ensure their involvement enhances targeted and tailored mental health interventions (including preventive health interventions) for identified vulnerable populations and/or neighbourhoods.

**Action: 1.3.6:** Extend 'Skills for Psychological Recovery' training to social networks and community organisations in communities that are adversely affected by extreme weather events or considered vulnerable to climate change impact and ensure they have access to resources and information to increase community awareness of symptoms of mental health problems, and support for people experiencing mental health problems during disaster recovery.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 1.3 Psychosocial Support:</b> Mental health and psychosocial support is enhanced through working with vulnerable communities.					
<b>Action Implementation</b>					
<b>Action 1.3.1:</b> Target mental health and psychosocial support initiatives to identified vulnerable populations and/or neighbourhoods.	Policy	<b>State agency for health,</b> with assistance from State agency for community and disabilities	Ongoing	Follows 2.1.1 Coupled with 2.1.1	Caniglia & Trotman 2011
<b>Action 1.3.2:</b> Increase funding for mental health support and psychosocial health initiatives in areas where mental health services are under-resourced and where the mental health effects of climate change may become heightened.	Policy	<b>State agency for health,</b> with assistance from State agency for community and disabilities	Episodic / ongoing		Blashki et al 2011; Fritze et al 2008
<b>Action 1.3.3:</b> Provide additional financial counselling support, and psychosocial and mental health support to affected communities over the medium to long-term disaster recovery phase (up to 3 years or even more in some cases).	Policy	<b>State agency for health,</b> with assistance from State agency for community and disabilities	Episodic		QCOSS 2011
<b>Action 1.3.4:</b> Support early introduction of debriefing and counselling post-disaster, with follow-ups as required.	Standard Operating Procedure, through the Disaster Management Strategic Policy Framework	<b>State agency for health,</b> with assistance from State agency for community and disabilities	Episodic		Blashki et al 2011
<b>Action 1.3.5:</b> Continue to work with social networks and community leaders to ensure their involvement enhances targeted and tailored mental health interventions (including preventive health interventions) for identified vulnerable populations and/or neighbourhoods.	Policy	<b>State agency for community and disabilities</b> & State agency for health	Ongoing	Coupled with 2.1.3 & 2.1.4 Coupled with 2.2.4 Coupled with 2.4.1 & 2.4.7	Yardley et al 2010; Caniglia & Trotman 2011
<b>Action: 1.3.6:</b> Extend 'Skills for Psychological Recovery' training to social networks and community organisations in communities that are adversely affected by extreme weather events or considered vulnerable to climate change impact and ensure they have access to resources and information to increase community awareness of symptoms of mental health problems, and support for people experiencing mental health problems during disaster recovery.	Educational	<b>State agency for community and disabilities</b> with assistance from Queensland Alliance for Mental Health Inc.	Episodic (in a recovery context) / Continuous (for communities identified as vulnerable to future events).	Follows 2.1.1 Coupled with 2.2.6	Blashki et al 2011; Berry 2009



## Action Monitoring & Evaluation

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 1.3.1:</b> Target mental health and psychosocial support initiatives to identified vulnerable populations and/or neighbourhoods.	Feedback from organisations representative of vulnerable populations and/or neighbourhoods	Review of Queensland Health Disaster Plan – Mental Health and Psychosocial Sub Plan, and review of strategic directions	<b>State agency for health</b> and State agency for communities
<b>Action 1.3.2:</b> Increase funding for mental health support and psychosocial health initiatives in areas where mental health services are under-resourced and where the mental health effects of climate change may become heightened.	Feedback from organisations representative of populations and/or neighbourhoods identified as being vulnerable to climate change impacts; Feedback from mental service providers; Consistency of supply of mental health and psychosocial support services with demand	4-year reporting on the Queensland Plan for Mental Health 2007-2017	<b>State agency for health</b> and Queensland Alliance for Mental Health Inc.
<b>Action 1.3.3:</b> Provide additional financial counselling support, and psychosocial and mental health support to affected communities over the medium to long-term disaster recovery phase (up to 3 years or even more in some cases).	Feedback from organisations representative of disaster-affected communities affected; Feedback from mental service providers; Consistency of supply of mental health and psychosocial support services with demand	Review of Queensland Health Disaster Plan – Mental Health and Psychosocial Sub Plan	<b>State agency for health</b> and Queensland Alliance for Mental Health Inc.
<b>Action 1.3.4:</b> Support early introduction of debriefing and counselling post-disaster, with follow-ups as required.	Feedback from organisations representative of disaster-affected communities affected; Feedback from mental service providers; Consistency of supply of mental health and psychosocial support services with demand	Review of Queensland Health Disaster Plan – Mental Health and Psychosocial Sub Plan	<b>State agency for health</b> and Queensland Alliance for Mental Health Inc.
<b>Action 1.3.5:</b> Continue to work with social networks and community leaders to ensure their involvement enhances targeted and tailored mental health interventions (including preventive health interventions) for identified vulnerable populations and/or neighbourhoods.	Feedback from organisations representative of populations and/or neighbourhoods identified as being vulnerable to climate change impacts; Feedback from mental service providers.	4-year reporting on the Queensland Plan for Mental Health 2007-2017	<b>State agency for health</b> and Queensland Alliance for Mental Health Inc.
<b>Action: 1.3.6:</b> Extend 'Skills for Psychological Recovery' training to social networks and community organisations in communities that are adversely affected by extreme weather events or considered vulnerable to climate change impact and ensure they have access to resources and information to increase community awareness of symptoms of mental health problems, and support for people experiencing mental health problems during disaster recovery.	Number of participants receiving training and resources in vulnerable or disaster-affected areas; Feedback from communities on the quality of resources for mental health awareness	4-year reporting on the Queensland Plan for Mental Health 2007-2017	<b>Queensland Alliance for Mental Health Inc.</b>

**HH POLICY 2.** Health risk minimisation and capacity building for communities, private sector and government departments will be assisted through a range of initiatives and programs.

**Policy Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Policy will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy; Educational;	<b>State agency for health</b> ; with assistance from State agency for community and disabilities; Volunteering Queensland; and Community organisations;	Regional	Community level actions are coordinated with those of government and the private sector to enable greater capacity to develop climate adaptation initiatives and actions for health protection; Greater support for community-level actions reduces vulnerability to adverse psychosocial impacts of extreme weather events, and increases community resilience (Berry 2011, Parsons 2011); Greater public awareness of health risks associated with climate change and health risk avoidance measures; Environmental interventions decrease heat wave impacts on health, and decrease adverse health impacts associated with climate change through facilitating active lifestyles and local food security; Improved volunteer skills, and enhanced volunteer recognition and retention; Collaboration and information sharing, facilitated by a Health Decision Support System, increases capacity to track and respond to climate-driven changes in health patterns and incorporate responses with other policies and programs	Community level actions require adequate resourcing and sustained community interest to yield reliable and/or sustained benefits.	Abrahamson et al 2009; Aung & Whittaker 2010; Bambrick et al 2011; Berry 2011; Blashki et al 2011; Bauman et al 2008; Boon et al 2011; CAP 2010; Capon et al 2009; Coutts et al 2007; DDAG 2009; Edwards et al 2011; enHealth 2010; Fahey 2002; Gold Coast Community Directory; Gudes et al; Hanna et al 2011; Heart Foundation & VicHealth 2011; Howard 2009; Iersel & Bi 2008; Khang et al 2012; Kristie et al 2006, McMichael et al 2009; Mersereau & Penney 2008; Local government respondent 2012; Patrick & Capetola 2011; QCOSS 2011; Qld Floods Commission of Inquiry 2011; Qld Floods Commission of Inquiry 2012; Smoyer-Tomic & Rainham 2001; Spickett et al 2007; NGO Respondents 2011; Sunshine Coast Council Community Hub; Thompson et al 2011; Thrush et al 2005; Urbis 2011; Woodcock et al 2009; Yardley et al 2010; stakeholder interview

**PROGRAM 2.1 COMMUNITY CAPACITY-BUILDING:** Capacity to adapt to health impacts is enhanced through identifying and supporting social networks.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation on Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (Immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy; Standard Operating Procedure	<b>Local government;</b> state agency for health and communications; QCOSS; community organisations; state agency for community and disabilities	Implemented at a local government level in response to identified vulnerable areas	Ongoing / episodic	Immediate for anticipatory actions for vulnerable communities, and upon review of recovery plans for more reactive measures	UPM 1.3 & 2.1.7 UPM 2.3 PI 3.2 EM 3.1 EM 6.1 EM 6.2	Berry 2011; State government respondent, 2012; Gold Coast Community Directory; Kristie et al 2006; QCOSS 2011; Sunshine Coast Council Community Hub; Thompson et al 2011; Urbis 2011; Yardley et al 2010; stakeholder interview

**Action 2.1.1:** Assess the spatial distribution of vulnerability to natural hazards and climate change, and target community resilience initiatives to vulnerable areas.

**Action 2.1.2:** Work with health authorities, social networks and community organisations to ensure cohesion and consistency in their health messages regarding climate-related health impacts.

**Action 2.1.3:** Identify current support networks for vulnerable groups and strengthen programs that build the capacity of community-based organisations and local level initiatives working with these groups to plan for future extreme weather events and associated health impacts.

**Action 2.1.4:** Local government continue to keep and regularly update a directory of community networks and organisations and liaise with these groups in matters relating to health impacts associated with climate change.

**Action 2.1.5:** Increase the adaptive capacity of social networks and community organisations by ensuring they have access to information and avenues for collaboration around climate adaptation for human health.

**Action 2.1.6:** Provide local case workers during disaster recovery to support people in mediating through multiple entitlements, social services and processes involved in their rebuilding and recovery. Case workers should work alongside and in collaboration with local government and state government departments involved in disaster recovery.

