APPENDIX
EAST COAST CLUSTER SCENARIO PLANNING WORKSHOP DOCUMENTS

WORKSHOP AGENDAS

WORKSHOP 1		
SESSION	**TOPIC**	**DESCRIPTION**
8:45-9:00	Registration	Registration
9:00-9:10	Introduction and Background to the workshop	
9:10-9:40	Introduction to and outline of Scenario Planning Approach	Scenario planning Drivers of change
9:40-11:00	Identification of drivers of change	Brainstorming session on drivers of change Identification of key drivers of change Classification of drivers of change in terms of uncertainty and importance
11:00-11:30	MORNING TEA	
11:30-12:30	Likely Trends, Uncertainties, Shocks and Surprises	In groups
12:30-1:00	Report back from the different groups	Plenary
1:00-1:30	LUNCH	
1:30-2:15	Synthesis – Identify critical drivers – highly uncertain and highly important	Plenary
2:15-3:00	Scenario frameworks	Creation of scenario matrix to explore four possible scenarios for the future in groups
3:00-3:15	AFTERNOON TEA	
3:15-3:45	Report back from the different groups	Plenary
3:45-4:00	Next steps and Wrap-up	

WORKSHOP 2		
SESSION	**TOPIC**	**DESCRIPTION**
9:00-9:30	Introduction, review of progress, explanation of the workshop process and outline of the scenarios	Workshop agenda and tasks Scenario Descriptions
9:30-10:30	Presentation of selected strategies/ policies/ targets and group consensus for assessment	Selected strategies/ policies/ targets (composite table)
10:30-10:45	MORNING TEA	
10:45-11:00	Collective Brainstorming session Warm-up exercise with *"Anthropocentric"* scenario	In Plenary, using scenario descriptions
11:00-12:15	'Wind Tunnel' test of each strategies/ policies/ targets in *"Anthropocentric"* scenario	In small groups, testing strategies against 'what if' questions
12:15-12:45	Plenary discussion including report back from the sub groups	Plenary report back
12:45-1:15	LUNCH	
1:15-1:30	Collective Brainstorming session Warm-up exercise with *"New Paradigm"* scenario	In Plenary, using scenario descriptions
1:30-2:45	'Wind Tunnel' test of each strategies/ policies/ targets in *"New Paradigm"* scenario	In small groups, testing strategies against 'what if' questions
2:45-3:15	Plenary discussion including report back from the sub groups	Plenary report back
3:15-3:30	AFTERNOON TEA	
3:30-4:15	Overall assessment of strategies/ policies/ targets (independent of scenarios)	Plenary – roadmap and signposts
4:15-4:30	Next steps and Wrap-up	

FACT SHEETS FOR WORKSHOP 1

Scenario Planning

Scenario planning is a strategic tool. It can be used to develop a science based decision-making framework in the face of high uncertainty and low controllability (Peterson et al, 2003). It provides a systematic approach for the development and testing of plans, strategies and policies in an uncertain environment through the creation of possible futures to test them in (O'Brien, undated). Scenario planning creates possible futures to inform present decision-making. Developed during World War 2 and then pioneered by the Royal Dutch Shell Company, the technique is now widely used to consider the future by the public and private sectors worldwide.

Futures thinking needs a structured systematic approach to explore the range of possible futures rather than relying on the prediction of a single expected or 'most-likely' future (Cork et al, 2005). To this end, scenario planning involves:

1. the identification of a focal issue or question;
2. assessing certain and uncertain drivers of the issue or question over a selected timeframe;
3. the development of options based on those drivers – i.e. creation of scenarios (plausible and coherent pictures of possible futures);
4. the development of narratives from the present to the possible futures (including a 'roadmap' for each scenario with signposts that could indicate if one future is becoming more likely than another) and
5. testing existing plans, strategies and policies against each scenarios.

Scenario planning is instructive for a decision context that involves a particular question or problem that demands action now but will play out in an uncertain future (O'Brien, undated). It involves the systematic exploration and description of the range of ways in which uncertainties could be played out and their impact on the focal question. Scenario planning "simplifies the avalanche of data into a limited number of possible states" (Schoemaker, 1995: 27). Each scenario involves the consideration of: likely trends; uncertainties; and possible shocks and surprises (welcome and unwelcome).

There is no one way to do scenario planning with most variations being in their qualitative verses quantitative approaches. However, it is important to distinguish that scenario planning is based on the generation of descriptions of possible futures involving a high degree of uncertainty and are not predictions of a particular future. In this sense scenario planning does not involve forecasting or modelling which normally deal with the short term and are based on predetermined elements particularly from the past and the present. Current evidence suggests that two or four scenarios work well with any greater number leading to levels of complexity that potentially dampens engagement. Three scenarios it is suggested, inadvertently promotes the idea that the 'middle' scenario is the most likely most probable future (O'Brien, undated).

Scenario planning is based on the premise that the future is not "knowable" – any statements, stories, narratives or scenarios about the future are hypothetical possible futures that may or may not be realised (O'Brien, undated). However they should be built from research that can identify the pre-determined and the uncertain elements of the future with the objective being the creation of plausible, coherent pictures / descriptions of possible futures and the identification of their drivers.

Cork et al (2005) have identified the following steps to futures analysis:

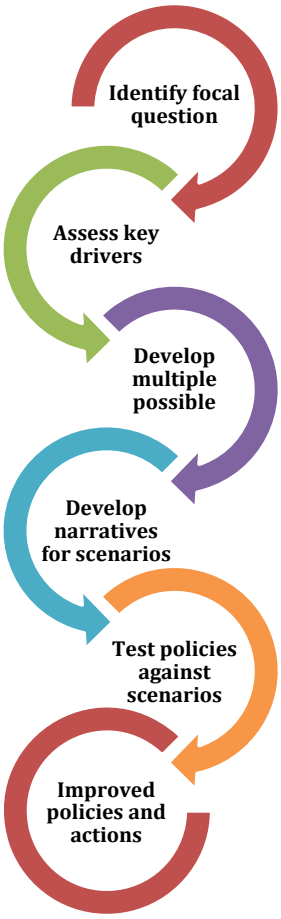
1. identify factors that brought about change in the past;
2. identify factors that could bring about change in the future;
3. separate what is relatively certain from what is uncertain about the future;
4. explore the range of ways in which uncertainties could play out (often using carefully constructed 'stories' or 'scenarios' to rest logic and communicate key messages); and
5. identify what needs to be done now to prepare for later.

This should include the development of "Roadmaps" (plausible narratives) from the PRESENT to these possible FUTURES. It also involves the identification of "sign posts" which are indicators of possible futures being realised such as events, occurrences or observations that can be scanned from the real world. It is also important to log the deliberations and discussions during the scenario construction process in the form of a "Decision Track".

Once constructed, the scenarios can then be used in a "wind tunnel" or "test beds" approach to evaluate and refine existing or proposed strategic plans, policies or decisions.

Scenario planning should attempt to involve the key decision-makers – the 'owners' of the problem (focal question). Meaningful scenario planning will be enhanced if participants can bring imagination, expert knowledge, experience and judgement to complement their analysis of empirical data.

Because the actual scenario panning exercise normally involves a small select group, it is important that the scenarios are communicated to the wider audience of stakeholders so that they too can benefit from the reflection of the scenarios and their consequences. The scenarios can provide a useful 'hypothetical' to engage stakeholders about the uncertainties of the future, especially in the context of a wider regional planning and visioning exercise.



The scenario planning process provides an opportunity to improve plans and policies by testing them against possible futures.

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East Coast Cluster –
Population, demographics, economy

East Coast Cluster

6 coastal regional bodies, Rockhampton to Sydney
Significant natural features: reefs, beaches, waterways, brigalow, rainforest
5 of the 10 largest urban areas; greater than 42% of Australia's population

Fitzroy

Population: 240,254 **Area**: 156,000 km^2

LG: Central Highlands, Banana, Gladstone, Rockhampton, Woorabinda, Livingstone, Isaac, Maranoa, Western Downs

Burnett Mary

Population: 317,480 **Area:** 53,236 km^2

LG: Wide Bay Burnett ROC (Bundaberg, Gympie, Cherbourg, North Burnett, South Burnett, Fraser Coast), Gladstone, Sunshine Coast, Noosa

South East Queensland

Population: 3,047,450 **Area:** 23,239 km^2

LG: SEQ Council of Mayors (Brisbane, Gold Coast, Ipswich, Logan, Lockyer Valley, Moreton Bay, Redland, Scenic Rim, Somerset, Sunshine Coast, Noosa and Toowoomba)

Northern Rivers (North Coast LLS)

Population: 541,276 **Area:** 50,580 (32,287) km^2

LG: Northern Region ROC (Ballina, Byron, Kyogle, Lismore, Richmond Valley and Tweed), Clarence Valley, Port Macquarie and Hastings, Kempsey, Nambucca, Bellingen, Coffs Harbour, Tenterfield, Guyra, Armidale Dumaresq, Uralla, Walcha

Hunter-Central Rivers (Hunter LLS)

Population: 1,024,037 **Area**: 33,284 (33,118) km^2

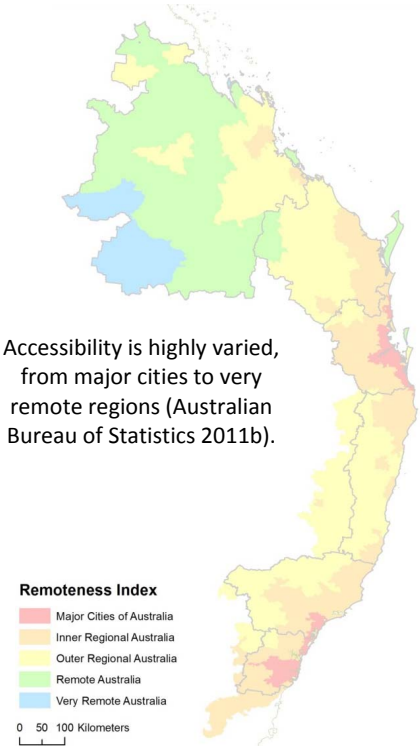
LG: Hunter Coastal Councils (Dungog, Gloucester, Gosford, Greater Taree, Great Lakes, Lake Macquarie, Maitland, Muswellbrook, Newcastle, Port Stephens, Singleton, Upper Hunter, Wyong, Cessnock)

Hawkesbury-Nepean (Greater Sydney LLS)

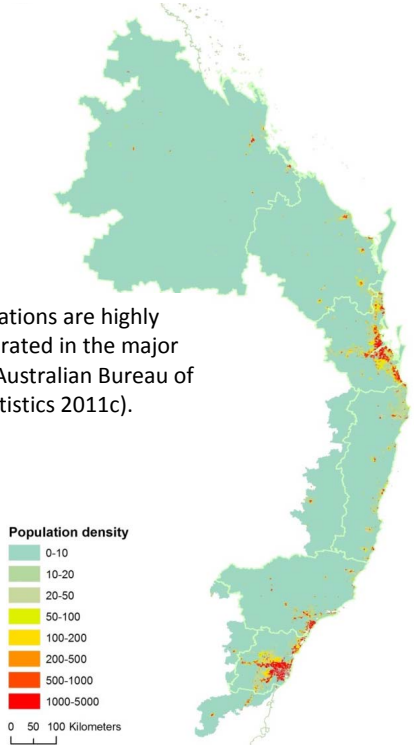
Population: 4,415,164 **Area**: 23,121 (12,525) km^2

LG: Cooks River Alliance (Ashfield, Bankstown, Canterbury, Sydney, Hurstville, Marrickville, Strathfield and Rockdale), Sydney Coastal Councils Group (Botany Bay, Hornsby, Leichhardt, Manly, Mosman, North Sydney, Pittwater, Randwick, Rockdale, Sutherland, Sydney, Warringah, Waverley, Willoughby, Woollahra), Singleton, Blue Mountains, Gosford, Wollondilly, The Hills, Ku-ring-gai, Campbelltown, Camden, Liverpool, Lithgow, Woolongong, Wingecarribee, Upper Lachlan, Goulburn Mulwaree

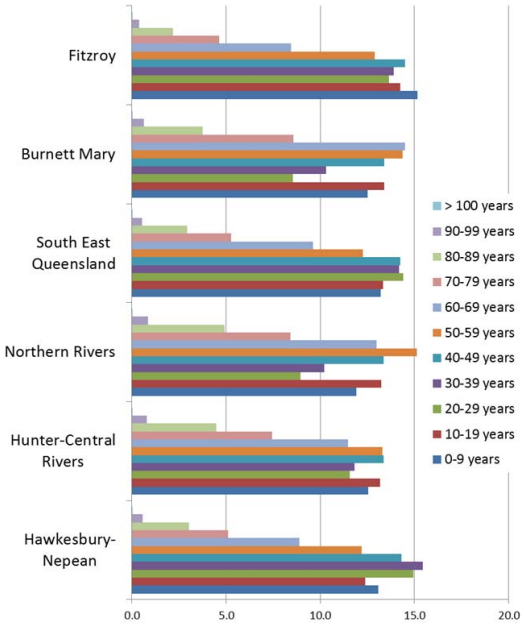
Population characteristics



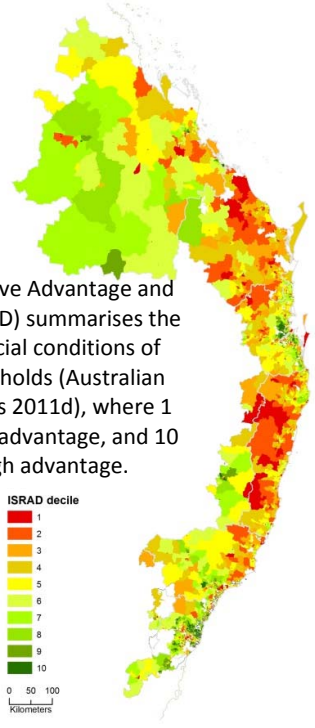
Accessibility is highly varied, from major cities to very remote regions (Australian Bureau of Statistics 2011b).



Populations are highly concentrated in the major centres (Australian Bureau of Statistics 2011c).



Regions with capital cities have a relatively higher percentage of 20-39 year olds and fewer people above 70 (Australian Bureau of Statistics 2011c).



The Index of Relative Advantage and Disadvantage (ISRAD) summarises the economic and social conditions of people and households (Australian Bureau of Statistics 2011d), where 1 represents high disadvantage, and 10 represents high advantage.