**Action 2.1.7:** Maintain social spaces and support for social gatherings that may contribute to community resilience to mental health impacts associated with extreme weather events and community capacity to organise around issues of health risk management relating to disaster prevention.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.1 Community capacity-building:</b> Capacity to adapt to health impacts is enhanced through identifying and supporting social networks.					
<b>Action Implementation</b>					
<b>Action 2.1.1:</b> Assess the spatial distribution of vulnerability to natural hazards and climate change, and target community resilience initiatives to vulnerable areas.	Standard Operating Procedure	<b>State agency for community and disabilities</b>	Ongoing	Precedes 1.1.1 Coupled with 1.2.1 Precedes 2.1.3 & 2.1.5 Coupled with 2.4.2 & 2.4.5 Precedes 3.2.1, & 3.2.2	Loughnan et al 2009
<b>Action 2.1.2:</b> Work with health authorities, social networks and community organisations to ensure cohesion and consistency in their health messages regarding climate-related health impacts.	Standard Operating Procedure	<b>State agency for health and communications, community organisations</b>	Ongoing	Coupled with 1.2.6 Coupled with 1.3.5 Coupled with 2.1.3 & 2.1.5 Coupled with 2.2.1 & 2.2.2	Yardley et al 2010
<b>Action 2.1.3:</b> Identify current support networks for vulnerable groups and strengthen programs that build the capacity of community-based organisations and local level initiatives working with these groups to plan for future extreme weather events and associated health impacts.	Policy	<b>QCOSS</b> , with assistance from State agency for community and disabilities	Ongoing	Coupled with 1.3.5 Coupled with 2.1.2 & 2.1.5 Coupled with 2.2.4 Precedes 2.2.6	Kristie et al 2006; Berry 2011; stakeholder interview
<b>Action 2.1.4:</b> Local government continue to keep and regularly update a directory of community networks and organisations and liaise with these groups in matters relating to health impacts associated with climate change.	Standard Operating Procedure	<b>Local government</b>	Ongoing	Precedes 1.2.3 & 1.2.4  Precedes 3.1.4	Gold Coast Community Directory; Sunshine Coast Council Community Hub
<b>Action 2.1.5:</b> Increase the adaptive capacity of social networks and community organisations by ensuring they have access to information and avenues for collaboration around climate adaptation for human health.	Policy	<b>QCOSS</b>	Ongoing	Follows 2.1.3 Follows 2.2.1 Coupled with 2.2.4 & 2.2.6	Yardley et al 2010; Kristie et al 2008

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.1.6:</b> Provide local case workers during disaster recovery to support people in mediating through multiple entitlements, social services and processes involved in their rebuilding and recovery. Case workers should work alongside and in collaboration with local government and state government departments involved in disaster recovery.	Standard Operating Procedure	<b>QCOSS</b> , with support from state agency for community and disabilities	Episodic		QCOSS 2011; Urbis 2011
<b>Action 2.1.7:</b> Maintain social spaces and support for social gatherings that may contribute to community resilience to mental health impacts associated with extreme weather events and community capacity to organise around issues of health risk management relating to disaster prevention.	Policy	<b>Local government</b>	Ongoing		Thompson et al 2011; stakeholder interview

### ***Action Monitoring & Evaluation***

<b>Action</b>	<b>Key performance indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.1.1:</b> Assess the spatial distribution of vulnerability to natural hazards and climate change, and target community resilience initiatives to vulnerable areas.	Degree of integration of climate projections into hazard and risk assessments; Degree to which 2.3.2 facilitates or enhances other strategic objectives, initiatives, measures, policy goals; Number of policies or plans updated as a result of vulnerability assessments	Relates to draft action 25 in the SEQ Climate Change Management Plan draft – review SPP 1/03 so that climate change is included in identification of sites at risk from natural hazards	<b>State agency for community safety</b>
<b>Action 2.1.2:</b> Work with health authorities, social networks and community organisations to ensure cohesion and consistency in their health messages regarding climate-related health impacts.	Feedback from health authorities and community organisations; Consistency between health messages of health authorities and health messaging of community organisations		<b>State agency for health</b>
<b>Action 2.1.3:</b> Identify current support networks for vulnerable groups and strengthen programs that build the capacity of community-based organisations and local level initiatives working with these groups to plan for future extreme weather events and associated health impacts.	Feedback from community organisations before and after disaster; Reduction in mortality and morbidity (including mental health cases) across disasters of similar magnitude and character		<b>State agency for communities / QCOSS</b>

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.1.4:</b> Local government continue to keep and regularly update a directory of community networks and organisations and liaise with these groups in matters relating to health impacts associated with climate change.	Feedback from community organisations; Regularity of contact between local government and community networks/organisations		<b>Local government</b>
<b>Action 2.1.5:</b> Increase the adaptive capacity of social networks and community organisations by ensuring they have access to information and avenues for collaboration around climate adaptation for human health.	Feedback from community organisations; Regularity of contact between community organisations and local government or research institutions		<b>Local government</b>
<b>Action 2.1.6:</b> Provide local case workers during disaster recovery to support people in mediating through multiple entitlements, social services and processes involved in their rebuilding and recovery. Case workers should work alongside and in collaboration with local government and state government departments involved in disaster recovery.	Feedback from community organisations and social services		<b>State agency for communities / QCOSS</b>
<b>Action 2.1.7:</b> Maintain social spaces and support for social gatherings that may contribute to community resilience to mental health impacts associated with extreme weather events and community capacity to organise around issues of health risk management relating to disaster prevention.	Feedback from community organisations and social services; Frequency of use of social spaces; Attendance in social gatherings, and diversity of social groups present		<b>Local government</b>



**PROGRAM 2.2 COMMUNITY RISK AWARENESS:** Health risk management is facilitated through communication and community awareness initiatives.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation on Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy Educational	<b>State agency for health</b> and communications, Queensland Water Commission, with input/assistance from media providers, and local governments	SEQ Local Hospital and Health Network Areas	Ongoing	Immediate	EM 3.1 EM 3.4	Abrahamson et al 2009; Aung & Whittaker 2010; Blashki et al 2011; DDAG 2009; enHealth 2010; Hanna et al 2011; Iersel & Bi 2008; Khang et al 2012; Kristie et al 2006; Loughnan et al 2009; Local government respondent; Spickett et al 2007; Thrush et al 2005; Yardley et al 2010; stakeholder interview

**Action 2.2.1:** Strengthen intra and inter-organisational communication plans for health messaging regarding health impacts associated with climate change and extreme weather events to the public and vulnerable groups.

**Action 2.2.2:** Review communication methods for public health and safety messaging during disaster response and recovery. Include media providers in the development of communication plans to ensure important public health messages are prioritised in radio, television and local newspapers.

**Action 2.2.3:** Work with social networks and community organisations to ensure cohesion and consistency between social networks and health authorities in health messages relating to health risks associated with extreme weather events and climate change.

**Action 2.2.4:** Engage separately with different vulnerable groups to enhance understanding of their perceptions of risk, and identify appropriate tailored methods and content for health messaging and communications aimed at reducing health risks during extreme weather events.

**Action 2.2.5:** Provide information and resources to encourage public participation in initiatives for the prevention of health risks associated with climate change. This may involve initiatives such as:

- Health campaigns or provision of grey water reuse devices to ensure grey water reuse does not impose health risks or environmental risks;
- Maintenance and strengthening of food handling awareness campaigns for hot weather and electricity supply disruption;
- Public awareness campaigns for monitoring of rainwater tanks and other forms of rainwater storage in general to reduce risks of vector borne disease;
- Public awareness campaigns for maintenance and monitoring of air-conditioners to reduce the risk of Legionnaire's disease;
- Campaigns to promote awareness among employers and workers of the hazards of working in hot environments, including recognition of heat-related illness symptoms and implementation of appropriate heat stress management measures that do not cause significant income loss for working people; and
- Early warning systems regarding smog alerts, dust storms (e.g. for asthma and sufferers of other respiratory problems), and high aeroallergen periods.

**Action 2.2.6:** Ensure that local authority and state government programs encouraging the use of rainwater tanks and water demand management are implemented alongside initiatives aimed at reducing health risks associated with vector-borne diseases, grey water usage, water reuse and other potential adverse health outcomes.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.2 Community risk awareness:</b> Health risk management is facilitated through communication and community awareness initiatives.					
<b>Action Implementation</b>					
<b>Action 2.2.1:</b> Strengthen intra and inter-organisational communication plans for health messaging regarding health impacts associated with climate change and extreme weather events to the public and vulnerable groups.	Policy	<b>State agency for health and communications</b>	Ongoing	Follows 1.2.1 Coupled with 1.3.1 Follows 2.1.1 Coupled with 2.1.2 Coupled with 2.2.2 Follows 2.2.5 Coupled with 2.4.1 Follows 2.4.2 & 2.4.3 Coupled with 3.1.1 Follows 4.1.1	stakeholder interview
<b>Action 2.2.2:</b> Review communication methods for public health and safety messaging during disaster response and recovery. Include media providers in the development of communication plans to ensure important public health messages are prioritised in radio, television and local newspapers.	Policy	<b>State agency for health and communications</b>	Ongoing		Aung & Whittaker 2010
<b>Action 2.2.3:</b> Work with social networks and community organisations to ensure cohesion and consistency between social networks and health authorities in health messages relating to health risks associated with extreme weather events and climate change.	Policy	<b>State agency for health and communications</b>	One-off		Spickett et al 2007
<b>Action 2.2.4:</b> Engage separately with different vulnerable groups to enhance understanding of their perceptions of risk, and identify appropriate tailored methods and content for health messaging and communications aimed at reducing health risks during extreme weather events.	Policy	<b>State agency for health and communications</b>	Ongoing		Yardley et al 2010; Kristie et al 2006; Spickett et al 2007; Iersel & Bi 2008; Abrahamson et al 2009; DDAG 2009; Thrush et al 2005