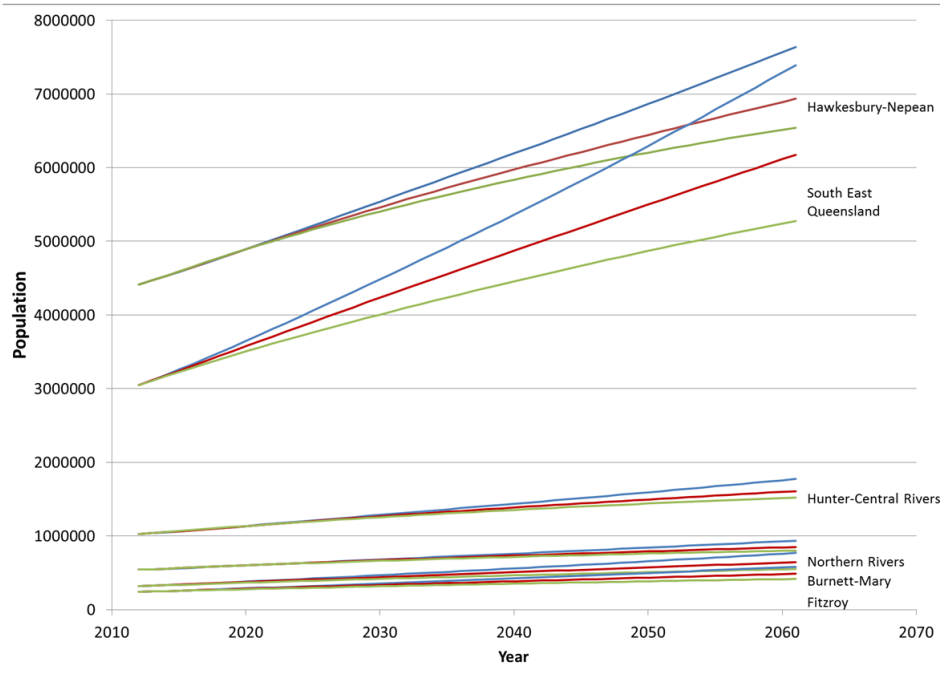
Population projections

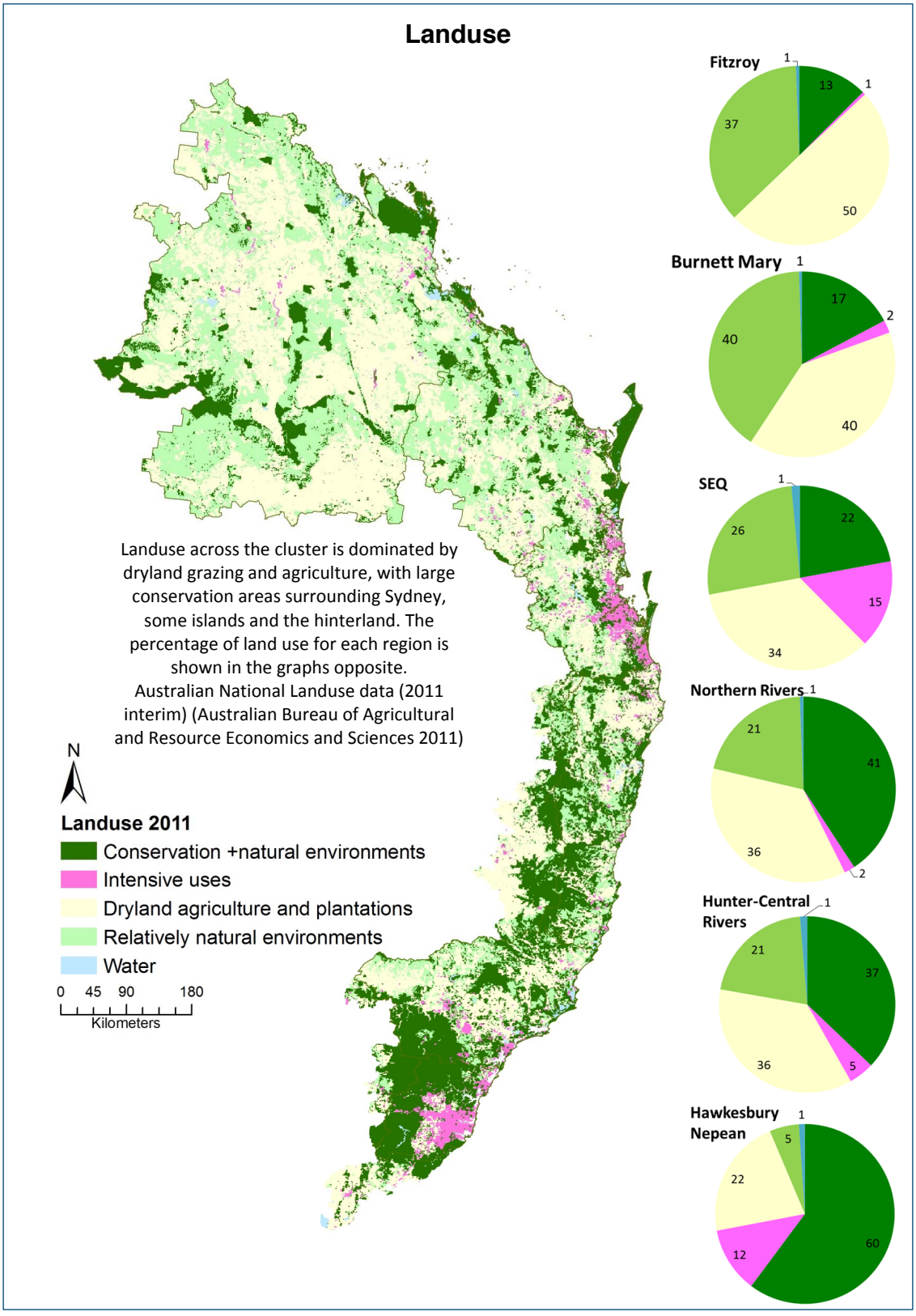
The ABS provides estimates of future population growth based on a range of assumptions about lifespan, rates of fertility and immigration, for all Australian states and territories (Australian Bureau of Statistics 2013). The high (A), medium (B) and low (C) series for Queensland and NSW were used to estimate regional population growth, based on the percentage of the state population in each region. The cluster population is estimated to increase from about 9.5 million people in 2012 to 12.5 million in 2031, and 16.7 million in 2061, under the medium range estimates.

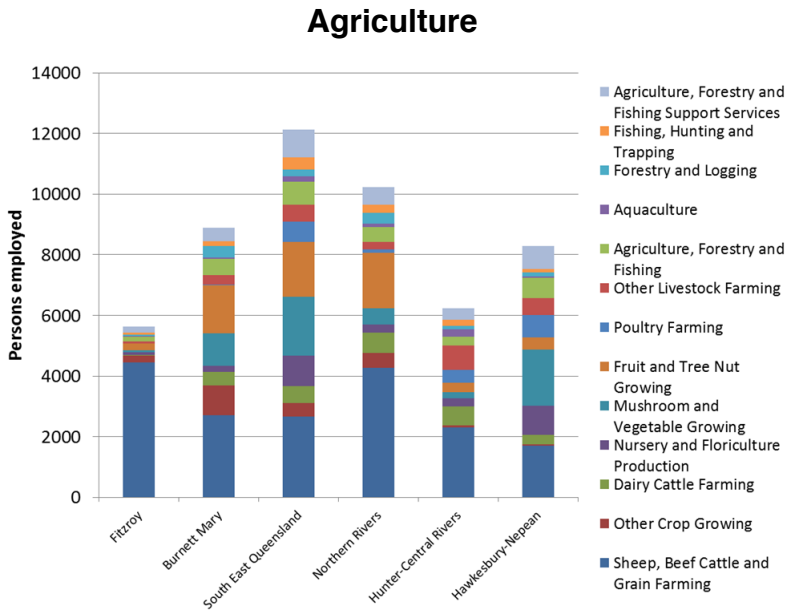
Under the medium scenario, the NSW population is expected to grow by 25% in 2031 and 57% in 2061; the Queensland population by 41% in 2031 and more than double (103%) in 2061.

Projected population in each region for the high, medium and low series for 2031 and 2061 (Australian Bureau of Statistics 2013)

	2012	2031			2061		
		High (A)	Medium (B)	Low (C)	High (A)	Medium (B)	Low (C)
Fitzroy	240,254	360,270	338,983	319,498	582,873	486,952	415,689
Burnett Mary	317,480	476,073	447,944	422,195	770,228	643,475	549,305
South East Queensland	3,047,450	4,569,760	4,299,752	4,052,594	7,393,317	6,176,625	5,272,707
Northern Rivers	541,267	687,278	676,311	668,338	936,719	850,182	802,270
Hunter-Central Rivers	1,024,037	1,300,278	1,279,530	1,264,445	1,772,201	1,608,480	1,517,835
Hawkesbury-Nepean	4,415,164	5,606,182	5,516,726	5,451,687	7,640,893	6,935,005	6,544,186
Cluster Total	**9,585,653**	**12,999,840**	**12,559,246**	**12,178,757**	**19,096,231**	**16,700,718**	**15,101,993**



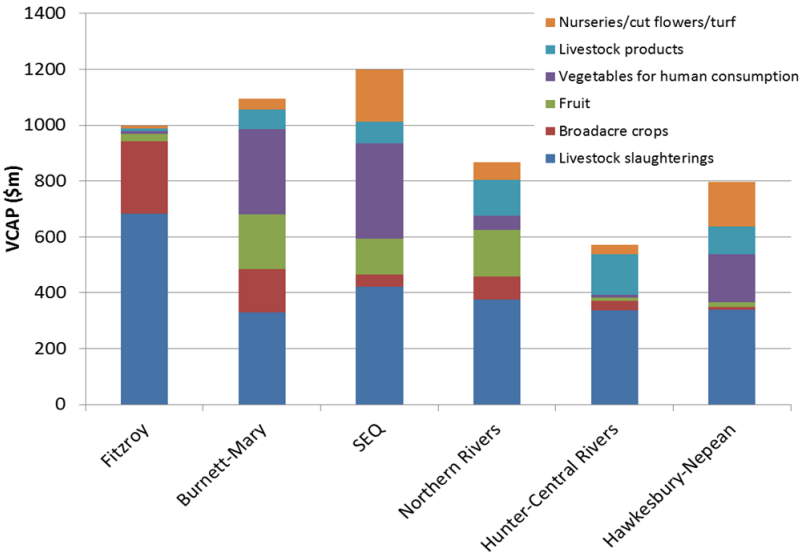

Landuse
Fitzroy
1
13
1
37
50
Burnett Mary
1
17
2
40
40
SEQ
1
22
26
15
34
Northern Rivers
1
21
41
36
2
Hunter-Central Rivers
1
21
37
36
5
Hawkesbury Nepean
1
5
22
12
60
Landuse across the cluster is dominated by dryland grazing and agriculture, with large conservation areas surrounding Sydney, some islands and the hinterland. The percentage of land use for each region is shown in the graphs opposite.
Australian National Landuse data (2011 interim) (Australian Bureau of Agricultural and Resource Economics and Sciences 2011)
N
Landuse 2011
Conservation +natural environments
Intensive uses
Dryland agriculture and plantations
Relatively natural environments
Water
0 45 90 180
Kilometers



Persons employed in agriculture by sub-sector (Australian Bureau of Statistics 2011c)

Grazing and cropping from the largest component of the agricultural workforce in all regions, and almost all agricultural workers in Fitzroy. Nursery and floriculture production is relatively higher in the capital cities. Fishing is relatively higher in the centre of the cluster (Burnett Mary to Northern Rivers).

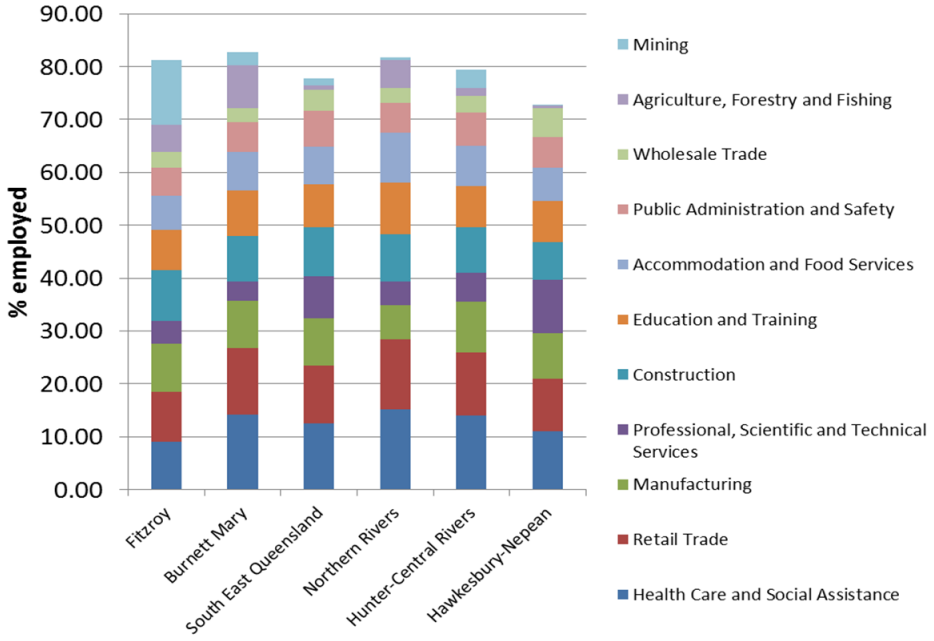
The value of agricultural commodities produced (VCAP) follows a similar pattern, although cropping production is relatively high in Fitzroy compared with employment. Note in the agriculture and employment sections, any reference to Hawkesbury Nepean includes both the Hawkesbury Nepean and Sydney Metro CMA areas as defined by the ABS (Australian Bureau of Statistics 2011a).



Value of agricultural commodities produced 2010-2011 (Australian Bureau of Statistics 2012)

Employment

Employment by industry is generally similar across the regions, with a large proportion of the employed population working in health, education, trade, manufacturing, construction, and professional services. Fitzroy and Hunter have relatively large mining sectors. SEQ and Hawkesbury-Nepean have smaller mining and agriculture sectors. The agriculture sector employs relatively more people in Burnett-Mary, Northern Rivers and Fitzroy.



Percentage of the workforce employed in employment sectors by region (Australian Bureau of Statistics 2011c)

Industry	Fitzroy	Burnett Mary	South East Queensland	Northern Rivers	Hunter-Central Rivers	Hawkesbury Nepean
Agriculture, Forestry and Fishing	5628	8904	12121	10237	6241	8295
%	5.20	8.17	0.89	5.22	1.53	0.43
Total employed**	108,324	108,979	1,355,982	196,227	408,542	1,924,430

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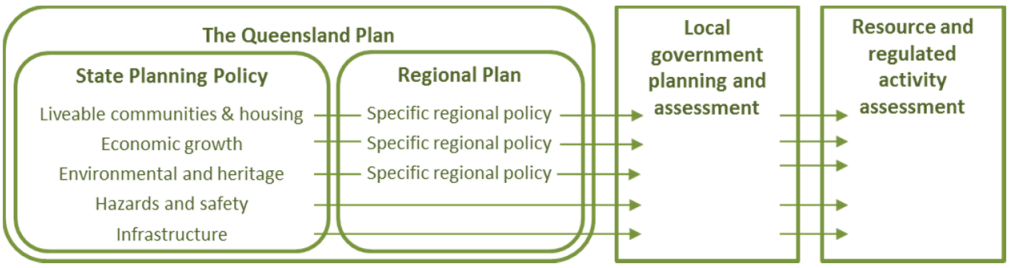
Planning in New South Wales and Queensland

New South Wales	Queensland
Planning reform	
Planning reform has begun but is now uncertain. The *Planning Bill 2013* was heavily amended by the upper house and returned to the lower house and has not been reconsidered.	Planning reform is currently underway. The *Draft Planning and Development Bill* and *Draft Planning and Environment Court Bill* have been released for public comment prior to an expected introduction to Parliament in November 2014. The associated *Draft Planning and Development Regulation* has not yet been released.
Key legislation	
Environmental Planning & Assessment Act 1979 *Environmental Planning and Assessment Regulation 2000* *Planning Bill 2013* (not passed) *New coastal management legislation – stage 2 announced (2014)*	*Sustainable Planning Act 2009* *Draft Planning and Development Bill* *Regional Planning Interests Act 2014* *Regional Planning Interests Regulation 2014* *Coastal Protection and Management Act 1995*
Planning purpose	
The overarching principle is ecologically sustainable development (previous); sustainable development (proposed).	The fundamental purpose is to achieve prosperity, defined as balancing economic growth, environmental protection and community well-being (Draft Planning Bill).
Planning hierarchy	
Current hierarchy: State Environmental Planning Policies (including Regional Environmental Plans) Local Environmental Plans (LEP), Development Control Plans **Proposed hierarchy:** NSW Planning Policies (PPs) Regional Growth and Infrastructure Plans (RGPs) Subregional Delivery Plans (SDPs) Local Plans (LPs)	**Proposed hierarchy:** (State Planning Regulatory Provisions) – to be removed State Planning Policy (single SPP) (Queensland Planning Provisions) – to be removed Regional Plan Local Planning Scheme
Regional planning	
Far and Mid North Coast Regional Strategies to be combined into North Coast Regional Growth Plan Strategic Regional Land Use Plan – Upper Hunter Lower Hunter Regional Growth Plan (under development) Draft Central Coast Regional Growth and Infrastructure Plan (TBD) Draft Metropolitan Strategy for Sydney	Fitzroy: The Central Queensland Regional Plan (2013) Burnett-Mary: The Wide Bay Burnett Regional Plan (2011); review recently started. SEQ: The SEQ Regional Plan (2009); currently under review, expected 2015.
Local Government planning	
Local Environmental Plans guide local government planning decisions through zoning and development controls. They are guided by the Standard Instrument LEP. Development Control Plans are not legally binding, but provide guidance to development proponents in regards to giving effect to other planning instruments.	Planning schemes provide the basis for local government decisions, and are currently guided by the Queensland Planning Provisions, which provide standardisation for planning scheme provisions across Queensland while allowing for flexibility. The Planning Provisions will be removed under the proposed framework, although some components may be included in the Regulations.

Queensland

Planning and Development Legislation

Requirements for planning in Queensland are currently prescribed by the *Sustainable Planning Act 2009* (SPA) and the *Sustainable Planning Regulation 2009*. The purpose of the SPA is to "seek to achieve ecological sustainability". Following review of the SPA, a draft Planning and Development Bill has been prepared for consultation, and is expected to commence in 2015. The purpose of the new legislation is to "facilitate the prosperity of Queensland, by giving effect to a planning system that balances community wellbeing, economic growth and environmental protection." The draft Bill is a 'skeleton act', which provides the overarching framework, while the detailed benchmarks and mechanics of implementation will be included in the regulation. The draft Bill simplifies the planning hierarchy, removing State Planning Regulatory Provisions and Queensland Planning Provisions as regulatory instruments.



Queensland planning framework (adapted from the Cape York Regional Plan, Figure 2) (Queensland Government 2014a)

The Queensland Plan

The Queensland Plan (Queensland Government 2014b) was developed by the state government with community consultation and includes nine foundation areas – education, community, regions, economy, health and wellbeing, environment, people, infrastructure, governance. The *Queensland Plan Bill 2014* gives effect to the plan by requiring all government policies and local government corporate plans to be consistent with the Queensland Plan. Local governments and the Premier must also provide annual reports on progress towards implementation of the Plan.