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<p><b>Action 2.2.5:</b> Provide information and resources to encourage public participation in initiatives for the prevention of health risks associated with climate change. This may involve initiatives such as:</p> <ul style="list-style-type: none"> <li>- Health campaigns or provision of grey water reuse devices to ensure grey water reuse does not impose health risks or environmental risks;</li> <li>- Maintenance and strengthening of food handling awareness campaigns for hot weather and electricity supply disruption;</li> <li>- Public awareness campaigns for monitoring of rainwater tanks and other forms of rainwater storage in general to reduce risks of vector borne disease;</li> <li>- Public awareness campaigns for maintenance and monitoring of air-conditioners to reduce the risk of Legionnaire's disease;</li> <li>- Campaigns to promote awareness among employers and workers of the hazards of working in hot environments, including recognition of heat-related illness symptoms and implementation of appropriate heat stress management measures that do not cause significant income loss for working people; and</li> <li>- Early warning systems regarding smog alerts, dust storms (e.g. for asthma and sufferers of other respiratory problems), and high aeroallergen periods.</li> </ul>	Educational	<b>State agency for health and communications</b>	Ongoing		Spickett et al 2007; Khang et al 2012; enHealth 2010; Hanna et al 2011; Blashki et al 2011, stakeholder interview
<p><b>Action 2.2.6:</b> Ensure that local authority and state government programs encouraging the use of rainwater tanks and water demand management are implemented alongside initiatives aimed at reducing health risks associated with vector-borne diseases, grey water usage, water reuse and other potential adverse health outcomes.</p>	Policy	<b>Queensland Water Commission</b> , with assistance from local governments and State agency for health	Ongoing		stakeholder interview

## Action Monitoring & Evaluation

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.2.1:</b> Strengthen intra and inter-organisational communication plans for health messaging regarding health impacts associated with climate change and extreme weather events to the public and vulnerable groups.	Feedback from State agencies for emergency management and health and community-based groups, media and members of Crisis Communication Networks for previous natural disasters in SEQ; Presence and frequency of health messaging in media; Regularity of communications across organisations regarding health messaging.		<b>State agency for health</b>
<b>Action 2.2.2:</b> Review communication methods for public health and safety messaging during disaster response and recovery. Include media providers in the development of communication plans to ensure important public health messages are prioritised in radio, television and local newspapers.	Feedback from media, and community organisations; Consistency across actions and messages regarding health protection present in the media, communication materials of community organisations, social networks.		<b>State agency for health and Disaster Management Groups</b>
<b>Action 2.2.3:</b> Work with social networks and community organisations to ensure cohesion and consistency between social networks and health authorities in health messages relating to health risks associated with extreme weather events and climate change.	Feedback from community organisations; Level of consistency between health messages		<b>State agency for health</b>
<b>Action 2.2.4:</b> Engage separately with different vulnerable groups to enhance understanding of their perceptions of risk, and identify appropriate tailored methods and content for health messaging and communications aimed at reducing health risks during extreme weather events.	Feedback from organisations representing involved vulnerable groups; Changes made to health messaging methods and/or content		<b>Public Health Unit Health Community Councils</b> , or stakeholder engagement groups established through Local Hospital Networks

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<p><b>Action 2.2.5:</b> Provide information and resources to encourage public participation in initiatives for the prevention of health risks associated with climate change. This may involve initiatives such as:</p> <ul style="list-style-type: none"> <li>- Health campaigns or provision of grey water reuse devices to ensure grey water reuse does not impose health risks or environmental risks;</li> <li>- Maintenance and strengthening of food handling awareness campaigns for hot weather and electricity supply disruption;</li> <li>- Public awareness campaigns for monitoring of rainwater tanks and other forms of rainwater storage in general to reduce risks of vector borne disease;</li> <li>- Public awareness campaigns for maintenance and monitoring of air-conditioners to reduce the risk of Legionnaire's disease;</li> <li>- Campaigns to promote awareness among employers and workers of the hazards of working in hot environments, including recognition of heat-related illness symptoms and implementation of appropriate heat stress management measures that do not cause significant income loss for working people; and</li> <li>- Early warning systems regarding smog alerts, dust storms (e.g. for asthma and sufferers of other respiratory problems), and high aeroallergen periods.</li> </ul>	<p>Incidence of avoidable health hazards and diseases referred to in 2.2.6; Level of public awareness of health hazards associated with grey water, food safety in hot weather etc – as expressed in a survey</p>		<p><b>State agency for health</b></p>
<p><b>Action 2.2.6:</b> Ensure that local authority and state government programs encouraging the use of rainwater tanks and water demand management are implemented alongside initiatives aimed at reducing health risks associated with vector-borne diseases, grey water usage, water reuse and other potential adverse health outcomes.</p>	<p>Presence of environmental health considerations in water demand management plans</p>		<p><b>Queensland Water Commission</b> and State agency for health</p>

**PROGRAM 2.3 SUPPORTING VOLUNTEERS:** volunteer retention and volunteer capacity to respond to health impacts and risks associated with climate change is strengthened through volunteer management and training

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; referred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Educational; Policy	<b>State agencies for community safety,</b> workplace health & safety, Volunteering Queensland, General Practice Queensland, Queensland Ambulance Service, with assistance from Volunteering Queensland, and state agency for health	Regional as defined through disaster districts	Ongoing	Immediate	EM 4.4	Boon et al 2011; Fahey 2002; Howard 2009; Qld Floods Commission of Inquiry 2011; Qld Floods Commission of Inquiry 2012; Spickett et al 2007; stakeholder interview

**Action 2.3.1:** Periodically seek feedback and input from existing and past volunteers assisting emergency health and disaster recovery to guide future volunteer recruitment, recognition and retention initiatives.

**Action 2.3.2:** Provide training opportunities where possible for volunteers assisting health services during disaster recovery to increase incentives for ongoing volunteering. Types of training provided should simultaneously enhance volunteer roles and volunteer satisfaction and retention, and should relate to volunteer feedback and input.

**Action 2.3.3:** Provide first aid training in vulnerable areas to increase the value of volunteer efforts. This includes training for special needs of vulnerable and disabled people during times of disaster.

**Action 2.3.4:** Review efforts for health protection and health prevention for volunteers and frontline recovery workers during disaster recovery.

**Action 2.3.5:** Establish a volunteering service to assist general practitioners and other health professionals wishing to volunteer their skills during times of disaster.

**Action 2.3.6:** Ensure continued adequate resourcing of volunteer-based organisations assisting or ancillary to emergency health services and preventative health services.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.3 Supporting Volunteers:</b> volunteer retention and volunteer capacity to respond to health impacts and risks associated with climate change is strengthened through volunteer management and training.					
<b>Action Implementation</b>					
<b>Action 2.3.1:</b> Periodically seek feedback and input from existing and past volunteers assisting emergency health and disaster recovery to guide future volunteer recruitment, recognition and retention initiatives.	Self-regulation	<b>State agency for community safety</b> , in association with Volunteering Queensland	Ongoing	Precedes 2.3.2	Fahey 2002; Howard 2009; Qld Floods Commission of Inquiry 2011; Qld Floods Commission of Inquiry 2012:639
<b>Action 2.3.2:</b> Provide training opportunities where possible for volunteers assisting health services during disaster recovery to increase incentives for ongoing volunteering. Types of training provided should simultaneously enhance volunteer roles and volunteer satisfaction and retention, and should relate to volunteer feedback and input.	Self-regulation	<b>Volunteering Queensland</b> , with assistance from Queensland Ambulance Service, and state agency for health	Ongoing	Follows 2.3.1	Fahey 2002
<b>Action 2.3.3:</b> Provide first aid training in vulnerable areas to increase the value of volunteer efforts. This includes training for special needs of vulnerable and disabled people during times of disaster.	Educational	<b>Queensland Ambulance Service</b>	Ongoing / periodic		Boon et al 2011; Spickett et al 2007
<b>Action 2.3.4:</b> Review efforts for health protection and health prevention for volunteers and frontline recovery workers during disaster recovery.	Policy	<b>State agency for workplace health &amp; safety</b> with assistance from state agency for health	One-off	Coupled with 2.2.3 Precedes 3.1.1	Original
<b>Action 2.3.5:</b> Establish a volunteering service to assist general practitioners and other health professionals wishing to volunteer their skills during times of disaster.	Standard Operating Procedure	<b>General Practice Queensland</b> , with assistance from state agency for health	Ongoing		stakeholder interview
<b>Action 2.3.6:</b> Ensure continued adequate resourcing of volunteer-based organisations assisting or ancillary to emergency health services and preventative health services.	Policy	<b>State government</b>	Ongoing		Fahey 2002; Queensland Floods Commission of Inquiry 2012:416

## Action Monitoring & Evaluation

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.3.1:</b> Periodically seek feedback and input from existing and past volunteers assisting emergency health and disaster recovery to guide future volunteer recruitment, recognition and retention initiatives.	Feedback from volunteer-based organisations; Number of volunteers engaged, and number of volunteer-based organisations involved		<b>Volunteering Queensland</b>
<b>Action 2.3.2:</b> Provide training opportunities where possible for volunteers assisting health services during disaster recovery to increase incentives for ongoing volunteering. Types of training provided should simultaneously enhance volunteer roles and volunteer satisfaction and retention, and should relate to volunteer feedback and input.	Extent to which types of training provided simultaneously enhances volunteer roles and volunteer satisfaction, and relate to volunteer feedback and input; Levels of volunteer retention	EMERGENCY MANAGEMENT intends to carry out independent review of training processes from March 2012	<b>State agency for communities,</b> Office of Volunteering
<b>Action 2.3.3:</b> Provide first aid training in vulnerable areas to increase the value of volunteer efforts. This includes training for special needs of vulnerable and disabled people during times of disaster.	Level of community interest in training; Number of first aid certificates issued		<b>State agency for community safety</b>
<b>Action 2.3.4:</b> Review efforts for health protection and health prevention for volunteers and frontline recovery workers during disaster recovery.	Frequency of cases of illness or injury related to disaster recovery over time	Post-flood CATI carried out by Queensland Health in 2011	<b>Volunteering Queensland, WHSQ</b>
<b>Action 2.3.5:</b> Establish a volunteering service to assist general practitioners and other health professionals wishing to volunteer their skills during times of disaster.	Feedback from State agencies for emergency management, health, community safety and other peak emergency management and emergency health bodies; Number of health practitioners signing up their volunteer services.	District Disaster Management Group post-disaster reviews	<b>GPQ</b>
<b>Action 2.3.6:</b> Ensure continued adequate resourcing of volunteer-based organisations assisting or ancillary to emergency health services and preventative health services.	Feedback from volunteers and management staff of volunteer organisations		<b>State government</b>

**PROGRAM 2.4 IMPROVED AVAILABILITY OF INFORMATION:** Improved availability of information for health authorities, professionals, private sector and other decision makers assists their capacity to adapt to climate change-related health hazards.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Self-regulation; Standard Operational Procedure	<b>State agency for health</b> and communications , Bureau of Meteorology, with assistance from research institutions and local governments	Local Health and Hospital Network areas across the region	Ongoing	Immediate (upon review of Queensland Health's Health Protection Strategic Directions 2010-2013)	UPM 3.3	Aged Care Queensland 2011; CAP 2010; Capon et al 2009; Gudes et al 2010; Kristie et al 2006; McMichael et al 2009; Mersereau & Penney 2008; Yardley et al 2010; stakeholder interview

**Action 2.4.1:** Identify priority health risks for SEQ associated with climate change impacts and differential vulnerability between populations, and share this information with various health authorities.