State Planning Policy

The State Planning Policy (Queensland Government 2013) identifies 16 state interests under 5 broad groups. These must be considered by local government when preparing or amending local planning schemes; by state government when designating land for community infrastructure, or preparing regional plans.

Regional Planning Interests

The *Regional Planning Interests Act 2014* and *Regional Planning Interests Regulation 2014* identify four areas of regional interest throughout Queensland: priority agricultural areas, priority living areas, strategic cropping areas and strategic environmental areas.

Regional Plans

Regional plans identify state interests in land use and development, by evaluating and balancing competing interests in the regional context. Regional planning provides for coordinated responses to issues across multiple local government planning schemes within a region. The Central Queensland Regional Plan came into effect in October 2013. The Wide Bay Burnett and South East Queensland Regional Plans are currently under review, with the SEQ plan expected to be released in 2015.

Local Government

Local Government plays a major role in local planning and development. It operates as an arm of the Queensland Government and has been granted special powers and responsibilities through the SPA, the *Local Government Act 2009* and the *City of Brisbane Act 2010*. Key planning documents produced by local government include a 5-yearly corporate plan (including community engagement) and the planning scheme. The planning scheme provides the framework for managing and assessing developments. Planning schemes across Queensland are at various stages of development following council amalgamation and de-amalgamation.

New South Wales

Planning reform

Planning reform has begun but is now uncertain. The *Planning Bill 2013* was heavily amended by the upper house and returned to the lower house and has not been reconsidered. Given the possibility of significant changes to the Bill before it is reconsidered, the existing planning legislation (rather than the proposed Bill) is described below.

Planning and Development Legislation – the Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EPAA) sets out the plan-making system in NSW. It seeks to: encourage environmental management and development that protects important resources, coordinate the development and economic uses of land and the provision of services and facilities and provide opportunity for public involvement and participation in environmental planning and assessment. The EPAA assists the coordination of responsibility for environmental planning between state and local levels of government by requiring LEPs to be prepared by local governments.

State Environmental Planning Policies (SEPPs)

SEPPs are statutory instruments that regulate land use and development. They are prepared by the state government, incorporating feedback from members of the public. SEPPs may be either state-wide or region-specific.

Regional Growth Plans

In June 2014 the NSW Government released new draft regional boundaries for NSW, which will provide the basis for Regional Growth and Infrastructure Plans. Existing Regional Strategies still apply until they are replaced by Regional Growth and Infrastructure Plans. Regional Growth and Infrastructure Plans will set an agreed government and community vision for the region and guide local government planning.

Coastal Zone Management Plans

Coastal Zone Management Plans are a legislative requirement under the *NSW Coastal Protection Act 1979* (and as amended in the *Coastal Protection Amendment Act 2012*). They can be gazetted by local government as statutory plans, giving their recommendations greater power. Coastal Zone Management Plans can address risks from coastal hazards as well as threats to coastal resources. A new Coastal Management Act is being proposed as part of stage 2 reforms to coastal management.

Local Environmental Plans (LEPs) and Development Control Plans

LEPs guide planning decisions for local government areas. They apply to either the whole or part of a local government area. Each LEP includes zones and objectives that indicate the primary intended use for that zone. LEPs list the types of development within each zone that require development consent or that are prohibited. Through zoning and development controls, LEPs allow local governments to supervise the ways in which land is used.

Development control plans, prepared in accordance with the *Environmental Planning and Assessment Act*, are also used to help achieve the objectives of the local plan by providing specific, comprehensive requirements for certain types of development or locations.

Integrated Regional Vulnerability Assessments

Integrated Regional Vulnerability Assessment (IRVA) processes have been undertaken in several NSW regions to "*develop a shared understanding among stakeholders of the likely vulnerability to climate change and stimulate action to plan adaptation*" (OEH 2013). The IRVA process includes systems thinking, participatory engagement, understanding the constraints to adaptation and qualitative analysis supported by quantitative data. IRVA processes have been carried out in the Greater Sydney and North Coast regions of the East Coast Cluster in NSW.

References

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Natural resource management

History of regional NRM in Australia

Regional NRM arrangements were introduced in Australia from the 1990s (Table 1). From 2001 onwards, formal Commonwealth-State agreements designated community-based regional bodies to engage the community in the development and implementation of regional NRM plans. NRM plans were built around targets that formed the basis for investment in strategic actions from government, philanthropic, community and the private sectors.

Table 1. A brief history of regional NRM arrangements in Australia

Years	Program	Governance	Objectives
1989-2008	National Landcare Program – the 'Decade of Landcare'	Federal funding of local Landcare groups (part of NHT I & II from 1996)	Raising awareness of land degradation; building social networks and partnerships
1996-2001	Natural Heritage Trust I	Federal funding of local Landcare, Bushcare and Rivercare groups	Broader focus but still primarily a local delivery model
00/01 – 07/08	NAPSWQ	Federal state agreements providing funding to regional NRM bodies for 21 at risk regions.	Integrated Catchment Management (ICM) for salinity and water quality
02/03 – 07/08	Natural Heritage Trust II	Formal agreements between federal and state; and between state and regional bodies (56 regions), based on accredited regional plans and investment strategies.	A comprehensive, integrated response to conserve, repair and replenish Australia's natural capital infrastructure
08/09 – 12/13	Caring for our Country	Funding of specific projects, including Reef Rescue	Emphasis on incentives and competitive tendering
2013-2018	Reef Program	Funding to NRM bodies through grants, industry bodies through partnerships	Reef water quality and resilience to climate change
2015 -	National Landcare Programme	TBA	TBA

There are currently 54 regional NRM bodies in Australia (Figure 1). The NRM bodies were created first on state lines, then along catchment or bioregion boundaries. The exception is the new boundaries for the Local Land Services (LLS) of NSW, which largely follow local government boundaries.

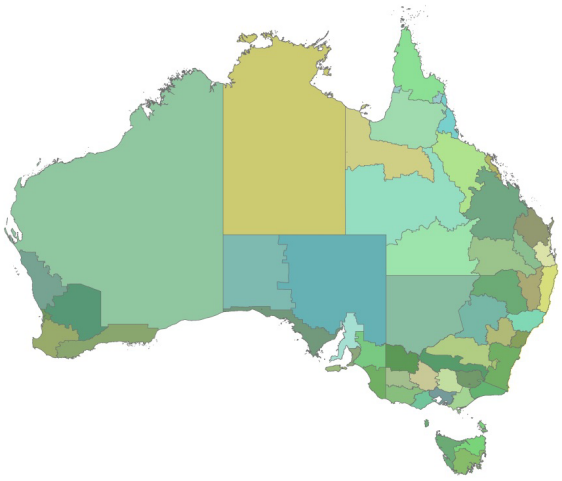

Figure 1. Current regional NRM boundaries (LLS boundaries shown for NSW)

NRM planning

There are several elements that provide a common basis for NRM planning and implementation across Australia:

- extensive collaboration and engagement with stakeholders in both planning and implementation activities
- evidence-based practice and use of research, best available knowledge and best practices
- an ongoing and increasing need to respond to uncertainty in several forms
- a focus on adaptive management, with monitoring and evaluation embedded within the planning cycle.

Adaptive planning is a core principle listed under the Queensland Regional NRM Planning Guidelines (Queensland Regional NRM Groups Collective 2012) and the Performance Standard for LLS (Natural Resources Commission 2014). Collaboration and effective stakeholder engagement are recognised as an essential component of both planning and implementation processes and are a requirement of funding provision (Australian Government 2012; Natural Resources Commission 2014; Queensland Regional NRM Groups Collective 2012). Properly undertaken, engagement provides legitimacy for activities undertaken by NRM bodies, and magnifies the extent and scope of activities that can be undertaken. Adaptive management provides the basic framework for NRM planning and management in Australia.

Queensland

History

There are 14 regional NRM bodies in Queensland, operating under a variety of structures. Unlike some other states, including NSW, NRM bodies in Queensland do not have a statutory basis or a standard governance structure. They are community-based, non-statutory, not-for-profit organisations. Regional bodies were formalised from community groups and catchment management organisations in response to the requirements of the NHT II program, and have continued to provide regional NRM based on funding from federal and state governments, program partners and investors. They have no ongoing formal responsibilities or reporting requirements under state legislation, and are independent from government.

State organisation

The Queensland regional bodies have formed a Regional Groups Collective (RGC), which is a peak body representing the interests of the 14 regional NRM group to improve delivery of NRM outcomes across the state. The regional bodies have also formed informal networks; for example, the Queensland Planners Network.

Regional NRM plans

Queensland regional bodies developed regional NRM plans and regional investment strategies as part of the requirements for accessing funding under NHT II. Various approaches have been taken to updating the plans across the state: for example, in the East Coast Cluster, Fitzroy Basin Association has not updated their plan, but relied on Reef Rescue funding; the Burnett-Mary Regional Group worked with the state government to develop an updated plan; while SEQ Catchments have updated their plan every 5 years to align with the statutory SEQ Regional Plan. Currently, all regions are updating their plans or writing plan addendums to incorporate climate change adaptation and prioritise

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New South Wales

History

Catchment Management Authorities (CMAs) were established in NSW in 2004 through the *Catchment Management Authorities Act 2003*. These 13 CMAs were established as statutory authorities, with boards reporting to the responsible minister. These CMAs replaced the previous 72 NRM committees. The Natural Resources Commission (NRC) Act 2003 established the NRC as a statutory independent body tasked with finding evidence-based solutions to NRM problems.

Local Land Services

In 2014, 11 Local Land Services (LLS) commenced operations, comprising the former CMAs, Livestock Health and Pest Authority, and the biosecurity and emergency management functions from NSW Department of Primary Industries. Under the Local Land Services Act 2013, LLS are responsible for 'for management and delivery of local land services in the social, economic and environmental interests of the State'. Funding for LLS comes from the federal and state governments, the charging of rates and levies of landholders, and individual fee for service arrangements. The investment of these funds is to 'deliver practice landscape management outcomes that reflect regional priorities and provide a triple bottom line return on investment (Natural Resources Commission 2014). While the former CMAs were established along catchment boundaries, the LLS largely follow local government boundaries.

Oversight of the LLS is by an independent local board of 7 members, 4 of whom are appointed by the government, and 3 of whom are elected by the ratepayers in each region (Western LLS is an exception, having 5 government-appointed and 4 elected board members). The Chair of each board sites on the state-wide Board of Chairs, which has its own independent Chair, and reports to the Minster.

The Natural Resources Commission

The Natural Resources Commission (NRC) was established under the *Natural Resources Commission Act 2003* to provide the NSW Government with independent advice on managing natural resources. The NRC advises the Minister on what is working, what needs improving and how NRM is tracking against their policies and targets. The NRC also promotes improvements in performance, governance and accountability and oversees their implementation in regional planning (Natural Resources Commission 2010). The NRC prepares the performance standard for regional NRM bodies (Natural Resources Commission 2014) and performs reviews and audits of the performance of NRM bodies.

Strategic Plans

A State Strategic Plan, effective for 10 years, will be prepared by the Local Land Services Board of Chairs. It will focus on triple bottom line outcomes and set the vision and priorities that will guide the development of local land services. A Local Strategic Plan will be developed by each regional LLS, effective for 5 years. Until Local Strategic Plans are developed, LLS will continue implementing the existing Catchment Action Plans. All regions in NSW recently updated their Catchment Action Plans, with final versions approved in 2012-2013.

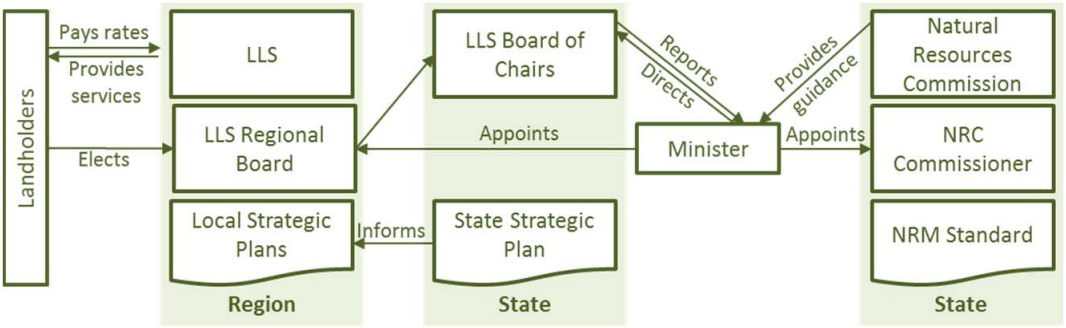

Figure 1. NSW regional NRM arrangements

Disaster and emergency management

Disaster: *A serious disruption to a community, caused by the impact of an event that requires a significant coordinated response by the State and other entities to help the community to recover.*

Disaster management is about managing the potential adverse effects of an event and includes arrangements for mitigating, preventing, preparing for, responding to and recovering from a disaster, as defined below.

- **Prevention:** The taking of preventative measures to reduce the likelihood of an event occurring or, if an event occurs, to reduce the severity of the event.
- **Preparedness:** The taking of preparatory measures to ensure that, if an event occurs, communities, resources and services are able to cope with the effects of the event.
- **Response:** Responding to an event to ensure that its effects are minimised and that persons affected by the event are given immediate relief and support.
- **Recovery:** Actions that support disaster-affected communities in the reconstruction of infrastructure, the restoration of emotional, social, economic and environmental wellbeing.

The National Approach to Managing Disasters

In Australia, the Commonwealth Government does not have the constitutional power to play a direct role in disaster management. Instead, the primary responsibility for emergency management falls to the local and state governments, and the Commonwealth Government provides support for the States in the form of coordination and resources in cases of major disasters, and support for the development of each State's disaster management capacity.

The Australian Government provides funding to help pay for natural disaster relief and recovery costs through the Natural Disaster Relief and Recovery Arrangements (NDRRA). A State or Territory may claim NDRRA funding if a natural disaster occurs for which state relief and recovery expenditure exceeds agreed thresholds (Australian Government – Attorney-General's Department 2011). Table 1 lists the disasters which the NDRRA does and does not apply to.

Disasters which the NDRRA applies to		Disasters which the NDRRA does not apply to	
• **Bushfire** • **Earthquake** • **Flood** • **Storm** • **Cyclone**	• Storm surge • Landslide • Tsunami • Meteorite strike • Tornado	• Drought • Frost • Heatwave • Epidemic	• Disasters resulting from: ➢ poor environmental planning ➢ commercial development ➢ personal intervention (other than arson)

Table 1. Disasters applicable to the NDRRA (Australian Government – Attorney-General's Department 2011).

Additionally, in 2011, the Council of Australian Governments (COAG) endorsed the National Strategy for Disaster Resilience, which recognises that a national, coordinated and cooperative effort is needed to enhance Australia's capacity to prepare for, withstand and recover from disasters. The Strategy provides guidance on disaster management to the Federal, State and Local Governments as well as business and community leaders. It recognises that disaster resilience cannot be sustained by governments alone and that responsibilities must also be shared with individuals, households, businesses and communities if successful outcomes are to be achieved.

State Emergency Services

The State Emergency Service (SES) is a national organisation of volunteers that assists the community in emergency and rescue service (NSW State Emergency Service 2013). There are 229 units located throughout NSW, comprising approximately 10,000 volunteer members and over 300 units in Queensland. The SES is the primary responder for flood and storm events, and also provide the majority of general rescue effort in rural areas. This includes road accident rescue, vertical rescue, bush search and rescue, evidence searches, emergency traffic management, urban search and rescue and community education. The SES also assists other emergency services, including the state Police forces, Rural Fire Services, Fire and Rescue and ambulance services.

New South Wales

In NSW, disaster management arrangements are based on the *State Emergency and Rescue Management (SERM) Act 1989,* which requires (Ministry for Police and Emergency Services 2012; Ministry for Police and Emergency Services 2013):

- The establishment of the State Emergency Management Plan (EMPLAN) to detail emergency preparedness, response and recovery arrangements for NSW to ensure coordinated response to emergencies by all agencies.
- The preparation of Regional Emergency Management Plans, and subordinate plans to ensure coordinated responses to emergencies.
- The establishment of EM Committees at State, Regional and Local Government Levels, which comprise representatives of emergency services organisations, government agencies and welfare services.
- Convening of the State Disasters Council to advise on emergency EM matters at the request of the Minister.

EMPLAN is the key element of emergency planning in NSW. The NSW EMPLAN places responsibility for disaster preparedness, response and recovery primarily at the local level, unless insufficient resources are available at the local level. In such a circumstance, local agencies are augmented by those at the regional level, and by the state level, where district agencies are still unable to cope (Ministry for Police and Emergency Services 2012). EMPLANs identify, for each type of emergency, the combat agency primarily responsible for controlling emergency response; specify the tasks to be performed by all agencies in the event of an emergency; and specify the responsibilities of the Minister, the State, the District or Local Emergency Operations Controllers (Ministry for Police and Emergency Services 2013).

In addition to the EMPLAN, Regional Emergency Management Plans are being developed to replace the previous District Emergency Management Plans. Regional EMPLANs are developed to ensure a coordinated response by all agencies that have responsibilities and roles in emergencies, and guide the coordination of other agencies in supporting the combat agencies. Additionally, sub-plans are prepared for specific hazards and supporting plans are prepared to provide support and assistance to combat agencies (Ministry for Police and Emergency Services 2012; Ministry for Police and Emergency Services 2013).

Local land services

Local Land Services (LLS) provide emergency support services where agriculture and animals are impacted, including natural disasters such as flood, bushfire, drought and biosecurity events involving plants, animals and pest insects such as locust plagues. LLS also work with landholders to improve their capacity to plan, prepare, respond and recover from disasters and emergencies.

Regional Disaster Plans

Emergency management regions have been established throughout NSW along with a Region Emergency Management Committee. The regions in the cluster are North Coast, Hunter-Central Coast, Sydney Metropolitan, North West Metropolitan and South West Metropolitan. Regional emergency management plans in the cluster include the Georges River District Disaster Plan, Lucas Heights sub-plans, Hunter Central Coast District Disaster Plan, Interim Plan - North Coast Regional Emergency Management Plan, Hawkesbury-Nepean Flood Emergency sub plan.

Disaster Recovery

The recovery phase of disaster management is often complex and costly, involving a wide array of groups. NSW EM arrangements emphasise the early commencement of recovery activity and community and stakeholder engagement. Following an emergency, an Initial Impact Assessment is completed. Recovery Plans (prepared in advance as part of planning processes) and the results of Initial Impact Assessments for the basis for detailed recovery action plans prepared following an emergency or disaster (Ministry for Police and Emergency Services 2012).

Emergency Management Committees at all levels are responsible for recovery planning. The State Disasters Council, established under the *SERM Act* includes a State Emergency Recovery Controller. A recovery operation aims, as far as possible, to assist the community to manage its own recovery (Ministry for Police and Emergency Services 2012).

Queensland

In Queensland, disaster management arrangements are based on a tiered structure that recognises four levels: local, disaster district, state and national levels (Figure 1). The *Disaster Management Act 2003*, which was reviewed in 2009, forms the legislative basis for disaster management activities within all levels of government in Queensland. In addition, several other key documents set out the State's approach to disaster management under the legislative responsibilities of the Act, including the State Disaster Management Plan (Queensland Government, 2013), the Queensland Strategy for Disaster Resilience (Queensland Government 2014), Disaster Management Strategic Policy Framework (Queensland Government, 2010), State-Wide Community, Economic and Environmental Recovery and Reconstruction Plan (Queensland Government 2011), and recovery plans developed for specific disasters (e.g. the Queensland 2013 Flood Recovery Plan). Collectively, these documents describe:

- the State's long term disaster management strategies
- the disaster management organisational structure
- procedures for mitigating and responding to disasters
- guidance to build disaster resilience
- guidance for community recovery
- guidance regarding the responsibilities of agencies at the district and local levels.

A series of guidelines also exists, including the Queensland Local Disaster Management Guidelines, Queensland District Diasaster Management Guidelines, Queensland Recovery Guideline and Queensland Evacuation Guideline.

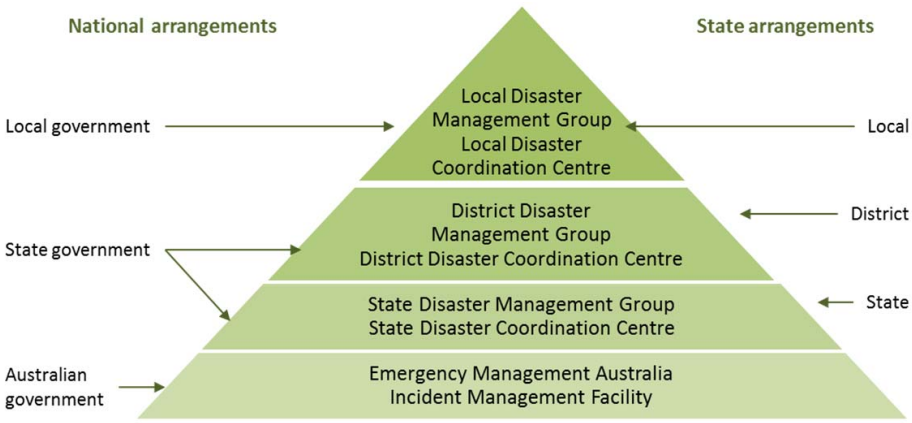

Figure 1. Organisational Structure of Disaster Management in Queensland

District Disaster Management Plans have been prepared for Brisbane, Bundaberg, Gladstone, Gympie, Maryborough, Rockhampton, Sunshine Coast, Logan, Gold Coast, Ipswich and Toowoomba. Local disaster management plans have also been prepared under the Act for most local governments in Queensland.

Queensland's disaster management arrangements are structured with disaster management groups (local, district and state) responsible for planning and implementation of measures to prevent, prepare for, respond to and recover from disasters; coordination centres (local, district and state) that support these groups in coordination for disaster operations; state government functional agencies; and state government threat-specific agencies.

Recovery operations are largely led by the state government, but a Local Disaster Management Group may appoint a Local Recovery Coordinator. There are several elements of recovery, each managed by a different government department. These are:

- **Human and social:** Department of Communities, Child Safety and Disability Services
- **Roads and transport**: Department of Transport and Main Roads
- **Building**: Department of Housing and Public works
- **Environmental**: Department of Environment and Heritage Protection
- **Economic**: Department of State Development, Infrastructure and Planning
- **Telecommunications**: telecommunications providers
- **Energy infrastructure, water and sewerage supply**: Department of Energy and Water Supply
- **Reconstruction monitoring:** Queensland Reconstruction Authority
- **Recovery coordination and monitoring:** Department of Local Government, Community Recovery and Resilience.

Special Cases

Disasters can occur in a number of ways besides those generated by extreme climatic events. Financial crises, pandemics, agricultural diseases and the loss of environmental assets can also undermine the social and economic structure of a region to the extent where a significant coordinated resonse is required to help the comminity to recover. Terrorism, shipwrecks, aircrashes or the release of toxic chemicals may present situations that require specialised responses. In these instances, the authority for the management of a disaster may be transfered to a better equipped or more informed agency. During these events, the Local and District DMG's may be called upon to support the responding agencies.

Risk assessment

The Queensland Government has also commissioned the 2012 State-wide Natural Disaster Risk Assessment (Risk Frontiers, 2011). The Risk Assessment describes the historical impacts of natural disasters in Queensland up to 2011. Tropical cyclones (including storm surge) and flooding are the most damaging natural hazards, and account for about 72% of building damage and 95% of fatalities for the period 1900-2011. Under one climate change scenario, the average damage cost of flooding in Brisbane could rise from $33m a year to $94m a year by 2050.

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IDENTIFICATION AND CLASSIFICATION OF DRIVERS

IMPORTANCE	UNCERTAINTY		
	Low	Medium	High
HIGH	Social licence to farm Population increase Extreme weather events Water availability – potable Change in biodiversity Consumerism increasing – has become a social value Energy – carbon based industries more extraction of coal, gas etc – cf switch to renewables Communication technologies – various applications e.g. disasters, environmental monitoring Population growth Urbanisation Ageing population – needs resources Global economic system – increasing connectivity, instability, increasing power of global companies Renewable energy technologies – cheaper, higher use in future, supply chain/ infrastructure Food security and demand – increased pressure on resources (global and national) Increased coastal development (national) Warmer heatwaves (global) Political unrest eg wars, terrorism -> decreased funds, increased migration and population increase (global, national, regional) Ongoing decline in biodiversity Improved information availability and sharing Impact of climate change on species -> geographic location and range Economic growth given greater priority than environmental protection (national) Majority of people within high populous countries become 'middle class' and increased consumers (global) water security (increased demand and decreased supply) increase CO^2 increasing population eucalypt dieback biodiversity loss and ecosystem change – weeds ecotones etc food security sea level rise storm surge floods tension over water bushfire GM	Biosecurity (fire ants, hive beetle) Change of government policy Information – mistrust institutions, use of social media, source of truth Social – community support for action on climate change (local -> global) Improved awareness of NRM in community Climate adaptation is prioritised Bipartisan support for climate change (global) Internationally agreed mitigation targets (global-> national) Decreased demand for coal and gas Geopolitical tensions Community support for NRM loss of pollinators Increasing inequality Vulnerable populations Energy security and balance Mental illness Green economy	Meteor strike or global cataclysm / pandemic Ocean currents affected by sea temperature change Artificial intelligence takes over Discovery or research investment in alternative energy New biosecurity threats to keystone species (national/ local) New technologies for carbon capture (national) Improved restoration technology Stress / fear / paranoia Governance Stewardship (increase) Economic instability Maturing approach to NRM prospering tourism

IMPORTANCE	UNCERTAINTY		
	Low	Medium	High
MEDIUM	Loss of high value agricultural land (intensifies) Land use intensification Change in land use and management Demographic change Ocean acidification Internal displacement (climate disasters) Carbon credits drive emission reduction Increasing disaster costs + frequency + severity Loss of ecological resilience – continued decline in environmental condition Major vegetation clearing Longer fire season (regional) Shifting demographics Infrastructure damage health	Consumer requirements for food Increase in climate variability Extreme climate disasters – tourism, risk in urban development, transport, agriculture Emergence of carbon farming as viable economic activity (global, national) Series of natural disasters (eg drought) -> shock people out of complacency (global, national, regional and local) More dependent population (regional and national) New modes of transport -> decreased fuel consumption, decreased landuse for transport, increased public transport (regional, local) Settlement patterns Disease Increasing philanthropy Urban heat island effect	Social values Fall of current political system (taken over by Fonterra) Global viral pandemic (zombies) Conflict – unknown importance based on location Constraints on agricultural nutrient supply Biotech – economy, energy Remote sensing technology Robotic technology – ecosystems, invasives control, economy
LOW	Gimmicks for NRM outcomes (apps, webinars) Australian debt reduction strategies Rise of celebrity cult worship industry: in rocks we trust Environmental markets – water offsets Refugees Increased technology for NRM monitoring eg LIDAR Economic decentralisation (increasing IT infrastructure etc) Sea level rise (global)	Political will – legislative change, policy change Lack of peak oil (global)	Lower birth rate / higher death rate (war, disaster, disease) -> decreasing population (global, national, regional, local) Streamlining of government across all scales (global, national, regional and local) -> decreased spending on bureaucracy, increased funding for action Free love

Text colours relate to responses made by different small groups participating in workshop

UNPACKING OF KEY DRIVERS

DRIVERS	LIKELY TRENDS	POSSIBLE SHOCKS AND SURPRISES
Regional conflict (SE Asia, Australia) E.g. climate refugees	Increase in conflict -> immigration to Australia from flooded islands. Increased pressure on natural resources: water, soil, forests etc. Increased political tensions Increasing conflicts due to a lack or scramble for natural resources	Regional partnerships develop out of crises or due to a catalytic crisis of regional proportions
New biosecurity threat to keystone species	More diseases and weeds infestation and spread leading to ecosystem change GMOs create unknown negative effects Free trade increases import of pests Increasing use of chemicals	Proliferation of a pest wiping out an important food crop Loss of key service e.g. such as mangroves resulting in collapse of fisheries Impact on pollinating species
Artificial intelligence taking over information systems	More efficient ecosystem management Loss of employment opportunities	Over-reliance leads to massive loss of information and knowledge
Lack of governance to deliver NRM	Less support for and interest in NRM Loss of biodiversity and ecosystem services Food shortages Water shortages Economic recession	Community uprising Anarchy The decline in ecosystem services is more rapid than predicted An amazing, solution oriented, green politician is elected
Climate disasters Increase infrequency and severity of climate impacts –disasters	Increasing extreme events = infrastructure and social costs Improved EM plans, disaster coordination Demographic shift- impact on regional economies Shift from recovery funding to preparation investment Increase in mental health issues Change in land tenure ownership- private/ rental	Global action on climate change (achieve targets) Dramatic change in global currents Dramatic shift in trends eg dramatic sea level rise The unexpected becomes the norm (e.g., ten year drought) Insurance costs force relocation Two tier social system-economically vulnerable can't protect themselves (e.g. by relocation or insurance).
New technology for carbon capture	Increased soil carbon contents as a result of agro-ecological practices eg holistic management Politicians grasp at new technologies and don't address the issues	Technology works Apathy towards environment e.g. trees Dramatic reversal of climate change

DRIVERS	LIKELY TRENDS	POSSIBLE SHOCKS AND SURPRISES
Change in ocean currents (affected by sea temperature)	Global ocean currents stop due to cold water input Conflicts arise over 'new' ocean tenure Infusing of cold water from glacial melt Southern oscillation is affected Collapse or other effect on fisheries	
Green economy (increase)	Shift to renewable resources- not happening locally Local food systems continue to develop and grow More farmers using agro-ecological methods and direct marketing	Strong move to a green economy
Internationally agreed mitigation targets	Increasing global governance New technology Larger ability of Australians to compete in engineering markets-geopolitical fallout implications	Australia gets its act together Shock to the coal industry Huge implication for Australia trade Australian ability to teach other countries to develop technologies to meet targets.
Discovery of rival alternative energy source	Price and viability of renewables increases Increase in cheap production- capacity to sustain increasing consumption patterns Delivery networks and infrastructure need changes New types of jobs	Fusion changes everything Technology change of energy source has even worse consequences for environment Disaster related to new energy source
Increasing use of robot rangers – robot solutions to NRM conundrums	Shift in workforce skill set – highly skilled labour Increased efficiencies Reduced human error Loss of connection to country Decline in capacity building Increased ability to detect environmental problems Increased ability to monitor resources/ communities and moving populations and respond Increased ability to monitor and shoot invasive species Increased compliance because robots are used for enforcements Improved management of some intractable issues (e.g., remote weed management) Change in employment unskilled (many) to skilled (few) Better monitoring to support the technology	-overwhelming success Adaptive intelligence Major energy crisis-reduced viability Malfunctioning technology and influences of extreme weather events-increase $ Reliance on system New application for technologies some with negative consequences Mechanism may not be able to disseminate potential impacts on beneficial species. Costs limits implementation Technology more applicable to production of NRM

DRIVERS	LIKELY TRENDS	POSSIBLE SHOCKS AND SURPRISES
Maturing approach to NRM (community support and NRM strategies) (more effective and mature management of environment – community values, improved practice, certainty of investment)	More community and government ownership for environmental protection Better outcomes – sustained ecosystem services Long term financial commitment to allow outcomes to be achieved Ecological accounting and reporting that recognises true value of environment – needs better methodologies NRM integration into mainstream business Improved valuation of natural assets and ecosystem services Impact on economic development and perceptions around it Changes in development techniques and patterns Increase in volunteerism	Underlying climate shift undermines the confidence that we can manage the system Land use conflicts and competing priorities e.g. water for agriculture or environment International market in biodiversity credits Dramatic shift in community attitude- positive and negative Recovery of ecosystems at broad scale Cat free Australia Increasing land use conflict Divided society Economic and cost of living issues
Reduction in demand for Australian coal	Reduced economic growth (short term) in oz New opportunities for technology to fill gaps (Oz) Economic impacts in customer countries (e.g. China) creates shifts on energy mix- global benefit in emissions Demographic shift (mining towns less viable) Demand increases for five years and then collapses Frenzy of infrastructure that nobody uses later Support industry collapse or shift towards renewables Need to retool people working in mines Social problems as a result of unemployment Diversification in energy technology Global ETS activities Shift in profits from coal- alternatives Increase in coal usage in Australia Reduction in NRM investment National economic and social shifts Decrease in review from mining operations Reliance on foreign supply Alternative uses for coal	New markets fill gap e.g., India for China Mining areas rehabilitated for other land use (e.g., biodiversity, agriculture/carbon price further reduce demand.) somebody finds a massive coal store NRM has an opportunity to rehabilitate mining holes Queensland government goes broke due to loss of revenue Negative economic and social shift Coal industry collapse Transition of coal mining regions-tourism and ecotourism Increased unemployment Steam powered public transport