**Action 2.4.2:** Ensure suitable information resources and collaborative links between Queensland, BoM, research institutions, and other sectors and industries affecting determinants of health to enhance the capacity of health authorities to recognise and respond to health risks associated with climate change in the region.

**Action 2.4.3:** Develop a regional Health Decision Support System based on mapping of community health profiles, social and environmental determinants of health, infrastructure, health-related services and facilities, exposure to climate change impacts, and environmental features that increase health risks associated with climate change. Ensure that community representatives are able to give contextual input to the development and maintenance of Health Decision Support Systems, and that government and non-government organisations, private sector, and community groups have access to this system<sup>5</sup>.

**Action 2.4.4:** Provide Early Warning Systems (for events such as dust storms and extreme weather events) for aged care facilities and facilities housing people with disabilities, with appropriate methods of alert for people with hearing or vision impairments.

**Action 2.4.5:** Provide training on health impacts of climate change for current and future health professionals. This can be implemented through:

- Addition of climate change to undergraduate medical curricula;
- General Practitioner registrar training; and
- Continued Professional Development programs for Environmental Health Officers and other health professionals.

<sup>5</sup> This Health Decision Support System may incorporate information from climate change vulnerability assessments and resemble the HDSS developed by the Logan Beaudesert Health Coalition

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.4 Improved availability of information:</b> Improved availability of information for health authorities, professionals, private sector and other decision makers assists their capacity to adapt to climate change-related health hazards.					
<b>Action Implementation</b>					
<b>Action 2.4.1:</b> Identify priority health risks for SEQ associated with climate change impacts and differential vulnerability between populations, and share this information with various health authorities.	Self-regulation	<b>State agency for health</b>	Ongoing		McMichael et al 2009
<b>Action 2.4.2:</b> Ensure suitable information resources and collaborative links between Queensland, BoM, research institutions, and other sectors and industries affecting determinants of health to enhance the capacity of health authorities to recognise and respond to health risks associated with climate change in the region.	Self-regulation	<b>State agency for health</b> , with assistance from BoM and research institutions	Ongoing	Coupled with 2.1.2 Coupled with 2.2.1	Capon et al 2009; Kristie et al 2006
<b>Action 2.4.3:</b> Develop a regional Health Decision Support System based on mapping of community health profiles, social and environmental determinants of health, infrastructure, health-related services and facilities, exposure to climate change impacts, and environmental features that increase health risks associated with climate change. Ensure that community representatives are able to give contextual input to the development and maintenance of Health Decision Support Systems, and that government and non-government organisations, private sector, and community groups have access to this system <sup>6</sup> .	Self-regulation	<b>State agency for health</b> , Local governments	Ongoing	Follows 1.1.1 Follows 1.2.1 Follows 2.4.1	Gudes et al; Mersereau & Penney 2008; CAP 2010; Yardley et al 2010; stakeholder interview
<b>Action 2.4.4:</b> Provide Early Warning Systems (for events such as dust storms and extreme weather events) for aged care facilities and facilities housing people with disabilities, with appropriate methods of alert for people with hearing or vision impairments.	Standard Operational Procedure	<b>Bureau of Meteorology</b> , with assistance from state agency for health and communications	Ongoing	Coupled with 2.2.6	Aged Care Qld 2011

<sup>6</sup> This Health Decision Support System may incorporate information from climate change vulnerability assessments and resemble the HDSS developed by the Logan Beaudesert Health Coalition

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 2.4.5:</b> Provide training on health impacts of climate change for current and future health professionals. This can be implemented through: <ul style="list-style-type: none"> <li>- Addition of climate change to undergraduate medical curricula;</li> <li>- General Practitioner registrar training; and</li> <li>- Continued Professional Development programs for Environmental Health Officers and other health professionals.</li> </ul>	Educational	<b>State agency for health</b> , with assistance from Tertiary education institutions	Ongoing	UPM 3.2.4	Hamel Green et al 2009

### ***Action Monitoring & Evaluation***

<b>Action</b>	<b>Key performance indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 2.4.1:</b> Identify priority health risks for SEQ associated with climate change impacts and differential vulnerability between populations, and share this information with various health authorities.	Feedback from health authorities; Number of policies or plans updated using this information		<b>State agency for health</b>
<b>Action 2.4.2:</b> Ensure suitable information resources and collaborative links between Queensland, BoM, research institutions, and other sectors and industries affecting determinants of health to enhance the capacity of health authorities to recognise and respond to health risks associated with climate change in the region.	Regularity of communications between health personnel, climate researchers, and other sectors and industries; Frequency of use of information resources and collaborative links developed; Number of policies or plans updated using this information; Degree to which info/knowledge is used to underpin decisions		<b>State agency for health Integrated</b> (Communications Branch)

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.4.3:</b> Develop a regional Health Decision Support System based on mapping of community health profiles, social and environmental determinants of health, infrastructure, health-related services and facilities, exposure to climate change impacts, and environmental features that increase health risks associated with climate change. Ensure that community representatives are able to give contextual input to the development and maintenance of Health Decision Support Systems, and that government and non-government organisations, private sector, and community groups have access to this system <sup>7</sup> .	Degree to which the HDSS facilitates participation in decision-making (according to community health organisations, local government and health authorities); Frequency of use of Health Decision Support System; Number of organisations using and/or contributing to the Health Decision Support System		<b>State agency for health</b> (Population Health Branch)
<b>Action 2.4.4:</b> Provide Early Warning Systems (for events such as dust storms and extreme weather events) for aged care facilities and facilities housing people with disabilities, with appropriate methods of alert for people with hearing or vision impairments.	Feedback from aged care providers; Number of times early warning systems instigate actions at aged care facilities and facilities housing people with disabilities		<b>State agency for health</b>
<b>Action 2.4.5:</b> Provide training on health impacts of climate change for current and future health professionals. This can be implemented through: <ul style="list-style-type: none"> <li>- Addition of climate change to undergraduate medical curricula;</li> <li>- General Practitioner registrar training; and</li> <li>- Continued Professional Development programs for Environmental Health Officers and other health professionals.</li> </ul>	Number of health professionals undertaking climate related Continued Professional Development programs; Number of tertiary education students receiving education in climate-related health hazards		<b>State agency for health</b> (Human Resource Services)

<sup>7</sup> This Health Decision Support System may incorporate information from climate change vulnerability assessments and resemble the HDSS developed by the Logan Beaudesert Health Coalition

**PROGRAM 2.5 LEADERSHIP DEVELOPMENT THROUGH COLLABORATION:** Leadership must be developed by encouraging strong partnerships across government, business and the community in order to improve communication of climate change risks to decision-makers and wider community.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

*“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”*

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High



## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (Policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Self-regulation	<b>State agencies for energy and water supply;</b> state agency for health	Local Health and Hospital Networks located across the region	Ongoing	Immediate	UPM 3.1	Goater et al 2011; Aagaard-Hansen et al 2009; stakeholder interview

**Action 2.5.1:** Strengthen public health input into existing water policy, regulation and surveillance infrastructure in order to reduce potential health risks associated with water scarcity and waterborne infections in recreational waters

**Action 2.5.2:** Ensure databases related to health impacts associated with climate change are accessible and shared across health departments of local government, State agency for health, and other relevant organisations where possible to facilitate improved understandings of risks

**Action 2.5.3:** Establish a coalition/network for health professionals, industry bodies, non-government organisations and government agencies interested in issues of human health and climate change.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 2.5 Leadership development through collaboration:</b> Leadership must be developed by encouraging strong partnerships across government, business and the community in order to improve communication of climate change risks to decision-makers and wider community.					
<b>Action Implementation</b>					
<b>Action 2.5.1:</b> Strengthen public health input into existing water policy, regulation and surveillance infrastructure in order to reduce potential health risks associated with water scarcity and waterborne infections in recreational waters	Self-regulation	<b>State agencies for energy and water supply</b> with support from State agency for health Environmental Health Branch	Ongoing	Coupled with HH 3.3.3	Goater et al 2011
<b>Action 2.5.2:</b> Ensure databases related to health impacts associated with climate change are accessible and shared across health departments of local government, State agency for health, and other relevant organisations where possible to facilitate improved understandings of risks	Self-regulation	<b>State agency for health</b>	Ongoing		Aagaard-Hansen et al 2009
<b>Action 2.5.3:</b> Establish a coalition/network for health professionals, industry bodies, non-government organisations and government agencies interested in issues of human health and climate change.	Self-regulation	<b>State agency for health</b>	Ongoing		stakeholder interview

## Action Monitoring & Evaluation

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 2.5.1:</b> Strengthen public health input into existing water policy, regulation and surveillance infrastructure in order to reduce potential health risks associated with water scarcity and waterborne infections in recreational waters	Presence of health measures in policies associated with water scarcity and water quality; Presence of public health personnel on water planning boards	Review of Queensland Health's Health Protection Strategic Directions 2010 - 2013	<b>State agency for health</b> (Environmental Health Branch)
<b>Action 2.5.2:</b> Ensure databases related to health impacts associated with climate change are accessible and shared across health departments of local government, State agency for health, and other relevant organisations where possible to facilitate improved understandings of risks	Feedback from health departments of local government, State agency for health, and other relevant organisations; Frequency of use of databases across different departments	Review of Queensland Health's Health Protection Strategic Directions 2010-2013	<b>State agency for health</b>
<b>Action 2.5.3:</b> Establish a coalition/network for health professionals, industry bodies, non-government organisations and government agencies interested in issues of human health and climate change.	Frequency of gatherings, events and/or outputs of coalition/network		<b>State agency for health</b>

**HH POLICY 3.** Integration of health initiatives with policies and plans in other sectors will enhance climate adaptation efforts for human health.