DRIVERS	LIKELY TRENDS	POSSIBLE SHOCKS AND SURPRISES
Community focus on climate change and bipartisan support driving action	Impacts (driver) create concern / fear Social media (driver) builds a campaign Increasing pressure on politicians and decision makers to enact policy More constructed solution – seawalls etc. New building standards (e.g. flood zones etc.) Carbon pricing Increasing cynicism of population of government policies Good for the shade cloth industry Increasing local action by communities on climate change Greater use of alternative communication channels to disseminate information Greater focus on local and personal impacts and costs.	Another global economic crisis Loss of an icon eg Great Barrier Reef Climate impacts less severe than projected People vote for a government that supports climate change action Global climate action Inequity in costs and benefits from climate action and people suffer
Energy security and balance (supply and demand – how to respond)	Increase in global demand (population + increased affluence) Mixture – diversification including "dirty" energy: shale oil, tar sands, coal; and "renewable": biofuel and solar, wind etc. Potential land use conflicts Trade-off: cost / impact Continued reduction in demand Increase in cost due to reduced demand Growing reliance on renewables Energy storage technology improvement Instant charging batteries Deprivatisation of electricity assets and infrastructure Grid asset renewal and maintenance not viable Potential shift to nuclear	Carbon pricing – global Unacceptable environmental impacts eg China – air pollution Unacceptable choice – energy, plastics and other material use Global shifting of resources and energy Limitless global mobility and accelerated globalisation Viable fusion power Eco terrorism
Discovery of viable alternative energy source e.g. solar/home storage , hydrogen fuel cells	Recued demand for formal energy Perverse impact on people that don't have the disposable income to exploit technology –they face higher energy costs As alternative technologies become more cost competitive uptake would increase.	Unknown health impacts Public safety risks due to shabby installations Broad scale application not effective in meeting outcomes-loss of public trust Government could mandate use of new technology

Text colours relate to responses made by different small groups participating in workshop

SCENARIO: ANTHROPOCENTRIC

	Global	Australia	East Coast Cluster
Overall	Focus on adaptation as a reactive solution. Lack of investment in mitigation could mean that greater adaptive responses will be required. Inevitable loos in biodiversity and habitat. Widespread concern over climate change impacts on people Global economy	Focus on adaptation as a reactive solution. Lack of investment in mitigation could mean that greater adaptive responses will be required. Inevitable loos in biodiversity and habitat. NRM unimportant consideration in decision making and funding	Focus on adaptation as a reactive solution. Lack of investment in mitigation could mean that greater adaptive responses will be required. Inevitable loos in biodiversity and habitat.
Demography	There will be losses – climate refugees World population growing Lack of education for women in global south/opportunities/ services	Some demographic shift due to emerge or disappearing industries Ageing population Vulnerable people increase Reducing birth rate?	Some demographic shift due to emerging or disappearing industries Ageing population and sense of vulnerability
Environmental change	Cumulative degradation at a global scale. Increased temperatures, sea level change locked in Sea level rise threatening people Regular extreme events Changes in ecosystems not as apparent	Unpredictable, likely to undergo degradation as not the focus of investment Sea level rise threatening people Regular extreme events Changes in ecosystems not as apparent	Unpredictable, likely to undergo degradation as not the focus of investment Significant impacts from climate change events in region Changes in ecosystems not readily apparent in region
Economy	Shift in global economic balance – need to support emerging nations Actions are for economic reasons	New economic opportunities in applying new technologies + engineering. Some industries will become redundant Uranium takes over from coal as our major export Insurance unaffordable, focus on economic concerns and what climate change means for Australian economy	New economic opportunities in applying new technologies + engineering. Some industries will become redundant Uranium takes over from coal as our major export

	Global	Australia	East Coast Cluster
Technology and science	Technology transfer + environmental investment Capturing emissions at power stations Focus on engineering solutions to carbon storage, reductions and adaption	Reliance on engineering solutions – sea walls, carbon capture Capturing emissions at power stations Focus on engineering solutions to carbon storage, reductions and adaption Focus on solutions that support continued resource use (e.g. coal or nuclear)	Reliance on engineering solutions – sea walls, carbon capture
Governance and (geo) politics	Setting targets, sanctions and incentives for emerging countries See overall. Worldwide agreement on action and concern for humankind	Community concern on climate impacts drives political action Top down governance as a result – agreed projections and sea level rise engineering standards	Community concern on climate impacts drives political action Top down governance as a result – agreed projections and sea level rise engineering standards
Attitudes and values	Action on climate change but not necessarily focused on conservation – "direct action" thinking See overall. Focus + concern overwhelming on impacts on people	Risks are recognized and need for action. Focus on economic "quick fix" solution to protect their interests. Reliance on engineering solutions	Risks are recognized and need for action. Focus on economic "quick fix" solution to protect their interests. Reliance on engineering solutions

SCENARIO NARRATIVES

Future East Coast
The scenarios

Future East Coast - Creating the scenarios

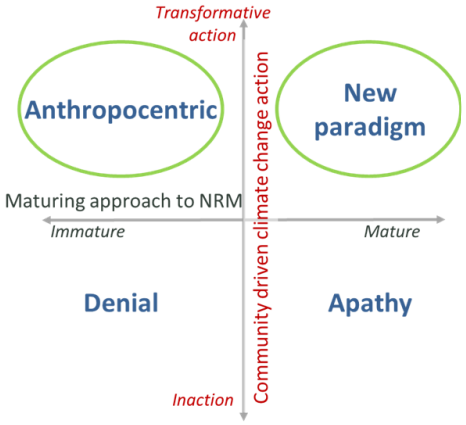
In traditional planning, we create a vision of a desired future, and create a plan for how to get there from the current state and predicted trajectory. However, when there is a high degree of uncertainty about the future, it can be useful to consider a number of alternative, plausible futures and evaluate plans and policies in light of those futures [1].

Plausible alternative futures can be developed by considering major drivers of change, and the impacts that these drivers may have on current trends associated with important themes and issues. The most significant drivers of change for the future of NRM planning for climate change were identified in the first scenario planning workshop by participants. Two were voted as being the most significant:

Maturing approach to NRM
Community driven climate change action

The drivers can be shown on two axes displaying a range of possible outcomes (Figure 1). The x axis describes a maturing approach to NRM, and ranges from an immature to a mature approach. The y axis describes the degree of community driven climate change action, and ranges from inaction to transformative action. Four quadrants can be seen in Figure 1, equating to low and high levels of each of the drivers of concern. The two that were selected for the development of more detailed possible futures are: 'Anthropocentric' and 'New paradigm'.

Anthropocentric: a high level of community climate change action, which in turn drives bipartisan political support and efforts at all scales to tackle climate change, with action heavily focused on human impacts, and little concern for or investment in NRM.



New paradigm: a high level of community climate change action, which in turn drives bipartisan political support and efforts at all scales to tackle climate change, with climate change action hand-in-hand with increased focus on NRM, manifest through increased community concern and action, as well as improved institutional and governance arrangements.

Figure 1. Axes showing variations in the most significant drivers of change, and the four possible scenarios.

Box 1: The problem with uncertainty

Uncertainties about the future are a primary obstacle to planning for the future. While trends provide some indication of how issues might develop in the future, they are not guaranteed. The unforeseen has shaped our recent development in ways that could not be imagined twenty years ago. For example, the World Wide Web saw its first web site go online in 1991. The impact of technological advances such as gene therapy, GPS, DVDs, cloning, commercial space flights and mobile phones were yet to be realised. Social, political and economic events created sweeping changes across the world. Communism in Europe collapsed, as did apartheid in South Africa; the development of participatory governance occurred over this period; GFCs and 9/11 were not foreseen; while the Boxing Day Tsunami and Hurricane Katrina reminded us of the surprises nature can still provide. Planning for the future requires the flexibility and resources to respond effectively to the uncertainties that will continue to drive change in the future.

Current climate

The East Coast Cluster is predominantly sub-tropical, with the northern regions experiencing some tropical conditions and the southern regions some temperate conditions[1]. Mean temperatures in the East Coast North vary from around 15°C in July to 26°C in January, with minimums in July of about 8°C and maximums in January of around 33°C (Table 1). In the East Coast South, mean temperatures vary from 10°C to 22°C, and minimum and maximum temperatures from 4°C to 28°C [2]. The whole cluster experiences greater rainfall in summer than winter, although the difference is less pronounced in East Coast South due to greater temperate and less tropical influences (Figure 1).

Table 1. *Average summer and winter temperatures in East Coast North and South.*

	East Coast	
	South	North
Average July minimum	4	8
July daily mean	10	15
January daily mean	22	26
Average January maximum	28	33

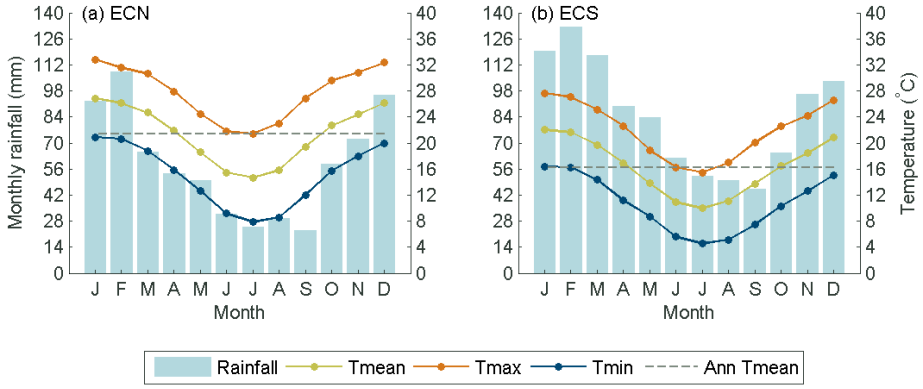


Figure 1 *Rainfall and monthly mean temperature (minimum, mean and maximum) for East Coast North (a) and East Coast South (b) for 1966-2005. Ann Tmean is the annual average of mean temperature (21.4°C for ECN and 16.3°C for ECS). Data are from Australian Water Availability Program.*

[1] All information in 'Current climate' and 'Climate projections' sections sourced from [3] unless otherwise indicated.

Climate projections

Key messages

Average temperatures will continue to increase - more hot days and warm spells, fewer frosts

Decreases in winter rainfall in East Coast South.

Extreme daily rainfall events more intense

Sea level rise continues, height of extreme sea-level events will also increase

Harsher fire-weather climate

Models and RCPs

The climate projections are based on a set of 40 global climate models (GCMs), complemented by regional modelling and statistical downscaling. The projections are based on four Representative Concentration Pathways (RCPs), which represent future trajectories of greenhouse gases.

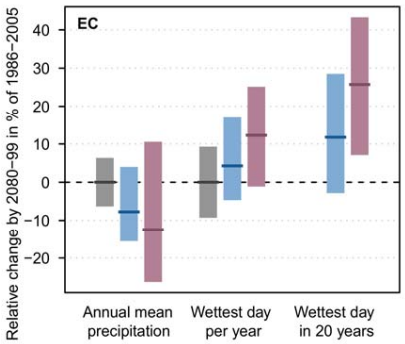
- RCP 8.5 - high emission scenario
- RCP 4.5 - intermediate scenarios with moderate emission reductions
- RCP 2.6 - low emissions from significant global emission reductions.

Temperature

Temperatures increased across the cluster by about 0.8°C in the south and 1°C in the north between 1910 and 2013. The rate of warming has been higher since 1960. By 2030, temperatures are projected to be about 0.4 to 1.3°C higher than the climate of 1986-2005, depending on the RCP used (Table 2). There will be a corresponding increasing in the number of hot days, maximum temperatures and duration of warm spells, and decrease in frost days.

Table 2. *Projected temperature change compared to 1986-2005 for 3 RCPs: median (10^{th} – 90^{th} percentile)*

	RCP		
	2.6	4.5	8.5
2030	**0.8** (0.4-1.1)	**0.9** (0.6-1.2)	**1.0** (0.6-1.3)
2090	**0.9** (0.5-1.5)	**1.9** (1.3-2.5)	**3.7** (2.7-4.7)



Rainfall

Changes to rainfall patterns are unclear, but it is likely that there will be less rainfall in the south in winter. The change for the north of the cluster is unclear. The intensity of heavy rainfall events is also likely to increase, and there may be an increase in the frequency and duration of drought. Increased evapotranspiration rates are likely to lead to reduced soil moisture and reduced runoff, but more detailed hydrological modelling is needed. It is also likely that the changed climate will result in a harsher fire-weather climate.

Sea level rise

Sea level rose at an average rate of 1.4 mm per year between 1966 and 2009. The predicted sea level rise for the East Coast is 0.08-0.19 m above the 1986-2005 level by 2030. An allowance can be calculated that represents the minimum distance required to raise an asset to maintain the current frequency of breaches, taking into account the uncertainty in the projections. For 2030, the allowance is between 13-15 cm. Oceans are also predicted to continue to acidify, affecting the ability of marine organisms to calcify. pH has decreased by 0.1 pH unit over the last 200 years, and is projected to fall by 0.08 pH units by 2030.

Population trends

Population

The East Coast Cluster covers a large area of the eastern Australian coast, and includes a variety of landscapes, cities and towns. The population of the cluster in 2012 was around 9.5 million people. The cluster includes 5 of the 10 largest urban areas in Australia, and includes more than 42% of Australia's population. Accessibility and remoteness in the cluster ranges from major cities through to very remote. The population is highly concentrated in the major urban centres and towns.

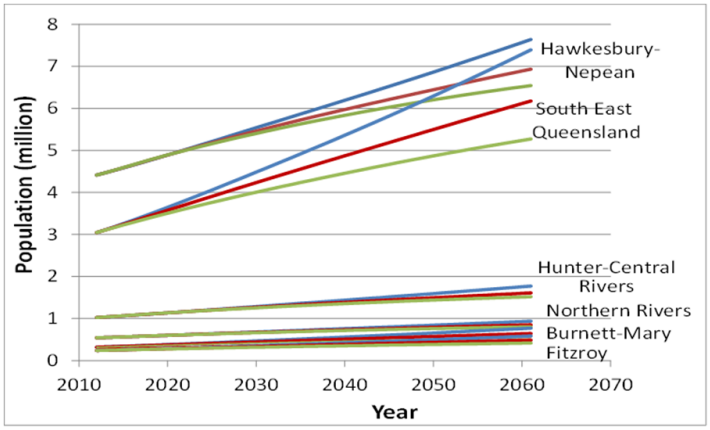


Figure 2. *Population projections for each of the regions to 2070.*

The ABS provides estimates of future population growth based on a range of assumptions about lifespan, rates of fertility and immigration, for all Australian states and territories [3]. The high (A), medium (B) and low (C) series for Queensland and NSW were used to estimate regional population growth, based on the percentage of the state population in each region. The cluster population is estimated to increase from about 9.5 million people in 2012 to 12.5 million in 2031, and 16.7 million in 2061, under the medium range estimates (Figure 2).

Under the medium scenario, the NSW population is expected to grow by 25% in 2031 and 57% in 2061; the Queensland population by 41% in 2031 and more than double (103%) in 2061. Population age structure varies across the cluster, with a relatively higher percentage of 20-39 year-olds in capital cities, and a relatively higher percentage of people above 70 in more rural and coastal areas.

Scenario narratives

Background climate narrative for both scenarios

2016 is known as the year that changed the debate on climate change in Australia. The climate appeared to go mad, with a series of multiple disasters all across the country. Floods, droughts, severe storms, extreme heat waves and extensive bushfires seemed to march unending across the country (and indeed the globe), sometimes simultaneously. The massive damage provoked a concerted response from all; the whole country demanded immediate, effective and extensive action on climate change, NOW. However, the responses in the two scenarios were quite different.

Anthropocentric scenario

Characterised by a high level of community driven climate change action leading to political support and efforts at all scales to tackle climate change, but with little investment in or concern for NRM.

Likely trends leading to a future East Coast over the next twenty plus years

Demography

- Ageing population
- Population growth resulting from immigration; birth rates low
- Population concentrated in cities away from vulnerable areas
- Vibrant city culture and increased services due to population concentration.

Urban development and Housing

- Movement away from the coast (storm surge and flooding) and inland areas (heatwaves), concentrating population in medium to large cities.

Environmental change

- Significant impacts from extreme events on sensitive ecosystems not rehabilitated
- Natural assets under pressure from development and agriculture; lack of concern for ecosystem services.

Economy

- Employment relatively high and stable due to large government workforce
- Economy generally performing well and incomes high
- Cost of living and energy cost increases

Technology

- Focus on engineering solutions to climate impacts.
- Development of nuclear industry.

Community

- Community burnout and disengagement widespread
- Population movement into cities led to loss of social cohesion
- Volunteer rates down; more reliance on government

+ POSITIVE TRENDS

- Risk assessment approaches are common, leading to improved understanding of likely impacts
- Some decreases in emissions; remaining emissions largely mitigated
- Most of the population protected from climate change impacts by engineering solutions
- Many people feel secure as their lifestyle can remain relatively unchanged
- Employment is high and economic conditions are generally good
- Some marginal agricultural lands that have been abandoned may regenerate

− NEGATIVE TRENDS

- Limited flexibility in application of NRM funding leads to narrowing focus
- Sensitive ecosystems lost due to extreme events
- Low rates of volunteerism and funding along with low rates of support for NRM
- Water conflict intensified due to ongoing droughts and floods
- Lack of community involvement in decisions leading to centralised decision making
- Reduced focus on environment leading to a double bottom line approach – economy and people only are considered

Anthropocentric narrative

In the anthropocentric scenario, the deadly nature of the disasters has led to a focus on saving human lives and preserving lifestyles, and there is a growing perception of nature as an 'enemy', to be fought at all costs. The widespread nature of the disasters meant that there were nearly as many people impacted as not, and there were not enough volunteers and donations to go around. Failure to mobilise as a community led to a general disengagement from civic and community life, and increasing centralisation of service provision. Coordination and communication among the community is generally poor [4]. In the wake of the disasters, local and state governments employed large numbers of people in the clean-up and relief efforts, creating a public service workforce that could not easily be disbanded in a time of general economic hardship. The public now looks to the various levels of government to solve problems, and public affairs are increasingly viewed as 'someone else's business' [5]. Policy formation is centralised, change is slow, and decisions are largely reactive [6, 7]. The focus on reactive management has limited learning about the broader system and reduced the ability of government to manage adaptively [8-10].

Australia's population is increasing and ageing. The proportion of the population aged 65 years and over has increased from 14 % in 2011 to 23% [11]. However, changing working models mean that many people over 65 are engaged in part-time work, and are slowly transitioning out of the workforce instead of retiring [12], further reducing the available pool of community volunteers. The gradual decline in the birth rate since 2008 has continued [13], but the total population of Australia has increased due to an influx of climate change migrants and political refugees.

Population concentrated in cities: vibrant city culture, high employment and incomes.

Engineering solutions protect settlements

Even more dramatic than the changing demographics, is the changing spatial distribution of the population. The heat waves were particularly harsh in inland areas, leading to increased emigration from these areas, while the storm surge and flooding resulting from severe sub-tropical storms resulted in a general move away from the immediate coast and flood-prone areas. The population is now concentrated in the large cities, which are 'protected' by engineering solutions including sea walls and flood barriers. Unfortunately, these are prone to sudden failure and have had negative impacts on nearby areas that are not protected.

The focus of climate change action is on risk assessment and cost-benefit analysis of economic impacts, and there is a general reliance on engineering solutions and solutions that support existing consumption patterns and resource use, and constraints to experimental approaches [14]. Emissions have declined slightly, but are partially mitigated by carbon capture and storage [15] and large monoculture carbon farming plantations [16]. The renewable industry declined following a series of

Extreme events impacted renewable industry

wild storms [17] with massive hail that smashed solar panels and super wind gusts that damaged wind turbines in several locations. Coal fired power stations still dominate energy production, but nuclear power plants are beginning to be built [18]. Most people believe that continued emissions are essential to maintaining the lifestyle to which they are accustomed, but that technological fixes can 'mop up' excess carbon to reduce impacts [19]. Projected impacts are highly uncertain, as carbon capture is heavily subsidised [20] and the long-term effectiveness of sequestration in an era of frequent bushfires is unknown [16, 21]. Global demand for coal is down due to the agreed emission targets [22], and uranium is Australia's major export.

Focus on carbon capture and nuclear power rather than emission reduction.

However, the economic outlook is good. The reliance on hard solutions and large public sector workforce has led to high levels of employment, relatively high incomes and a positive outlook. Most sectors of the economy are booming. Social life is also generally positive, with the increased population density in the cities leading to an increase in cultural and social activities. Generally, people are employed, have good incomes, and spend their leisure time and money on entertainment.

Biodiversity and natural resources have continued to decline. Many sensitive ecosystems were impacted by the 2016 disasters, and the focus on human life and lifestyle has meant there has been little attempt at rehabilitation or recovery. The population 'squeeze' has contributed to further habitat losses, and some marginal agricultural areas have been deserted. Areas adjacent to the major cities are intensively farmed, with a combination of intensive agriculture and feed lots, while areas further away are dedicated to carbon farming, primarily quick growing monocultures. The focus on immediate costs and benefits in dollars has meant that natural systems providing ecosystem services are considered unimportant compared with intensive food production and urban development. Water conflict has intensified [12]; water resource allocation is tightly controlled by government and allocations tend to be political.

Food production maintained through intensive agriculture and feed lots.

There is therefore little concern for, or investment in, natural resource management. The NRM functions of government have disappeared from most departments, and exist now to manage contracts with the independent NRM bodies to deliver NRM outcomes [23]. However, the consistent defunding of NRM bodies, along with a decline in volunteerism and community groups as a result of focusing on 'the war on climate change', has left regional NRM bodies with few resources and even less political or community support. What support there is, is strictly tied to climate change actions, leaving regional bodies with little flexibility and the dilemma of balancing financial stability with independence, and the need to respond to ever more detailed audits [6, 24].

New Paradigm scenario

Characterised by a high level of community driven climate change action leading to political support and efforts at all scales to tackle climate change, along with increased focus on natural resource management, manifest through increased community concern and action, as well as improved institutional and governance arrangements.

Likely trends leading to a future East Coast over the next twenty plus years

Demography
- Population growth stabilised
- Lower levels of workforce participation
- Population spread among many regional towns

Urban development and housing
- Increased sharing of common resources
- Focus on net zero houses
- Mixed landuse in regional towns with a focus on meeting needs locally

Environmental change
- Rehabilitation of impacted ecosystems progressing to improve resilience through ecosystem services
- Mixed farming is common
- Focus on managing ecosystems for multiple ecosystem services

Economy
- Incomes low; decline in formal economy
- Sharing economy prevalent, especially for innovative good practice
- Some sectors e.g. retail significantly reduced

Technology
- Advances in sustainable technologies and eco-innovation, including renewable energy and storage and agricultural technologies

Community
- High levels of volunteerism; high reliance on volunteers to provide services
- Community is politically engaged; effective consultation required on all policies

+ POSITIVE TRENDS

- Improved governance models resulting in improved communication and reduced silo mentality
- Increased community input and involvement should lead to improved capacity and social resilience
- Regional focus can improve local knowledge and management and lead to policy solutions well adapted for each location
- The focus on broader indicators of progress contributes to better understanding of links between environment, social and economic

− NEGATIVE TRENDS

- Some business sectors have collapsed or declined significantly e.g. insurance, retail
- Strong reliance on community volunteers may result in reduced government provision of services over time
- Need for extensive consultation may result in delayed responses or policy change
- Reduced travel between regions could result in insularity and parochial thinking
- Multiple regional approaches to innovation may lead to lack of consistency that inhibits take-up of best solutions
- Some people may feel disenfranchised as the shift in values means their skills are not desired

New paradigm narrative

In the 'new paradigm' scenario, the community responded to the climate disasters of 2016 by banding together to form local and regional volunteer recovery groups. The groups were supported by all levels of government, and maintained effective and coordinated communication between groups. 'We'll do it together' became the rallying call for the year, as the community organisations and relationships formed in response to initial impacts were cemented and developed in subsequent emergencies [4]. The community response was in part necessitated by a general collapse of the insurance industry, resulting in greatly reduced payouts and public distrust of big business. As the recovery continued, community focus turned to the need for a rapid transition to carbon neutrality and the need to rebuild in ways that both adapted to, and mitigated, future climate change impacts [25-27].

Strong community response to disaster and high levels of volunteerism.

The population of Australia has increased, primarily due to immigration, but is beginning to stabilise as the flow of climate migrants slows. The population is more evenly distributed spatially than currently, and many regional towns have developed along the coast and the fertile hinterland. The regional towns usually include a thriving town centre, which is the hub of community activity and small businesses, government functions, trading markets and communal offices for teleworkers. Volunteerism and community groups are common, as the community recovery organisations have prospered. Few people work full-time now; the overall availability of jobs is down, and people spend more time on other activities [28]. Many people divide their time between family, work, community service, and local food production, although there is little time for relaxation per se [24]. The formal economy has declined; incomes and discretionary spending are low, resulting in a marked reduction in sectors such as retail.

Population spread through local towns with town centres, although employment is low.

Focus on passive design and zero carbon building.

Concerted effort following the climate disasters led to a rapid reduction in greenhouse gas emissions. Rebuilding and recovery efforts focused on building to new zero carbon standards [25, 26]. Passive design has become the new focus of renovation reality shows, and 'Grand Designs' has become 'Green Designs'. After nearly 20 years, the remaining low level of emissions is offset through revegetation that also provides habitat and biodiversity co-benefits. However, as the long-term effectiveness of carbon sequestration is still uncertain [16, 21], a strong push remains to eliminate emissions entirely. Renewables and energy storage technology has boomed, and most regional towns rely on decentralised 100% renewable energy [29]. The mitigation effort in Australia was mirrored around the world, with the linking of the emission trading schemes of most countries [27].

Australia is a world leader in sustainable technologies, including renewable energy and storage, sustainable agriculture, carbon farming and habitat rehabilitation (eco-innovation in general) [25, 26, 30]. There is a focus on sharing good practice. There has been a focus on developing local agriculture and food supplies that are well integrated with the provision of ecosystem services and retention of habitat for biodiversity. Landuse is managed in a way that matches and maximises land capability, rather than historical land uses. Mixed farming is common, particularly in the fertile areas with good soils that provide more farming options [31]. Sophisticated technology and monitoring systems are used to provide immediate feedback and maximise agricultural outputs. Crops are more diverse and include native foods as well as pharmaceuticals and fuels [32]. Areas that were worst impacted by the disasters (coastal foreshores, floodplains and hot inland areas), are gradually being rehabilitated to improve their supply of regulatory ecosystem services [33]. Tourism is still important, although spending rates are lower than previously [34].

Focus on mixed farming and integration with biodiversity and ecosystem services.

NRM institutions offer a prime example of improved governance models. Regional NRM organisations are independent, and receive relatively high levels of funding (independent of election cycles) and high levels of cooperation from local community groups. Cooperation between regions has also improved, and regions work together to analyse different approaches under an experimental framework, dramatically increasing the effectiveness of adaptive management [6, 8 , 10 , 14]. There is general acceptance of the roles that biodiversity plays in contributing to wellbeing [8], and regional NRM plans and implementation are seen as a high priority and integrated into most government services and community plans. There are also serious attempts to move towards proactive, anticipatory management of ecosystems as a means to improve the ability to cope with continually changing conditions [8], although this is still in early stages. Government in roles and responsibilities are clearly defined, along with objectives and evaluations for policies [10]. There has been a gradual move towards greater consideration of wellbeing impacts over economic impacts, and a reduced influence of big business on government. The community is highly engaged politically and effective consultation is regarded as an essential part of any policy making process [35].

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STRATEGIES FOR TESTING

STRATEGIES/ POLICIES/ TARGETS

Vertebrate pest management

1.1.1 Plan and coordinate priority regional approaches to vertebrate pest management

1.1.2 Raise landholder and community awareness of vertebrate pest issues

1.1.3 Provide advice and training; and control pests with landholders (and groups)

1.1.4 Develop and support vertebrate pest management groups

1.1.5 Compliance

1.1.6 WHS and Staff Training

1.1.7 Monitor and review vertebrate pest management

Pest plant management

1.4.1 Support/co-ordinate regional approaches to weed management, including development of a Regional Weed Management Strategy

1.4.2 Invest in weed management programs with key stakeholders in line with regional strategy

1.4.3 Prevent spread of weeds through containment lines, managing new incursions and outlier populations

1.4.3 Support and promote Bushland/Landcare programs

Priority waterway restoration

3.1.1 Identify priorities for investment

3.1.2 Develop incentive projects for implementation

3.1.3 Promote and disseminate educational resources for waterway management

3.1.4 Develop targeted and strategic cross tenure riparian weed programs

3.1.5 Build partnerships with local government, agencies and community

Improving urban waterways

3.2.1 Develop partnership projects with local government and agencies using incentive funding

3.2.2 Support capacity building initiatives for best practice urban waterway management

3.2.3 Support initiatives to minimise adverse landuse and recreation impacts on urban waterways

3.2.4 Support and promote Bushland/Landcare programs

Increase the extent and connectivity of native vegetation

4.1.1 Identify priority locations for rehabilitation

4.1.2 Establish partnerships with key land managers to support rehabilitation projects

4.1.3 Deliver rehabilitation projects through partnership and incentive programs

4.1.4 Raise awareness of priority vegetation management issues through education and training

4.1.5 Support and promote Bushland/Landcare programs

Protection and restoration of key biodiversity assets

4.2.1 Identify key biodiversity assets for management

4.2.2 Identify key threats to priority assets

4.2.3 Establish partnership projects with key land managers to reduce threats or recover assets

4.2.4 Deliver incentives to land managers to implement threat management projects

4.2.5 Support education and awareness initiatives on threats to biodiversity

4.2.6 Support and promote Bushland/Landcare programs

Objective 1: Support customers to make informed decisions in relation to biosecurity, agricultural production, natural resources and emergency management

Action 1.3: Deliver information products that are evidence based and adaptive to existing and emerging risks

Objective 2: Implement extension and advisory services to increase the economic, social and environmental viability of agriculture, fisheries and natural resources.

Action 2.1: Work with customers and targeted groups to understand their extension and advisory service needs.

Action 2.3: Deliver extension and advisory services that are integrated, evidence based and adaptive to risks including climate change.

Action 2.6: Invest in priorities for natural resource management assets including threatened species, strategic native vegetation, important water quality outcomes and priority sites for rivers, estuaries marine and soil outcomes.

Objective 3: Build capacity of landholders to prevent, prepare for, and respond to, biosecurity and natural disaster events.

Action 3.1: Provide advice and support services to assist communities to prevent, and prepare for, biosecurity incidents and natural disaster emergencies.

Action 3.7: Provide support to the effective operation of the Hunter Valley Flood Mitigation Scheme.

Objective 4: Develop effective partnerships with stakeholders (public, private and community), to deliver better outcomes

Action 4.5: Optimise integration of investor, stakeholder and customer priorities.

Objective 6: Support research in priority knowledge gaps and facilitate two-way communications with land managers to enable improved practices

Action 6.2: Work with research organisations to address knowledge gaps and prioritise research and development projects.

Action 6.3: Support landholders and stakeholders to undertake applied research and development trials to improve practices in managing their enterprise.

Action 6.4: Disseminate research and development outcomes through advisory and extension services to facilitate on-ground practice change.

Objective 7: Support Aboriginal people to care for Country and share traditional land management knowledge.

Action 7.3: Develop long-term community projects that deliver employment outcomes for the Aboriginal community.

Action 7.4: Encourage the Aboriginal community to develop partnerships with other stakeholders through facilitation and negotiation of proposed projects.

Objective 7: To support and enable Aboriginal customers to implement practices that care for Country and adopt traditional land management practices

Strategy 7: Deliver services that support Aboriginal people to care for Country and share traditional land management knowledge

Action 7.1: Use Aboriginal contemporary and traditional knowledge of land management to underpin advisory and capacity building programs

Objective 9: To effectively manage Crown lands and travelling stock reserves, consistent with best practice.

Strategy 9: Care for, control and manage Crown land vested in Local Land Services for environmental, social and economic 0utcomes

Action 9.3: Provide a proactive and engaging approach to managing community attitudes, expectations and perceptions with respect to Crown land use.

Objective 11: To ensure that NCLLS continues to improve its service delivery and has a strong culture of learning and adaptive management within the organisation and statewide across the LLS organisation

Strategy 11: Foster a values-based culture which emphasises collaboration, innovation and continual improvement

Action 11.4: Implement contemporary strategic and investment planning processes that integrate service delivery and create value for customers, stakeholders and investors.

Goal 1: Adapting to a changing climate:

Fostering capacity to adapt to change, ensuring landholders are informed and working towards resilience.

Strategy 1: Deliver information and knowledge services that support and enable customers to improve decision making.

Action 1.1: Extension programs fostering capacity to adapt to change (relate to "change" generally, rather than climate change only).

Goal 6: Adapting to a changing climate

Remaining flexible and open to future scenarios - monitoring emerging climate futures in our region

Strategy 6: Connect research and development with agriculture advisory services to address knowledge gaps and barriers to improving practice

Action 6.2: Develop citizen science programs for monitoring what climate futures are emerging in our region

Threshold: Waterways

Scheduled water quality objectives for all SEQ waterways will be achieved or exceeded by 2031.

Local action:

1.1 Stabilise actively eroding gullies and creek banks (channel erosion) in priority sub catchments particularly in areas that are key sources of sediment44 (Map 1.0).

1.2 Decrease runoff (hillslope erosion and landslip) by strategic revegetation and restoration in priority sub catchments (Map 2.0).

1.3 Implement current salinity management plans in key sub catchments: Roadvale; Black Snake Creek; Woolshed Creek.

Planning action:

1.4 Use Map 1.0 and 1.1 to prioritise Catchment Action Planning and implementation as part of the development of Catchment Action Plans for the 19 Sub Catchments in SEQ (SEQ Regional Water Quality Improvement Plan).