**Policy Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl modified)
Policy	<b>State agency for health</b> , with assistance from state agencies for emergency management and aged care and Local Disaster Management Groups	All settlement types	Greater synergies and co-beneficial policies and programs across the health sector and other sectors generate greater cost efficiency and effectiveness of health measures.		Aged Care Qld 2011; Bambrick et al 2008 Blum 1998; CAP 2010; Carthey et al 2009; Climate Risk 2011; Coutts et al 2007; Edwards et al 2011; Goater 2011; Heart Foundation & VicHealth 2011; Patrick & Capetola 2011; LGAQ 2007; Livesley & Aye 2011; Patrick & Capetola 2011 PWC 2011; QNU 2011; Smoyer-Tomic & Rainham 2001; Spickett et al 2007; Woodcock et al 2009; stakeholder interview

**PROGRAM 3.1 INTEGRATION WITH EMERGENCY MANAGEMENT:** More integrated actions with Emergency Management assists the delivery of health services for frontline emergency health personnel and vulnerable groups that are susceptible to climate change health impacts.

### **Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	Medium	Medium

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State agency for health</b> , state agencies for emergency management and aged care, Local Disaster Management Groups, with assistance from Bureau of Meteorology, Australian Red Cross Queensland	State-wide	Ongoing / episodic	Immediate	EM 1.1 EM 1.2 EM policy 3 EM policy 4	Aged Care Qld 2011; QNU 2011; stakeholder interview

**Action 3.1.1:** Improve health messaging during disaster preparedness and recovery through increased integration with emergency management communications.

**Action 3.1.2:** Provide emotional support and counselling to protect the wellbeing of health and emergency response staff that are both disaster victims as well as key workers required for emergency response.

**Action 3.1.3:** Continue to link Emergency Preparedness measures of health facilities and services with Early Warning Systems and seasonal forecasts of extreme weather events.

**Action 3.1.4:** Ensure Local Disaster Management Groups have access to organisations coordinating periodically updated registers of contact details of people with chronic health conditions and other vulnerable individuals (such as the Red Cross, or other relevant organisation).

**Action 3.1.5:** Volunteer and/or paid staff tasked with running evacuation centres are given food safety guidelines, and training is offered to ensure at least one food safety supervisor with appropriate competency standards is present at evacuation centres.

**Action 3.1.6:** Ensure aged care organisations (residential care, retirement villages and community care) play an active role in local government disaster management planning, and have representatives on Local Disaster Management Groups.

**Action 3.1.7:** Ensure that evacuation centres are equipped with appropriate facilities and supplies required to meet the needs of people with disabilities and vulnerable older people, (such as accessible toilets and showers, privacy screens and suitable bedding).

**Action 3.1.8:** Include community resilience and health prevention considerations in long-term post-disaster recovery plans and disaster mitigation plans.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.1 Integration with Emergency Management:</b> More integrated actions with Emergency Management assists the delivery of health services for frontline emergency health personnel and vulnerable groups that are susceptible to climate change health impacts.					
<b>Action Implementation</b>					
<b>Action 3.1.1:</b> Improve health messaging during disaster preparedness and recovery through increased integration with emergency management communications.	Self-regulation	<b>State agency for health Emergency Management Unit</b>	Ongoing		Stakeholder interviews
<b>Action 3.1.2:</b> Provide emotional support and counselling to protect the wellbeing of health and emergency response staff that are both disaster victims as well as key workers required for emergency response.	Standard Operating Procedure, delivered through the Framework for Psychological and Counselling Services for Disaster Affected Persons and Recovery Workers under the Queensland Health Disaster Plan – Human Social Sub Plan	<b>State agency for emergency management</b> , with assistance from state agency for health	Episodic	Coupled with 1.3.1, 1.3.3 & 1.3.4	QNU 2011
<b>Action 3.1.3:</b> Continue to link Emergency Preparedness measures of health facilities and services with Early Warning Systems and seasonal forecasts of extreme weather events.	Standard Operating Procedure	<b>State agency for health</b> , with assistance from the Bureau of Meteorology	Ongoing	Coupled with 1.1.1 & 1.1.3	Stakeholder interviews
<b>Action 3.1.4:</b> Ensure Local Disaster Management Groups have access to organisations coordinating periodically updated registers of contact details of people with chronic health conditions and other vulnerable individuals (such as the Red Cross, or other relevant organisation).	Self-regulation	<b>Local Disaster Management Groups</b>	Ongoing	Precedes 1.2.3  Coupled with 2.1.4	
<b>Action 3.1.5:</b> Volunteer and/or paid staff tasked with running evacuation centres are given food safety guidelines, and training is offered to ensure at least one food safety supervisor with appropriate competency standards is present at evacuation centres.	Educational	<b>State agency for health</b> , with assistance from Australian Red Cross Queensland	Ongoing	Coupled with 2.3.2 Follows 2.3.6	Stakeholder interviews



<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 3.1.6:</b> Ensure aged care organisations (residential care, retirement villages and community care) play an active role in local government disaster management planning, and have representatives on Local Disaster Management Groups.	Advice	<b>Aged Care Queensland</b>	Ongoing		Aged Care Qld 2011
<b>Action 3.1.7:</b> Ensure that evacuation centres are equipped with appropriate facilities and supplies required to meet the needs of people with disabilities and vulnerable older people, (such as accessible toilets and showers, privacy screens and suitable bedding).	Guidelines, through Queensland Evacuation Guidelines for Disaster Management Groups,	<b>State agency for community safety, Red Cross</b>	Ongoing		Aged Care Qld 2011:5
<b>Action 3.1.8:</b> Include community resilience and health prevention considerations in long-term post-disaster recovery plans and disaster mitigation plans.	Policy	<b>State agency for health</b>	Ongoing	EM 1.1 EM 1.2	

### **Action Monitoring & Evaluation**

<b>Action</b>	<b>Key Performance indicators</b>	<b>Opportunities for monitoring and evaluation</b> (e.g. existing review cycles)	<b>Primary Responsibility</b> (plus associated responsibility/ies)
<b>Action 3.1.1:</b> Improve health messaging during disaster preparedness and recovery through increased integration with emergency management communications.	Feedback from a range of emergency management frontline and strategic planning staff.	Annual review of Queensland Health Disaster Plan	<b>State agency for health, Emergency Management Unit</b>
<b>Action 3.1.2:</b> Provide emotional support and counselling to protect the wellbeing of health and emergency response staff that are both disaster victims as well as key workers required for emergency response.	Number of health and emergency response staff that seek available counselling services		<b>State agency for community safety</b>
<b>Action 3.1.3:</b> Continue to link Emergency Preparedness measures of health facilities and services with Early Warning Systems and seasonal forecasts of extreme weather events.	Extent to which seasonal forecasts influence disaster preparation Regularity of communications between BoM and State agency for health		<b>State agency for health</b>

Action	Key Performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.1.4:</b> Ensure Local Disaster Management Groups have access to organisations coordinating periodically updated registers of contact details of people with chronic health conditions and other vulnerable individuals (such as the Red Cross, or other relevant organisation).	Feedback from Red Cross, local authority or other relevant organisation maintaining registers of contact details; Feedback from organisations representing vulnerable individuals; Frequency of maintenance of registers; Nomination of at least one staff member that has access to registers that can be accessible at all times by a LDMG		<b>Local Disaster Management Groups</b>
<b>Action 3.1.5:</b> Volunteer and/or paid staff tasked with running evacuation centres are given food safety guidelines, and training is offered to ensure at least one food safety supervisor with appropriate competency standards is present at evacuation centres.	Number volunteers/staff that receive food safety supervisor training; Incidence of food-borne disease in evacuation centres		<b>Red Cross, Queensland, Police Service, State agency for health</b>
<b>Action 3.1.6:</b> Ensure aged care organisations (residential care, retirement villages and community care) play an active role in local government disaster management planning, and have representatives on Local Disaster Management Groups.	Feedback from Local Disaster Management Groups and Aged Care providers; Presence of aged care representatives on Local Disaster Management Groups	Annual and/or post-disaster review of local disaster management plans	<b>State agency for aged care</b>
<b>Action 3.1.7:</b> Ensure that evacuation centres are equipped with appropriate facilities and supplies required to meet the needs of people with disabilities and vulnerable older people, (such as accessible toilets and showers, privacy screens and suitable bedding).	Feedback groups working closely with or representing older people	<b>Annual and/or post-disaster review of local disaster management plans</b>	<b>State agency for aged care</b>
<b>Action 3.1.8:</b> Include community resilience and health prevention considerations in long-term post-disaster recovery plans and disaster mitigation plans.	Presence of community resilience and health prevention measures in recovery plans		<b>Australian Health Promotion Association</b>

**PROGRAM 3.2 INTEGRATION WITH URBAN PLANNING AND MANAGEMENT:** Integration of human health into urban planning and management increases resilience and reduces susceptibility to adverse health impacts of climate change.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	State agencies for housing and public works, local governments, UDIA, with assistance from the state agency for planning, Building Design Council of Australia	All settlement types	Ongoing	Immediate (upon review of town planning schemes and urban design guidelines)	UPM 1.3 UPM 1.7 UPM 1.10 UPM 1.19 UPM 2.3 UPM 2.8 UPM 2.10 UPM 2.18 UPM 1.3 UPM 2.3	Bambrick et al 2008; Blum 1998; CAP 2010; Carthey et al 2009; Climate Risk 2011; Coutts et al 2007; Edwards et al 2011; Heart Foundation & VicHealth 2011; Livesley & Aye 2011; Patrick & Capetola 2011; Smoyer-Tomic & Rainham 2001; Spickett et al 2007; Woodcock et al 2009

**Action 3.2.1:** Strategically relocate/retreat and/or upgrade essential health facilities to ensure appropriate standards for building design, backup of and siting of essential infrastructure. This may involve strategic relocation and/or upgrade of health services and facilities into low risk areas so they can continue to operate during emergencies.