1.5 Recognise salinity as a land use management issue in Planning Schemes (Lockyer Valley Regional Council case study).

Threshold: Bushland

Remnant vegetation cover of 35% (minimum) across the region.

Local action:

2.1 Support management and revegetation in strategic areas (Map 2.0). This will contribute to multiple outcomes for connectivity, habitat and water quality. Priority activities: Management of regrowth vegetation; Revegetation; Pest and Weed Management; Fire Management

2.2 Manage areas of poorly conserved regional ecosystems especially in strategic areas (Map 2.1).

Planning action:

2.3 Plan to maintain core bushland areas (Map 2.0).

2.4 Develop management plans for the 35 poorly conserved Regional Ecosystems (Map 2.1). Moreton Sub BioRegion is a priority area for management of poorly conserved ecosystems.

Threshold: Beaches

Local actions:

3.1 Provide managed access to beaches by fencing sand dunes.

3.2 Manage remaining intact dunes and related vegetation (refer to shoreline erosion management plans where available).

3.3 Revegetate high energy beaches.

3.4 Promote compatible recreational use.

Planning action:

3.5 Undertake systematic conservation planning and action for beaches and dunes that recognizes the ecological values and process of beaches and establish a network of protected areas that encompass beaches and their associated surf-zones and dunes across the region.

Threshold: Farmland

Target by 2031 is no greater loss than 10% of this area which would ensure at least 1,272,766 ha (90%) of A, B and C Class lands remain.

Local action:

5.1 Maintain and enhance productivity of farmland through promotion and adoption of best management practice supported by:

- Property Management Planning (PMP)
- Grazing Land Management (GLM).
- Growcom Farm Management System Modules
- Other industry Best Management Programs as appropriate.

Planning action:

5.2 Maintain extent and productivity of Agricultural Land - Implement the Guiding Principles for Planning for Agriculture in Queensland (QFF 2012). 5.3 Focus planning and best management practice in high priority areas for water quality (Map 1.0).

Threshold: Seagrass, mangroves and saltmarsh

Seagrass (as at 1998) 18,391ha Mangrove (as at 2001) 22,590ha

Local action:

7.1 Provide Environmentally Friendly Moorings particularly high density seagrass areas (Map 7).

Planning action:

7.2 Undertake catchment management planning as part of a Water Quality Improvement Plan for SEQ to reduce sediment from urban and rural areas (Map 1.0).

7.3 Plan land use in areas needed for mangroves and other critical habitats to retreat from sea level rise (Map 4.0).

7. 4 Consider the potential impacts on the Moreton Bay Marine Park boundaries from sea level rise to ensure RAMSAR and economic values remain into the future.

Threshold: Community

Community capacity and resilience to shocks and longer term changes have been measured based on: a. Volunteer participation b. Natural Resource Management activities on agricultural land c. Index of Socio- economic Advantage and Disadvantage d. Leverage on investment provided by the community

Actions:

10.1 Provide support to community and land managers through extension, workshops and field days.

10.2 Provide the resources for the community and land managers to undertake actions in this Plan.

10.3 Diversify economies where possible as dependency on a narrow range of industries or natural assets increases vulnerability and reduces the capacity to adapt to changes(Map 10). Local Government Plans and Regional Development Australia Roadmaps provide guidance and direction.

Land and sea country values that focus the guardianship of Aboriginal people in the Burnett Mary region are widely acknowledged across the entire community.

2020 Target 3

Regional Councils, State Government agencies and other major land and sea -management agencies recognise and respect cultural heritage values in their urban planning and NRM related processes and have established working relationships with Traditional Owners.

Traditional Owners have established partnerships with all levels of government that result in:

- *documentation of the cultural landscape of their region*
- *established local forums that facilitate incorporation of Aboriginal cultural landscape values in statutory planning initiatives*

Traditional Owner, custodian-prioritised list of heritage management issues to address.

The region makes an equitable contribution to state and national air quality targets and mitigation measures to reduce the atmospheric carbon level.

2020 Target

Participation in schemes that encourage bio-sequestration, using the carbon storage capacity of soils and vegetation, will exceed the 2015 baseline.

Primary producers and other land managers will participate in and benefit from their involvement in carbon farming initiatives.

The region makes an equitable contribution to state and national air quality targets and mitigation measures to reduce the atmospheric carbon level.

2020 Target

Regional initiatives to reduce greenhouse gas emissions and atmospheric carbon releases will exceed 2015 levels.

There will be increased uptake of emissions avoidance initiatives and an improved regional understanding of the issues of atmospheric carbon pollution, projected climate change scenarios and measures - at local and international scale - undertaken to address these concerns.

Land condition will be maintained or improved.

2020 Target 4

Sheet erosion risk, stream bank erosion risk and gully erosion extent and severity are reduced by 10% compared to the 2015 baselines.

Land productivity is maintained and damage to infrastructure is reduced. Nutrient and sediment loads in streams will be reduced by 20% to support the Reef Plan.

Terrestrial ecosystem condition, extent and connectivity will support constituent species and maintain landscape processes.

2020 Target 1

The region's suite of terrestrial ecosystems will be maintained at 2015 levels with improved opportunities for sustaining constituent communities and species' populations, particularly those that are threatened.

No terrestrial ecosystems have been lost from the regional suite and there are improved survival prospects for the most vulnerable communities and species.

Terrestrial ecosystem condition, extent and connectivity will support constituent species and maintain landscape processes.

2020 Target

The condition of terrestrial ecosystems will be maintained at the 2015 baseline through reductions in the negative impacts of invasive pest animals and weeds and inappropriate fire management regimes.

Processes that threaten the condition of terrestrial ecosystems are addressed to maintain ecosystem health.

Attribute: Soil Quality

Objective: Maintain the extent and condition of productive land

Strategy (practice):

Promote land and water management practices that:

- Maintain ground cover
- Minimise risks of soil loss and degradation
- Increase soil carbon
- Prevent and minimise impacts of salinity and acid sulphate soils
- Minimise contamination
- Improve soil physical, biological and chemical health

Attribute: Water levels and pressure

Objective: Manage groundwater to maintain levels and/or pressures long-term

Strategy (practice): Promote land management practices to maintain/restore vegetation in areas of salinity risk

Attribute: Flows

Objective: Manage flows

Strategy (practice): Reduce the impact of barriers to aquatic connectivity

Attribute: Terrestrial ecosystems

Objective: Maintain the extent, composition, structure and function of terrestrial ecosystems.

Strategy (practice): Promote land and water management practices to minimise the impacts of weed and pest species.

Attribute: Atmospheric carbon

Objective: Manage atmospheric carbon emissions

Strategy (practice): Promote and support mitigation actions including carbon sequestration and emissions reduction.

ASSESSMENT OF STRATEGIES

STRATEGIES/ POLICIES/ TARGETS	SCENARIO	OVERALL ASSESSMENT – "WHAT IF" QUESTIONS (1= LOW, 2 = MEDIUM, 3 = HIGH)				
		To what extent will this option enable the East Coast to deal with future major natural hazards?	To what extent will this option enable the East Coast to deal with future shocks and surprises?	To what extent does this option represent the best use of public money?	To what extent will this option have a negative impact on the East Coast?	To what extent will this option assist the East Coast to fulfil its vision?
STRATEGY 3.1 public land, natural foreshore areas, e.g., mangroves and replanting Priority waterway restoration 3.1.1 Identify priorities for investment 3.1.2 Develop incentive projects for implementation 3.1.3 Promote and disseminate educational resources for waterway management 3.1.4 Develop targeted and strategic cross tenure riparian weed programs 3.1.5 Build partnerships with local government, agencies and community	Anthropocentric	e.g. flooding 2. Where there is a strong focus on community education awareness, awareness and participation, and where coupled with other adaptation options. Need more information on how investments will be prioritised (e.g., criteria for location and values).	1. Vulnerable to shocks. Labour intensive so funding/ volunteer efforts high. But beneficial for employment and community participation. In periods of downturn won't deal with immediate threats (e.g. long term establishment and maintenance)	3. Effective in the long term for building resilience but may not be seen to deliver human benefits under this scenario.	2. Limit access and use of public foreshore land. Seen as a development constraint or constraint on usage.	2. Beneficial as compared to hard engineering but need strong evidence base to support projects and funding.
	New Paradigm	3. strategic, collaborative focus, enabled more flexible approach	3. Assist with improving WQ and reduce velocity of water and flooding potential and impacts, improve ES and improve domestic food production with WQ, greater transportation opportunities and improve health and wellbeing / amenity of people	3. More affordable than pipes and hard infrastructure e.g. water treatment facilities – also has additional benefits	1. Tree planting may upset minority of population who would prefer to maintain access to water views	3. Assist by enabling greater community participation and uptake of restoration projects
STRATEGY 1.1 Vertebrate pest management 1.1.1 Plan and coordinate priority regional approaches to vertebrate pest management 1.1.2 Raise landholder and community awareness of vertebrate pest issues 1.1.3 Provide advice and training; and control pests with landholders (and groups) 1.1.4 Develop and support vertebrate pest management groups 1.1.5 Compliance 1.1.6 WHS and Staff Training 1.1.7 Monitor and review vertebrate pest management	New Paradigm	2. Some improvement in (reduction of) extent of natural hazard particularly re agriculture and improved environmental outcomes (ie less pests -> better agricultural ability). Of course better environmental outcomes -> better eco-tourism outcomes. Health / disease benefits from reduced pests. Eg rabbits, foxes, deer, pigs. Diseases are a natural hazard?	1. Less pests – agriculture and natural environment will be more resilient to shocks and surprises	1. Not sure – may be better ways of spending money. Maybe dependent on species and how they react to changed climate	None?	2. More resilient ecosystems better at adapting to changing climate. Eg major baiting for foxes in north Sydney beaches – much community consultation due to potential impacts on pets. Bring bandicoots back was outcome – spread micro-rhyza to help native vegetation. Now many more bandicoots and impacting gardens.

STRATEGIES/ POLICIES/ TARGETS	SCENARIO	OVERALL ASSESSMENT – "WHAT IF" QUESTIONS (1= LOW, 2 = MEDIUM, 3 = HIGH)				
		To what extent will this option enable the East Coast to deal with future major natural hazards?	To what extent will this option enable the East Coast to deal with future shocks and surprises?	To what extent does this option represent the best use of public money?	To what extent will this option have a negative impact on the East Coast?	To what extent will this option assist the East Coast to fulfil its vision?
OBJECTIVE 3 Build capacity of landholders to prevent, prepare for, and respond to, biosecurity and natural disaster events. Action 3.1 Provide advice and support services to assist communities to prevent, and prepare for, biosecurity incidents and natural disaster emergencies. Action 3.7 Provide support to the effective operation of the Hunter Valley Flood Mitigation Scheme.	Anthropocentric	3. Issues: salinity, water supply, equine influenza. Helps to prepare and increase awareness of natural hazards and changing temps.	3. Where actions- Promote niche markets Increase adaptability Different crop selection Increase awareness and strategies to adapt.	2. Needs to be very targeted and respond to local conditions both physical and social. Sharing knowledge and best ways to do things e.g. new crops	2. If info too general wouldn't be effective. People moving away from forming areas – knowledge drawn.	1.. Minimal mention of climate change. Long lead in time e.g., change Need focus on building adaptive capacity through education of extreme and major events. Flood mitigation options will tend to move against nature under this scenario.
OBJECTIVE 7 Support Aboriginal people to care for Country and share traditional land management knowledge. Action 7.3 Develop long-term community projects that deliver employment outcomes for the Aboriginal community. Action 7.4 Encourage the Aboriginal community to develop partnerships with other stakeholders through facilitation and negotiation of proposed projects.	New Paradigm	Loose association – improve values and connection to land, general community understanding values of landscape, but not specific to any hazard management. Management of bushfires in landscape – do we follow traditional practices? Lachlan trialling firesticks (HN) – not just applying traditional knowledge as connections lost but landscape also different – temperature and plans different. Needs to be relearnt in different context. NQ – managers come together e.g. in cyclone to help communities.	2. Can create a narrative around long term planning frameworks (tens of thousands of years) – aboriginals have been living off land and adapting for centuries. Helps move away from electoral cycle mentality. Helps think about value of natural capital and not to draw down. Understanding how use and relate to country gives greater depth of understanding how to manage lands.	3. Should be best practice in this scenario and would be relating well to engaging with minority groups. Goes towards a general goal of achieving social justice for aboriginal people	2. Outcomes need to include building capacity eg training and enabling to find employment opportunities Need to facilitating active involvement and building capacity of the Aboriginal community to manage their own lands and reinstate / actively apply traditional practices on their land	2. Broadens thinking about how to adapt to changing environment and what can learn about managing land and how this relates to challenges in the future re adaptive mindset. Should include more about building capacity. Good story as have lived through climate change and ice age – need to think about these time frames and relate this to future challenges.

STRATEGIES/ POLICIES/ TARGETS	SCENARIO	OVERALL ASSESSMENT – "WHAT IF" QUESTIONS (1= LOW, 2 = MEDIUM, 3 = HIGH)				
		To what extent will this option enable the East Coast to deal with future major natural hazards?	To what extent will this option enable the East Coast to deal with future shocks and surprises?	To what extent does this option represent the best use of public money?	To what extent will this option have a negative impact on the East Coast?	To what extent will this option assist the East Coast to fulfil its vision?
GOAL 1 Adapting to a changing climate: Fostering capacity to adapt to change, ensuring landholders are informed and working towards resilience Strategy 1 Deliver information and knowledge services that support and enable customers to improve decision making Action 1.1 Extension programs fostering capacity to adapt to change (relate to "change" generally, rather than climate change only).	New Paradigm	3. Providing capacity to enable community to adapt and change – providing community and landholders with information about how they can adapt to changing climate and enabling to do it themselves -	3. Self-sufficiency enables them to be more resilient to shocks, even with a lack of insurance	3. The people can do the work themselves resulting in relatively low public costs and community ownership = good job.	Increased independence Hard to control what people are doing – lack of consistency, less connectivity between regions.	Greater sense of community may result in people helping each other – lack of insurance may lead to more likely to help, or move out of danger areas (fire, flood, erosion). Community banks – e.g. of alternative to traditional insurance – stuck in paradigm of insurance will be the same- but may not be. Community could set up mutual fund e.g. councils are self-insuring. – mutual fund to help everyone. Need to be open to very fast changes. Also insurance – only needed because have so much stuff. Insurance – maybe need to build somewhere else not in high risk area – insurance may not encourage to move away - Brisbane flood studies – 2 cases – wealthy that afford recovery; others with low cost high risk – can't afford to move out as locked into this area – risk = cheaper, but can't afford insurance.
	Anthropocentric	2. Build capacity within local community to be able to adapt to local hazards, prevents problem with lack of investment in NRM to implement capacity building in local community Critical to further adaptation programs	1. If implemented, capacity building – community would be less shocked when these happened and would be able to adapt more quickly and efficiently than otherwise. Less confronting approach talking to people and support knowledge and learning	2. Ok – investment in NRM is low	1. Potential for NRM agencies to lose credibility if knowledge isn't presented accurately	1. Foundation from which adaptation can go further through knowledge base in the community
OBJECTIVE 11 To ensure that NCLLS continues to improve its service delivery and has a strong culture of learning and adaptive management within the organisation and statewide across the LLS organisation	New Paradigm	3 Greater communication between branches allows best practice to be promoted across all branches, resulting in ideal resilience to natural disasters				

STRATEGIES/ POLICIES/ TARGETS	SCENARIO	OVERALL ASSESSMENT – "WHAT IF" QUESTIONS (1= LOW, 2 = MEDIUM, 3 = HIGH)				
		To what extent will this option enable the East Coast to deal with future major natural hazards?	To what extent will this option enable the East Coast to deal with future shocks and surprises?	To what extent does this option represent the best use of public money?	To what extent will this option have a negative impact on the East Coast?	To what extent will this option assist the East Coast to fulfil its vision?
STRATEGY 11 Foster a values-based culture which emphasises collaboration, innovation and continual improvement Action 11.4 Implement contemporary strategic and investment planning processes that integrate service delivery and create value for customers, stakeholders and investors.	Anthropocentric	2. Gets info out to people more quickly and allows to adapt more efficiently than if planning was only in a five yearly cycle e.g. planning scheme review Continuous learning rather than iterative planning Getting information out quicker to allow people to adapt We need to move knowledge based culture – we can factor new information every time we review the documents (i.e. every 3 years) or we can use it on ongoing basis – we ned to sue the information as it arrives	1. Allows local community to internalise risk analysis to cope with risks that might occur and allow use of current information when making decisions Internal risk analysis to cope with surprise Allows people to use more current information to make decisions – it could help; it can trigger analysis (may not be logical but gets people thinking – what can we do?)	2. fundamental for adaptation to continually review knowledge base and strategies in plan "cornerstone" It underpins the information that comes out – gives you the 'right' to 'walk in the door and plan' (ie justify your existence as a planner)	1. No negative impacts	2. Provides mechanisms to communicate and adapt within community Planning for effective and efficient adaptation Provides mechanisms to communicate and adapt – gives you the mechanism and justification to plan and analyse
THRESHOLD: BEACHES Local actions: 3.1 Provide managed access to beaches by fencing sand dunes. 3.2 Manage remaining intact dunes and related vegetation (refer to shoreline erosion management plans where available). 3.3 Revegetate high energy beaches. 3.4 Promote compatible recreational use. Planning action: 3.5 Undertake systematic conservation planning and action for beaches and dunes that recognizes the ecological values and process of beaches and establish a network of protected areas that encompass beaches and their associated surf-zones and dunes across the region.	Anthropocentric	Good Allow natural processes to re-establish the dunes Where built infrastructure behind dunes Restore and protect dunes to allow migration.	Natural process – self generating lots of energy with beaches and wave action, one events have happened may assist with recovery	Not a high cost to give the dunes time to stabilise and revegetation	no	Good option in terms of climate change

STRATEGIES/ POLICIES/ TARGETS	SCENARIO	OVERALL ASSESSMENT – "WHAT IF" QUESTIONS (1= LOW, 2 = MEDIUM, 3 = HIGH)				
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THRESHOLD: SEAGRASS, MANGROVES AND SALTMARSH Seagrass (as at 1998) 18,391ha Mangrove (as at 2001) 22,590ha Local action: 7.1 Provide Environmentally Friendly Moorings particularly high density seagrass areas (Map 7). Planning action: 7.2 Undertake catchment management planning as part of a Water Quality Improvement Plan for SEQ to reduce sediment from urban and rural areas (Map 1.0). 7.3 Plan land use in areas needed for mangroves and other critical habitats to retreat from sea level rise (Map 4.0). 7. 4 Consider the potential impacts on the Moreton Bay Marine Park boundaries from sea level rise to ensure RAMSAR and economic values remain into the future.	Anthropocentric	2. Absence of NRM funding creates community engagement in pockets If there is no money to implement – there is very little impact (depending on the specific adaptation strategy e.g. engineering) If the community is involved, maybe the community can take more responsibility – but it depends on the type of action (some solutions re expensive and complex and community cannot fund them without government support) "I don't think you can have a strong community without strong government and support"	2. Cannot cope as a whole due to lack of connectivity "Anthropocentric" is what is happening now but we don't have high level community action. No need for NRM – the community is doing it. NRM is not supported Strategy is fine – but delivering it under anthropocentric scenarios will not work.	2. Lack of NRM funding, community cannot fully fund	2.	2.
THRESHOLD: COMMUNITY Community capacity and resilience to shocks and longer term changes have been measured based on: a. Volunteer participation b. Natural Resource Management activities on agricultural land c. Index of Socio- economic Advantage and Disadvantage d. Leverage on investment provided by the community	Anthropocentric	2. Outreach to community -> beneficial	2 Discussion as per previous point (seagrass etc)	1.	1.	1.
THRESHOLD: BUSHLAND Remnant vegetation cover of 35% (minimum) across the region Local action: 2.1 Support management and revegetation in strategic areas (Map 2.0). This will contribute to multiple outcomes for connectivity, habitat and water quality. Priority activities: Management of regrowth vegetation; Revegetation; Pest and Weed Management; Fire Management 2.2 Manage areas of poorly conserved regional ecosystems especially in strategic areas. Planning action: 2.3 Plan to maintain core bushland areas. 2.4 Develop management plans for the 35 poorly conserved Regional Ecosystems (Map 2.1). Moreton Sub BioRegion is a priority area for management of poorly conserved ecosystems.	Anthropocentric	Medium – given anthropocentric, NRM focus on retaining vegetation I high risk areas above dams and water supply areas	Focus of retaining vegetation on water supply, would have benefits in resilient local economy – maintain resource – e.g. wood production, tourism, pest resistance (more diverse economy -> resilient	More efficient use of public money as more efficient to plant trees than look at engineering solutions	Positive impact	Positive way to adapt wrt reducing flood and heat impacts. Improve water quality.

STRATEGIES/ POLICIES/ TARGETS	SCENARIO	OVERALL ASSESSMENT – "WHAT IF" QUESTIONS (1= LOW, 2 = MEDIUM, 3 = HIGH)				
		To what extent will this option enable the East Coast to deal with future major natural hazards?	To what extent will this option enable the East Coast to deal with future shocks and surprises?	To what extent does this option represent the best use of public money?	To what extent will this option have a negative impact on the East Coast?	To what extent will this option assist the East Coast to fulfil its vision?
THRESHOLD: WATERWAYS Scheduled water quality objectives for all SEQ waterways will be achieved or exceeded by 2031. Local action: 1.6 Stabilise actively eroding gullies and creek banks (channel erosion) in priority sub catchments particularly in areas that are key sources of sediment44 (Map 1.0). 1.7 Decrease runoff (hillslope erosion and landslip) by strategic revegetation and restoration in priority sub catchments (Map 2.0). 1.8 Implement current salinity management plans in key sub catchments: Roadvale; Black Snake Creek; Woolshed Creek Planning action: 1.9 Use Map 1.0 and 1.1 to prioritise Catchment Action Planning and implementation as part of the development of Catchment Action Plans for the 19 Sub Catchments in SEQ Recognise salinity as a land use management issue in Planning Schemes	Anthropocentric	No natural regeneration. Engineering solutions instead. Desalination plant ->

Engineering solutions to control water movement (more dams and pipes) water network expanded
Interested in stabilising runoff using hard infrastructure – more dams, pipelines to transport water and desalination plant.

Increased system resilience (but little funding due to focus on engineering solutions) | ?
no, – not water if desalination plant goes offline – prevent sediment into dams. High chance of failure of system e.g. cyclone take out water supply

higher chance of failure (e.g. cyclone takes out pipeline) | 1.
Very expensive, not a good use
But could have hydroelectricity options for power supply, and create more jobs
Reasonably cheap. In some areas allow natural regeneration which is free | Negative for environment but positive for people and lifestyle | Desalination good as not reliant on rainfall, but problem with sea level rise if desalination plant got flooded (under water by 2100).
Possible catastrophic failure of engineering solutions resulting in region being wiped out |
| The region makes an equitable contribution to state and national air quality targets and mitigation measures to reduce the atmospheric carbon level.
2020 Target 1
Participation in schemes that encourage bio-sequestration, using the carbon storage capacity of soils and vegetation, will exceed the 2015 baseline.
Primary producers and other land managers will participate in and benefit from their involvement in carbon farming initiatives. | New Paradigm | 1.
Great idea – but actual impact not high. Mitigation is a nationally and internationally driven priority – to be successful needs to be supported in all jurisdictions. What happens in one area is useful but in terms of dealing with hazards – hazards will happen anyway due to locked in impacts. Mitigation will reduce but not eliminate the risks. Will only be effective if replicated nationally and internationally. Recognising responsibility and effective process but no good on its own.
Target 1 needs to be expressed numerically.
Targets but nothing to say what target is, needs to be numerical target to make more binding. More detail on by whom, where etc.
(CFI) More detail e.g. where, by who etc.
Lobby to reduce emissions | 2.
Have multiple benefits not just mitigation – analyse relationship to other benefits.
Help to maintain landscape function and resilience - will help head off other shocks e.g. to ag production by producing additional opportunities – may bring in additional income and create employment.
Additional benefits to maintain visual character of Australian landscape and countryside – attraction for tourism.
Helps production outcomes – salinity etc | 2.
Direct action and ERF under current government – may not be the most cost effective e.g. compared with power stations etc. if only looking for reduction of climate impact. But remembering non-financial analysis – many other benefits e.g. natural systems and quality of life – may stack up for public investment. | 2.
Make sure no perverse outcomes – e.g. know catchment yields for water supply and balance against these.
Need to consider risks – e.g. corridors are potential pathways for weeds and pests to move through.
Concern re fire – maybe not great risk but community perception.
By adding to extent and condition not changing other biodiversity values already have – consider provenance etc. | 3.
Yes – has some benefits in mitigation by carbon capture but insignificant on global scale – has benefits in adaption re landscape resilience.

Should it be air quality? – may partner this with active transport in urban areas, even county – but not role of NRM – but complementary. |

STRATEGIES/ POLICIES/ TARGETS	SCENARIO	OVERALL ASSESSMENT – "WHAT IF" QUESTIONS (1= LOW, 2 = MEDIUM, 3 = HIGH)				
		To what extent will this option enable the East Coast to deal with future major natural hazards?	To what extent will this option enable the East Coast to deal with future shocks and surprises?	To what extent does this option represent the best use of public money?	To what extent will this option have a negative impact on the East Coast?	To what extent will this option assist the East Coast to fulfil its vision?
Land and sea country values that focus the guardianship of Aboriginal people in the Burnett Mary region are widely acknowledged across the entire community. 2020 Target 3 Regional Councils, State Government agencies and other major land and sea -management agencies recognise and respect cultural heritage values in their urban planning and NRM related processes and have established working relationships with Traditional Owners.	New Paradigm	3. Traditional knowledge of previous disasters and how they were handled could improve management to reduce losses (human and infrastructure)	Better understanding of landscape leads to more efficient and effective use of resources			
	Anthropocentric	2. Critical to protection of lifestyle, and human impacts Could rate high in terms of stewardship – could be beneficial to NRM, but not critical	1. Not that important	2. Issues were not explored – ran out of time	2..	2.
ATTRIBUTE: SOIL QUALITY Objective: Maintain the extent and condition of productive land Strategy (practice): Promote land and water management practices that: • Maintain ground cover • Minimise risks of soil loss and degradation • Increase soil carbon • Prevent and minimise impacts of salinity and acid sulphate soils • Minimise contamination Improve soil physical, biological and chemical health	Anthropocentric	High – marginalised lands to be abandoned, focus on productive land and intensification of crops. Land may become more resilient. Policies have multiple goals and actions Good as it has specific goals.	Because specific goals, good for dealing with shocks. Negative – true cost of food would need to be reflected in society (currently subsidised) – may not be happy with this. Government may be forced to continue subsidies in food production, or adjust food eating habits. Difficult to implement May mean government buys up land, continues subsidies in food production. Unintended worsening if nuclear power used to supply energy.	Government using budget to subsidise policies in productive land- negative – not best use of public money. May facilitate new generation of technology – good use of public money. Links to educational institutions and innovation. Micro-responses from farmer s- may use own money to develop systems to deal with shocks. Able to monitor and track success.	Low – policy very practical, depends on receptive nature of farmers – some would do whatever wanted	Not specifically about CC adaptation, but does build resilience in productive land and encourages maintenance of carbon in veg and reduce heat.
ATTRIBUTE: TERRESTRIAL ECOSYSTEMS Objective: Maintain the extent, composition, structure and function of terrestrial ecosystems Strategy (practice): Promote land and water management practices to minimise the impacts of weed and pest species	New Paradigm	1. Issue with maintaining extent – to maintain is to limit or eliminate the ability adapt to future major natural hazards (will not have opportunity to adapt to changing climate). Need to improve the extent, composition etc. or capacity to. Practice should be broadened to cover other areas of NRM impacts, not just weeds and pests.	1. Needs to be rewritten to address need to improve extent	2. provides some benefit but money could potentially be wasted as investing in maintaining system that already not running ideally – condition needs to be improved not maintained. Money could potentially be wasted if only focusing on local maintenance – money better spent if focused on 'improvement'	2. Potential for negative impacts – not enough just to maintain. Might improve some things at local scale but have negative impacts at a regional scale. Investing in maintaining might reduce capacity of system to support new economic systems and society	1. Maintaining does not reflect that condition is already poor in most cases and actions need to take place that support changed climate condition

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ATTRIBUTE: WATER LEVELS AND PRESSURE Objective: Manage groundwater to maintain levels and/or pressures long-term Strategy (practice): Promote land management practices to maintain/restore vegetation in areas of salinity risk	New Paradigm	2. Drought – over extraction during drought -> benefit Extreme storms may increase recharge	2. Doesn't add to the shocks – helps maintain food security and water supply	2. Not high investment in well-established practice – especially in saline areas	Could be some conflict over access to water	More resilient landscapes to support food and natural resources
	Anthropocentric	Abandon affected areas (build a dam). Move to intensive production in feedlots.		Not spending public money	Negative impacts- e.g. dust storms.	
Attribute: Atmospheric carbon Objective: Manage atmospheric carbon emissions Strategy (practice): Promote and support mitigation actions including carbon sequestration and emissions reduction	Anthropocentric	Battery cows collect methane as alternate energy source. Abandon affected areas (build a dam). Move to intensive production in feedlots.	May have to sell cows to china (discounted price) Lose energy source.			
Attribute: Flows Objective: Manage flows Strategy (practice): Reduce the impact of barriers to aquatic connectivity	New Paradigm	Can go both ways – dams can improve resilience until eventually get a failure or overflow. Natural flow regimes help natural flora / fauna regimes, resulting in improved environmental resilience to climate hazards.	Removal of barriers may make humans such as farmers less resistant to drought. Increase resilience by improving health of system (more food or recreation opportunities)	2.	Potential negative impact on industry due to reduced water allocations	Local decentralised food production and rainwater collection reduces reliance on large scale cropping

NARRATIVE AND ROADMAP

(GOING FROM THE PRESENT TO THIS POSSIBLE FUTURE)

	GLOBAL SCALE	NATIONAL (AUSTRALIAN) SCALE	EAST COAST REGIONAL SCALE	NRM REGION
by 2030	• Agreed targets at the Paris COP in 2015	• Australia might not sign the agreement (COP)	• More likely to see higher emissions scenario, • Nothing could stop the ECC to go ahead on its own; regionally-driven initiatives to reduce emissions, some mitigation initiatives are possible (based on past experience it is possible that states could take the lead) • The effectiveness of these initiatives may be limited due to conflicting policies set at the stat level (e.g. QLD policies encouraging mining vs. emission reduction targets)	
	• China and India decide to use up their own resources before buying it therefore there will be a decline in demand for Australian coal at the international market (new market for sustainable energy sources to phase out coal market) • Reality check on actual country emissions (considering the externalities of burning coals) - economic sanctions to force reduction in emissions	• A national policy on climate change? Highly likely to have a national adaptation strategy (maybe not be as comprehensive or being permanent - could be curbed by next government), needs bipartisan support to achieve longevity and effectiveness; evidence is needed to get policy off the ground and maintain it beyond political cycles; what would be the tipping point? (marketable science that can prove upcoming threats to liveability and economic/ financial security); relationship with productive economy? E.g. impact of climate change on tourism industry to justify policy and / or support for such policy		

	GLOBAL SCALE	NATIONAL (AUSTRALIAN) SCALE	EAST COAST REGIONAL SCALE	NRM REGION
	• Technological change to assist the delivery of sustainable energy	• Impact on local industry - more renewable energy sources to be adopted and taken up by individual households	• Less incentive for coal / fossil fuel based energy sources create opportunities for regional areas to set up renewable energy plants (e.g. solar) • Regulations are put in place based on state / federal policies to address climate change impacts, including energy production and reduction in emissions, e.g. more heatwaves, new developments with solar power and other alternative sources of energy - demonstrated by cost-benefit, resilience benefits (possibly triggered by increasing incidence of disasters; not only reactive but also learning from experiences)	
by 2090	• More disasters will intensify on coastal areas; loss of iconic places such as beaches, barrier reef	• Regulations will be implemented, considerable economic losses, greater public pressure on politicians/ leaders; responses will be possible as changes/ shocks will be manageable (enough knowledge to respond based on scientific research, e.g. new food sources/ crops etc.; continued development of new technologies; changes in food production shift to species that can still be grown) • Major national response to deal with changes/ disasters (some science will be available but will not have all solutions as knowledge will still be evolving)	• Some locations may not be affected as severely as other areas facilitating adaptation processes (e.g. temperature increase favouring alternative crops to be grown); coastal areas will be impacted; • More people may be living in areas at risk making it more complicated for emergency responses and retreat policies etc; responses might still be limited due to lack of previous action/ preparation to deal with risks such as heat waves • Urbanisation will increase, more urban populations possibly due to displacement from rural areas due to climate change impacts (e.g. FBA area faming becoming unviable; some coastal areas will also become unliveable)	
	• Changes in insurance businesses to cope with increasing disasters	• Influence in settlement patterns - condition development to areas which are insurable	• Setting up of response bodies supported by the insurance companies to deal with increasing risks. Changes in taxation models; shifting responsibility to private sectors	

Key Positive Signposts (ie indicating changing direction - opportunities) - (ie indicators of possible futures being realised such as events, occurrences or observations that can be scanned from the real world):

Key Negative Signposts (ie indicating a dangerous direction - threats) - (ie indicators of possible futures being realised such as events, occurrences or observations that can be scanned from the real world):

Shocks and Surprises (that might be encountered along the way towards the possible scenario)

1. Collapse of economic system - new global financial crises (connected to peak oil or climate change)