**Action 3.2.2:** Ensure climate change vulnerability assessments and mapping contribute to reviews of Emergency Preparedness and Continuity Management plans to prepare health facilities in areas with elevated risks are prepared for disruption in infrastructure from natural hazards.

**Action 3.2.3:** Ensure transport planning provides access to health services, evacuation centres, and public cool spaces, prioritising neighbourhoods whose residents are more likely to have limited access to private transport and limited transport options.

**Action 3.2.4:** Encourage active and sustainable transport through urban design.

**Action 3.2.5:** Encourage innovative urban planning and design to minimise communities' exposure to extreme heat events and urban heat island effect (UHIE) through improved parkland design guidelines, and building design and performance standards that improve indoor thermal comfort and reduce energy demand.

**Action 3.2.6:** Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure. This may include grants and resources for community-based tree planting and urban greening initiatives that reduce UHIE and sun exposure.

**Action 3.2.7:** Continue to encourage active and sustainable transport through health campaigns and infrastructure provision.

**Action 3.2.8:** Improve parkland design guidelines to encourage reduced UHIE, and facilitate physical activity and active transport.

**Action 3.2.9:** Implement environmental/landuse interventions to maximise local food security and minimise adverse impacts of climate change on accessibility to affordable local food and nutrition. This may include actions such as:

- Identifying and amending local government bylaws and/or local laws and town planning scheme attributes that may unintentionally deter urban food production;
- Integrating food production into urban design and parkland design guidelines; and
- Provision of resources in open space planning to facilitate local food security (such as resources for edible planting, city farms and farmers markets).

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.2 Integration with Urban Planning and Management:</b> Integration of human health into urban planning and management increases resilience and reduces susceptibility to adverse health impacts of climate change.					
<b>Action Implementation</b>					
<b>Action 3.2.1:</b> Strategically relocate/retreat and/or upgrade essential health facilities to ensure appropriate standards for building design, backup of and siting of essential infrastructure. This may involve strategic relocation and/or upgrade of health services and facilities into low risk areas so they can continue to operate during emergencies.	Self-regulation	<b>State agency for housing and public works</b> , with assistance from state agency for planning	Ongoing		Carthey et al 2009; Climate Risk 2011
<b>Action 3.2.2: Ensure climate change vulnerability</b> <b>Action 3.2.2:</b> Ensure climate change vulnerability assessments and mapping contribute to reviews of Emergency Preparedness and Continuity Management plans to prepare health facilities in areas with elevated risks are prepared for disruption in infrastructure from natural hazards.	Guideline, through Queensland Health guidance documents for Emergency Preparedness and Continuity Management	<b>State agency for health</b>	Ongoing	Coupled with 1.1.4 Follows 2.1.1 Coupled with 3.3.1	Climate Risk 2011
<b>Action 3.2.3:</b> Ensure transport planning provides access to health services, evacuation centres, and public cool spaces, prioritising neighbourhoods whose residents are more likely to have limited access to private transport and limited transport options.	Self-regulation	<b>Local government</b>	Ongoing	Coupled with 2.5.2	Blum 1998
<b>Action 3.2.4:</b> Encourage active and sustainable transport through urban design.	Self-regulation	<b>Local government (through the SEQ council of mayors)</b> , with assistance from peak development bodies (such as UDIA)	Ongoing	Coupled with 2.5.2 Follows 2.5.3	Patrick & Capetola 2011
<b>Action 3.2.5:</b> Encourage innovative urban planning and design to minimise communities' exposure to extreme heat events and urban heat island effect (UHIE) through improved parkland design guidelines, and building design and performance standards that improve indoor thermal comfort and reduce energy demand.	Guidelines, (urban planning & design guidelines)	<b>UDIA</b> and other peak development bodies (such as AIDA), Building Design Council of Australia	Ongoing	Follows 1.2.1 Coupled with 2.5.1 Coupled with 3.3.2	CAP 2010; Livesley & Aye 2011

<b>Action</b>	<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
<b>Action 3.2.6:</b> Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure. This may include grants and resources for community-based tree planting and urban greening initiatives that reduce UHIE and sun exposure.	Self-regulation	<b>Local government</b>	Ongoing	Coupled with 1.2.6	Spickett et al 2007; Heart Foundation & VicHealth 2011; CAP 2010
<b>Action 3.2.7:</b> Continue to encourage active and sustainable transport through health campaigns and infrastructure provision.	Educational / Policy	<b>Local government</b> through Council of Mayors, with assistance from community health services	Ongoing	Couple with 3.2.5	Patrick & Capetola 2011; Woodcock et al 2009; Baum et al 2008
<b>Action 3.2.8:</b> Improve parkland design guidelines to encourage reduced UHIE, and facilitate physical activity and active transport.	Self-regulation	<b>UDIA</b> , AILA and other peak development industry bodies	Ongoing	Coupled with 3.2.6	Smoyer-Tomic & Rainham 2001; Coutts et al 2007; CAP 2010; Bambrick et al 2011
<b>Action 3.2.9:</b> Implement environmental/landuse interventions to maximise local food security and minimise adverse impacts of climate change on accessibility to affordable local food and nutrition. This may include actions such as: <ul style="list-style-type: none"> <li>- Identifying and amending local government bylaws and/or local laws and town planning scheme attributes that may unintentionally deter urban food production;</li> <li>- Integrating food production into urban design and parkland design guidelines; and</li> <li>- Provision of resources in open space planning to facilitate local food security (such as resources for edible planting, city farms and farmers markets).</li> </ul>	Policy	<b>Local government</b> , (through the Council of Mayors)	Ongoing	Coupled with 2.1.7	Heart Foundation & VicHealth 2011; Edwards et al 2011,

## Action Monitoring & Evaluation

Action	Key Performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.2.1:</b> Strategically relocate/retreat and/or upgrade essential health facilities to ensure appropriate standards for building design, backup of and siting of essential infrastructure. This may involve strategic relocation and/or upgrade of health services and facilities into low risk areas so they can continue to operate during emergencies.	Decrease in frequency of disruption to health services during extreme weather events.		<b>State agency for community safety</b>
<b>Action 3.2.2: Ensure climate change vulnerability</b> Action 3.2.2: Ensure climate change vulnerability assessments and mapping contribute to reviews of Emergency Preparedness and Continuity Management plans to prepare health facilities in areas with elevated risks are prepared for disruption in infrastructure from natural hazards.	Feedback from emergency health personnel in local disaster management groups, and health facility Emergency Preparedness Committees	Post-disaster review of disaster management plans	<b>State agency for aged care, Public Health Units</b>
<b>Action 3.2.3:</b> Ensure transport planning provides access to health services, evacuation centres, and public cool spaces, prioritising neighbourhoods whose residents are more likely to have limited access to private transport and limited transport options.	Feedback from Health Community Councils and public health officials	Transport planning within local government ; Local Hospital Network strategies for consumer and community engagement	<b>Local government</b>
<b>Action 3.2.4:</b> Encourage active and sustainable transport through urban design.	Community demand for active transport and feedback expressed in neighbourhood planning; Frequency of use of recreational areas and active transport infrastructure	Periodic monitoring of Community Plans under the Queensland Government Active Healthy Communities Program	<b>Heart Foundation</b>
<b>Action 3.2.5:</b> Encourage innovative urban planning and design to minimise communities' exposure to extreme heat events and urban heat island effect (UHIE) through improved parkland design guidelines, and building design and performance standards that improve indoor thermal comfort and reduce energy demand.	Feedback from peak developer bodies (UDIA, AIDA etc), and housing affordability organisations (such as AHURI); Reduction in UHIE and urban heat as seen in thermal imaging and UHIE mapping over time.		<b>Green Building Council of Australia</b>
<b>Action 3.2.6:</b> Develop and carry out urban forestry and tree planting programs, and tree protection bylaws to reduce UHIE and sun exposure. This may include grants and resources for community-based tree planting and urban greening initiatives that reduce UHIE and sun exposure.	Community support expressed through neighbourhood planning meetings; Changes in urban heat shown in thermal imaging and UHIE mapping; Community participation in urban greening initiatives	Neighbourhood planning	<b>Local government</b>
<b>Action 3.2.7:</b> Continue to encourage active and sustainable transport through health campaigns and infrastructure provision.	Community support expressed through neighbourhood planning meetings; Public use of public transport, bikeways and other active transport infrastructure; Kilometres of additional bike paths and improvements in bike paths, number of additional public transport services etc	Periodic monitoring of Community Plans under the Queensland Government Active Healthy Communities program	<b>Local government</b>

Action	Key Performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.2.8:</b> Improve parkland design guidelines to encourage reduced UHIE, and facilitate physical activity and active transport.	Feedback from community members residing near parklands undergoing changes; Presence of increased public use of active transport infrastructure and recreational facilities where new design guidelines have been put into action	Periodic monitoring of Community Plans under the Queensland Government Active Healthy Communities program	<b>State government</b>
<b>Action 3.2.9:</b> Implement environmental/landuse interventions to maximise local food security and minimise adverse impacts of climate change on accessibility to affordable local food and nutrition. This may include actions such as: <ul style="list-style-type: none"> <li>- Identifying and amending local government bylaws and/or local laws and town planning scheme attributes that may unintentionally deter urban food production;</li> <li>- Integrating food production into urban design and parkland design guidelines; and</li> <li>- Provision of resources in open space planning to facilitate local food security (such as resources for edible planting, city farms and farmers markets).</li> </ul>	Community feedback and consistency of these environmental / landuse interventions with community interests expressed in neighbourhood planning; Spatial extent of urban areas producing food.		<b>Local government</b>



**PROGRAM 3.3 INTEGRATION WITH PHYSICAL INFRASTRUCTURE:** The vulnerability of communities and health services to climate change is minimised by integrating human health considerations in the planning and management of physical infrastructure.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State agency for health</b> , state agencies for energy and water supply, energy and water, with assistance from electricity and utility providers	Local Health and Hospital Network across the region, and utility/ infrastructure networks	Ongoing	Immediate	PI 1.1 PI 1.2 PI 2.1 PI 2.2 PI 3.2 PI 3.3	Carthey et al 2009; Goater 2011; LGAQ 2007; PWC 2011

**Action 3.3.1:** Ensure health facility Emergency Preparedness and Continuity Management plans and associated redundancy plans are matched with multiple sources of power, water storage, communications, and contingency plans in the event of blocked access routes and/or disrupted infrastructure.

**Action 3.3.2:** Reduce heat wave health risks associated with electricity grid failure by diversifying and decentralising power sources, and improving demand management during heat wave events.

**Action 3.3.3:** Evaluate water sanitation infrastructure in the context of increased health risk from flood/drought, and incorporate this information into infrastructure planning, water management, and disaster preparedness measures for health protection.

**Action 3.3.4:** Ensure monitoring of sanitation infrastructure during disaster to prevent and/or manage health risks and hazards, and promptly trigger communication plans for public health messages.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 3.3 Integration with Physical Infrastructure:</b> The vulnerability of communities and health services to climate change is minimised by integrating human health considerations in the planning and management of physical infrastructure.					
<b>Action Implementation</b>					
<b>Action 3.3.1:</b> Ensure health facility Emergency Preparedness and Continuity Management plans and associated redundancy plans are matched with multiple sources of power, water storage, communications, and contingency plans in the event of blocked access routes and/or disrupted infrastructure.	Policy	<b>State agency for health</b>	Ongoing	Coupled with 1.1.4	Carthey et al 2009
<b>Action 3.3.2:</b> Reduce heat wave health risks associated with electricity grid failure by diversifying and decentralising power sources, and improving demand management during heat wave events.	Incentives and educational, through a range of measures such as rebates, and educational materials	<b>State agencies for energy and water supply</b> , with assistance from electricity providers	Ongoing	Coupled with 1.2.7 Coupled with 3.2.6	PWC 2011
<b>Action 3.3.3:</b> Evaluate water sanitation infrastructure in the context of increased health risk from flood/drought, and incorporate this information into infrastructure planning, water management, and disaster preparedness measures for health protection.	Self-regulation	<b>Queensland Water Commission</b>	Ongoing	Follows 4.2.5	LGAQ 2007, Goater 2011
<b>Action 3.3.4:</b> Ensure monitoring of sanitation infrastructure during disaster to prevent and/or manage health risks and hazards, and promptly trigger communication plans for public health messages.	Self-regulation	<b>State agencies for energy and water</b> , in association with utility providers	Ongoing	Precedes 2.2.1	Goater 2011

## Action Monitoring & Evaluation

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 3.3.1:</b> Ensure health facility Emergency Preparedness and Continuity Management plans and associated redundancy plans are matched with multiple sources of power, water storage, communications, and contingency plans in the event of blocked access routes and/or disrupted infrastructure.	Frequency of use of backup sources of power, water and other infrastructure during disaster events.	Post-disaster review of disaster management plans	<b>Public Health Units</b>
<b>Action 3.3.2:</b> Reduce heat wave health risks associated with electricity grid failure by diversifying and decentralising power sources, and improving demand management during heat wave events.	Co-benefits with other energy demand management and climate change mitigation plans and strategies; Frequency of electricity grid failure during heatwave events	ClimateQ, Energy Conservation and Demand Management Program	<b>State government</b>
<b>Action 3.3.3:</b> Evaluate water sanitation infrastructure in the context of increased health risk from flood/drought, and incorporate this information into infrastructure planning, water management, and disaster preparedness measures for health protection.	Use of best available science in evaluations		<b>Queensland Water Commission</b>
<b>Action 3.3.4:</b> Ensure monitoring of sanitation infrastructure during disaster to prevent and/or manage health risks and hazards, and promptly trigger communication plans for public health messages.	Feedback from environmental health professionals and water utility operators		<b>Queensland Water Commission</b>

**HH POLICY 4.** Surveillance & Monitoring for human health should be strengthened in order to have timely responses to future climate impacts.

**Policy Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	High	High	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Policy will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/ alignment	Coherence/ enhancement	Acceptability- political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Policy

<b>Implementation Mechanisms</b> (regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Anticipated Benefits</b>	<b>Possible undesirable or unintended impacts</b>	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>NHMRC</b> , State agency for health	Local Health and Hospital Network areas across the region	Research, collaboration and consequent information sharing leads to a generation of understanding of human health impacts of climate change in SEQ; Risk assessment and surveillance that includes epidemiological modelling, environmental indicators, and social determinants of health acts as a tool for identifying multi-endemic population segments, and for forecasting future disease hotspots	Sharing databases and efforts to make databases compatible across different health-related activities has been met with difficulty in the past.	Aagaard-Hansen et al 2009; Goater et al 2011; Hambling et al 2011; Harley et al 2011; Kristie et al 2006; McMichael et al 2009; SMEC 2009; Stakeholders interview

**PROGRAM 4.1 IMPROVED UNDERSTANDING:** Research, surveillance and monitoring leads to improved understanding of relationships between population health and climate change and capacity to respond to future health risks.

**Program Evaluation**

**What if questions** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	High

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

**How well Program will address climate change** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	Low	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Educational and Policy	<b>NHMRC</b> , Research institutions, state agency for health, research institutions, local government, state government	Local Health and Hospital Network areas across the region	Ongoing	Immediate (upon review of Queensland Health's Health Protection Strategic Directions 2010-2013)		Aagaard-Hansen et al 2009; Harley et al 2011; Kristie et al 2006; McMichael et al 2009; Spickett et al 2007; stakeholder interviews

**Action 4.1.1:** Support research to increase understanding of impacts of climate change on the health of different communities. This may include analysis of hospital admissions and doctor visits, laboratory reports, excess deaths, sentinel records, and epidemiological data in relation to climate phenomena. Research could also include investigation into the impacts of climate change on social determinants of health.

**Action 4.1.2:** Combine epidemiological surveys and studies of epidemiological, environmental and social determinants of health in a comprehensive Risk Assessment Surveillance System (RASS) to guide public health interventions for climate change adaptation.

**Action 4.1.3:** Research the relationship between air pollutants and climate parameters, and potential health risks under projected population increases and changes in climate for metropolitan areas of SEQ<sup>8</sup>.

**Action 4.1.4:** Research health implications of sea level rise, storm surges and changing rainfall patterns with regard to algae and water contamination in recreational waters, and mosquito breeding habitats.

<sup>8</sup> This could include incorporate considerations of health risks of increased particulate matter following dust storms and/or bushfires as well as from industrial air pollutants.



## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 4.1 Improved understanding:</b> Research, surveillance and monitoring leads to improved understanding of relationships between population health and climate change and capacity to respond to future health risks. <b>Action Implementation</b>					
<b>Action 4.1.1:</b> Support research to increase understanding of impacts of climate change on the health of different communities. This may include analysis of hospital admissions and doctor visits, laboratory reports, excess deaths, sentinel records, and epidemiological data in relation to climate phenomena. Research could also include investigation into the impacts of climate change on social determinants of health.	Policy	NHMRC, Research institutions	Ongoing	Precedes 1.1.3 Coupled with 2.4.1 Precedes 2.4.2 Precedes 4.1.2, 4.1.3 & 4.1.4 Precedes 4.2.2 & 4.2.4	Harley et al 2011; Kristie et al 2006
<b>Action 4.1.2:</b> Combine epidemiological surveys and studies of epidemiological, environmental and social determinants of health in a comprehensive Risk Assessment Surveillance System (RASS) to guide public health interventions for climate change adaptation.	Policy	State agency for health	Ongoing	Could be coupled with 2.4.5 Follows 4.1.1 Coupled with 4.1.3	Aagaard-Hansen et al 2009
<b>Action 4.1.3:</b> Research the relationship between air pollutants and climate parameters, and potential health risks under projected population increases and changes in climate for metropolitan areas of SEQ <sup>9</sup> .	Directive	NHMRC	One-off		Hansen et al 2009; Harlan & Ruddell 2011
<b>Action 4.1.4:</b> Research health implications of sea level rise, storm surges and changing rainfall patterns with regard to algae and water contamination in recreational waters, and mosquito breeding habitats.	Directive	NHMRC	One-off		Craig 2009

<sup>9</sup> This could include incorporate considerations of health risks of increased particulate matter following dust storms and/or bushfires as well as from industrial air pollutants.

## Action Monitoring & Evaluation

Action	Key performance indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 4.1.1:</b> Support research to increase understanding of impacts of climate change on the health of different communities. This may include analysis of hospital admissions and doctor visits, laboratory reports, excess deaths, sentinel records, and epidemiological data in relation to climate phenomena. Research could also include investigation into the impacts of climate change on social determinants of health.	Feedback and peer review from researchers working in the field of health and climate change		<b>NHRMC</b>
<b>Action 4.1.2:</b> Combine epidemiological surveys and studies of epidemiological, environmental and social determinants of health in a comprehensive Risk Assessment Surveillance System (RASS) to guide public health interventions for climate change adaptation.	Feedback from end users (health authorities and local government) regarding the extent of use of an RASS; RASS development is based on end user input.	Review of Queensland Health's Health Protection Strategic Directions 2010-2013	<b>State agency for health</b>
<b>Action 4.1.3:</b> Research the relationship between air pollutants and climate parameters, and potential health risks under projected population increases and changes in climate for metropolitan areas of SEQ <sup>10</sup> .	Peer-review from experts in similar fields of research; Use of research to inform environmental health planning and/or urban planning		<b>NHMRC</b>
<b>Action 4.1.4:</b> Research health implications of sea level rise, storm surges and changing rainfall patterns with regard to algae and water contamination in recreational waters, and mosquito breeding habitats.	Peer-review from experts in similar fields of research; Use of research to inform environmental health planning and/or urban planning		<b>NHMRC</b>

<sup>10</sup> This could include incorporate considerations of health risks of increased particulate matter following dust storms and/or bushfires as well as from industrial air pollutants.

**PROGRAM 4.2 RISK MANAGEMENT AND POPULATION HEALTH:** Surveillance and monitoring allows for continuous improvement in risk management at a population health level.

**Program Evaluation**

***What if questions*** (Assess on a threefold scale: low; medium; and high)

What is the likelihood that it will have negative impacts on society?	To what extent does it represent “value for money” (cost effectiveness)?	What is its likelihood of success (achieving aims)?	To what degree does it promote rather than inhibit resilience (see definition)?
Low	Medium	Medium	Medium

**Definition:** “Resilience is the capacity of a system to absorb disturbance to undergo change and still retain essentially the same function, structure and feedbacks.”

“Resilience reflects the degree to which a complex adaptive system is capable of self-organization (versus lack of organization or organization forced by external factors) and the degree to which the system can build capacity for learning and adaptation.”

***How well Program will address climate change*** (Appraisal Criteria: “high” = favourable; “low” = unfavourable) – refer “**Climate change adaptation options appraisal criteria**”

Flexibility	Robustness	Equity	Coherence/alignment	Coherence/enhancement	Acceptability-political, community, bureaucracy, private sector	Avoidance of maladaptation – Low GHG emissions	Avoidance of maladaptation – Less Vulnerable populations	Avoidance of maladaptation – Low Opportunity Costs	Avoidance of maladaptation – Adaptation Incentives	Avoidance of maladaptation – Low Path Dependency
High	High	High	High	High	High	High	High	High	High	High

## Outline of Program

<b>Implementation Mechanisms</b> (e.g. regulatory, educational, incentive etc)	<b>Primary Responsibility</b> (plus associated responsibility/ies)	<b>Area or Location</b> (policy relevance)	<b>Type of Implementation Response</b> (one-off; ongoing; episodic)	<b>Timing of Implementation</b> (immediate; deferred)	<b>Program Linkages</b> (coupling)	<b>Source/s</b> (evidence) Citation or "original" (incl. modified)
Policy	<b>State agency for health, NHMRC</b>	Local Health and Hospital Network areas across the region	Ongoing	Immediate		Goater et al 2011; Hambling et al 2011; Kristie et al 2006; McMichael et al 2009; SMEC 2009

**Action 4.2.1:** Periodically assess and update health surveillance systems and health alert systems with best available science and knowledge of links between climate and health to ensure that they are capable of detecting and responding to changes in disease patterns that may result from climate change.

**Action 4.2.2:** Expand environmental health and health equity programs to ensure they include newly identified at-risk areas.

**Action 4.2.3:** Identify and develop indicators to monitor climate change-related health outcomes within health surveillance systems and health alert systems.

**Action 4.2.4:** Incorporate social indicators of health and health equity in systems of surveillance and monitoring for climate change adaptation for human health.

## Actions Implementation

Action	Implementation Mechanisms (e.g. regulatory, educational, incentive etc)	Primary Responsibility (plus associated responsibility/ies)	Type of Implementation Response (one-off; ongoing; episodic)	Program Linkages (coupling)	Source/s (evidence) Citation or "original" (incl. modified)
<b>Program 4.2 Risk management and population health:</b> Surveillance and monitoring allows for continuous improvement in risk management at a population health level.					
<b>Action Implementation</b>					
<b>Action 4.2.1:</b> Periodically assess and update health surveillance systems and health alert systems with best available science and knowledge of links between climate and health to ensure that they are capable of detecting and responding to changes in disease patterns that may result from climate change.	Standard Operating Procedure	State agency for health	Ongoing	Coupled with 2.2.6 Coupled with 2.4.8 Coupled with 4.2.2 Follows 4.2.4	SMEC 2009
<b>Action 4.2.2:</b> Expand environmental health and health equity programs to ensure they include newly identified at-risk areas.	Policy	State agency for health (environmental and population health), Branch	Ongoing		McMichael et al 2009
<b>Action 4.2.3:</b> Identify and develop indicators to monitor climate change-related health outcomes within health surveillance systems and health alert systems.	Directive	NHMRC	One-off		Hambling et al 2011; SMEC 2009
<b>Action 4.2.4:</b> Incorporate social indicators of health and health equity in systems of surveillance and monitoring for climate change adaptation for human health.	Policy	State agency for health	Ongoing		Stakeholder interviews

## Action Monitoring & Evaluation

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 4.2.1:</b> Periodically assess and update health surveillance systems and health alert systems with best available science and knowledge of links between climate and health to ensure that they are capable of detecting and responding to changes in disease patterns that may result from climate change.	Frequency of updating of health surveillance systems	Review of Queensland Health's Health Protection Strategic Directions 2010 - 2013	State agency for health

Action	Key Performance Indicators	Opportunities for monitoring and evaluation (e.g. existing review cycles)	Primary Responsibility (plus associated responsibility/ies)
<b>Action 4.2.2:</b> Expand environmental health and health equity programs to ensure they include newly identified at-risk areas.	Feedback from researchers and personnel working in health surveillance and monitoring; Environmental health and health equity programs are altered in response to results of surveillance and monitoring systems	Review of Queensland Health's Health Protection Strategic Directions 2010 - 2013	<b>State agency for health</b> (Environmental Health Branch)
<b>Action 4.2.3:</b> Identify and develop indicators to monitor climate change-related health outcomes within health surveillance systems and health alert systems.	Feedback from climate researchers and personnel working in health surveillance and monitoring		<b>NHMRC</b> , State agency for health Strategic Partnership and Epidemiology Branch
<b>Action 4.2.4:</b> Incorporate social indicators of health and health equity in systems of surveillance and monitoring for climate change adaptation for human health.	Social indicators of health and health equity are included in surveillance and monitoring systems related to health impacts of climate change		<b>State agency for health</b>

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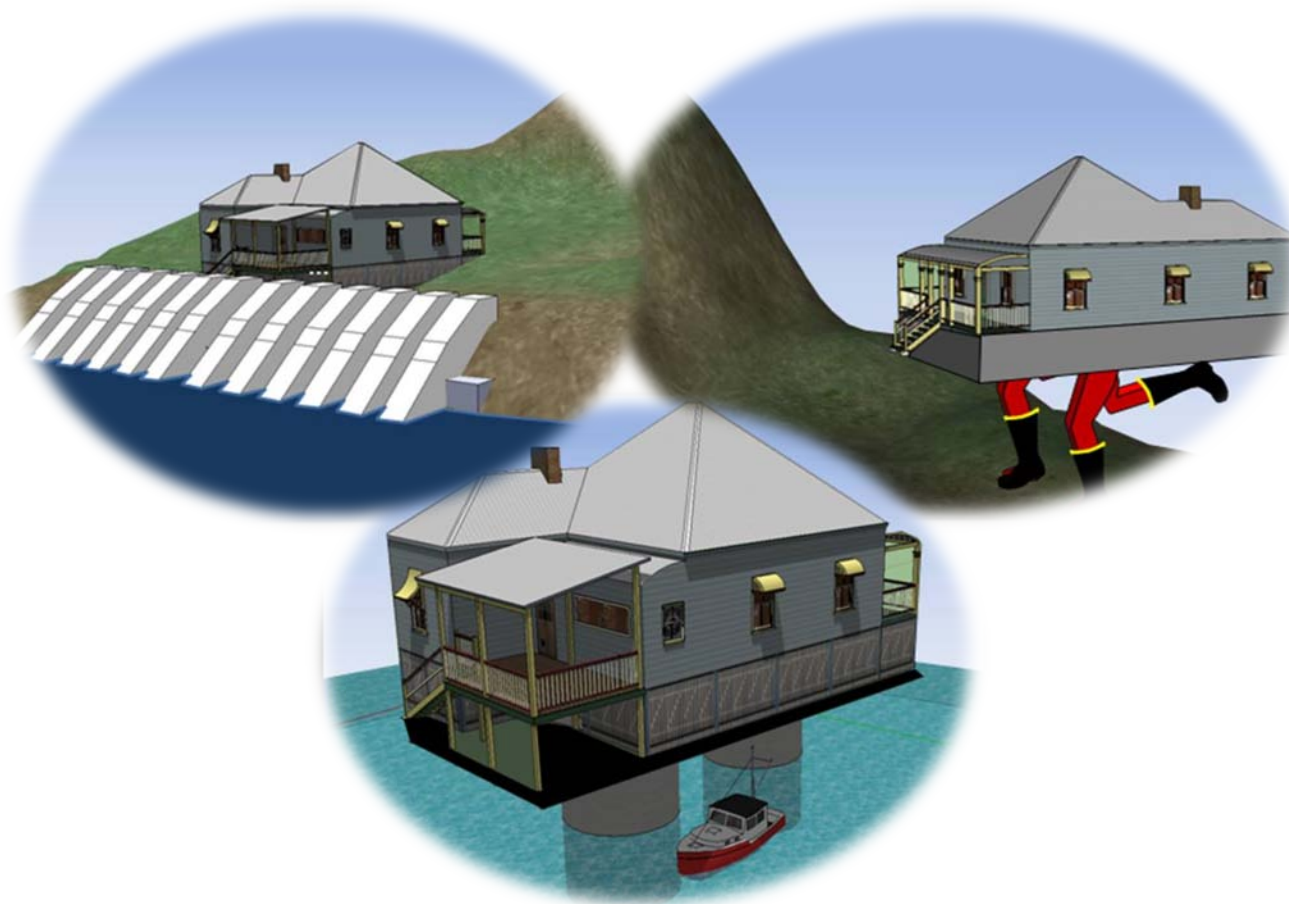
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