

Synthesis of Climate Change Knowledge and Planning Practices carried out by the Wet Tropics Cluster Natural Resource Management (NRM) Organisations

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November 2013

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Citation

Lyons, P., Bohnet, I.C, Hill, R. 2013. Synthesis of Climate Change Knowledge held and Planning Practices carried out by the Wet Tropics Cluster Natural Resource Management (NRM) Organisations. Report prepared for the Wet Tropics Cluster project collaborators and the Department of Environment. CSIRO Climate Adaptation Flagship, Cairns. 25pp.

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Acknowledgements

We acknowledge the generous support of the Australian Government who funded this project. We also acknowledge Dr Cath Moran's contribution to this report in piloting the survey form and for her suggestions for improvement. We also would like to thank the four Wet Tropics Cluster regional NRM organisations for the materials they supplied for review and the time of their staff in partaking in the interviews.

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Executive Summary

This report provides a synthesis of local knowledge and experiences of climate change, specifically on how this knowledge was integrated with science and planning practice. We based this synthesis on the collection and review of 47 documents provided by the four Wet Tropics Cluster regional NRM organisations. Documents included NRM, land use and country based plans, research and consultancy reports, summaries of workshops and meetings, as well as a video. In addition, we interviewed 6 NRM staff from the four regional NRM organisations to answer questions that arose during the review of these documents and to provide additional information, mainly for clarification. From our review we developed the following key messages:

Key message: Consistent and enduring action on climate change requires a climate change strategy or project that (i) has organisational support and appropriate resources; and (ii) aligns with both policy and community interests.

Only one of the four Wet Tropics Cluster NRM organisations has developed a Climate Change Strategy which provides the foundation and guidance for pro-active development of further activities to address the impacts of climate change. Without a strategy or specific project NRM organisations depend on their program managers to integrate activities that address the impacts of climate change within the program they manage. There are risks associated with this; for example, if NRM program managers change roles, activities related to climate change may be disrupted if they are not explicit within the program.

Key message: Framing climate change to improve understanding of its causes and impacts, and to address barriers that prevent dialogue about required behavioural change is a critical skill and role the regional NRM organisations need to strengthen.

The diverse stakeholders within the four Wet Tropics Cluster NRM regions hold different perceptions about climate change. For example, some stakeholder groups are already building their adaptive capacity to address the impacts of climate change whereas other groups are not ready yet to discuss climate change. Framing climate change to reach diverse stakeholder groups that perceive climate change differently is critical. The regional NRM organisations are already adapting their communication about climate change to the level of interest and awareness in their regions.

Key message: Translation of climate-relevant information, of the causes and impacts of climate change, has to be targeted for the particular groups involved with and affected by an NRM issue.

Each of the four Wet Tropics Cluster NRM organisations translated climate related information slightly different. Information collected in diverse contexts was translated either into management action targets listed in regional NRM plans, best practice options listed in land use plans, and on-ground actions in Country-based plans.

Key message: There is scope to work with innovative approaches to engage with and include Indigenous perspectives on climate change in NRM planning.

Involvement of Indigenous groups in climate change planning and action is slowly growing. To date, Indigenous groups across the Torres Strait and Cape York have been more involved than Indigenous groups in the Wet Tropics and Mackay-Whitsunday regions.

Key message: Regional NRM organisations are continually evolving to their policy, NRM, political and socio-economic context. They are playing a major role in translating science into planning and management, and in determining the most relevant science for their regions.

The four Wet Tropics Cluster regional NRM organisations operate in different social, political, geographic and ecological contexts. Science needs to find a niche role that will support each regional NRM organisation by addressing their region-specific needs. Science governance arrangements need to ensure timely and useful information is provided to regional NRM organisations. Science research gaps may not necessarily align with the regional NRM needs that are intimately engaged in and responding to complex community and policy contexts.

1.0 Introduction

In 2012, the Australian Government committed \$44 million to Regional NRM Planning for Climate Change Fund (Australian Government, 2013). This funding was designed to support regional Natural Resource Management (NRM) agencies to update their NRM plans using new regionally synthesised science products that support adaptation responses to climate change including resilience and adaptation planning, carbon and ecosystem services and participatory scenario analysis. Funding will also support regional NRM agencies to update their plans to guide climate change program actions and impacts on-the-ground and in particular maximise the environmental benefits of carbon farming projects (Bohnet et al., 2013; Australian Government, 2013). There are two streams of funding under this program: Stream 1 funding supports the regional NRM organisations across Australia to revise their NRM plans for adaptive management. Stream 2 funding supports coordination of research to develop scientific information on climate change at regional-level, and to generate new knowledge and tools required to develop new adaptive NRM plans.

Australia's 56 NRM regions have been grouped into eight clusters through which the research is delivered. The Wet Tropics Cluster comprises four geographically distinct NRM regions in Far North Queensland that include the Mackay Whitsunday, Wet Tropics, Cape York and the Torres Strait regions (Figure 1, the Wet Tropics Cluster region is shown in dark blue). These regions are managed by the Reef Catchments NRM, Terrain NRM Ltd, Cape York NRM and the Torres Strait Regional Authority (TSRA) respectively.



Figure 1. Location of the Wet Tropics Cluster region in Far North Queensland (dark blue area) in relation to the other regional Clusters in which the 56 Australian NRM regions have been grouped.

1.1 The Wet Tropics Cluster

The Wet Tropics Cluster comprises a wide range of landscapes and seascapes ranging from globally significant savannas to tropical rainforests, wetlands and low lying tropical islands. It also covers a high proportion of the Great Barrier Reef catchment including the Wet Tropics World Heritage Area and most of the Great Barrier Reef World Heritage Area.

Climate change threats to the Wet Tropics Cluster region have been well documented for some highly significant habitats. For example, the climate change threat to biodiversity has been especially well documented for the Wet Tropics rainforests (Hilbert et al., 2001; Kanowski, 2001; Williams et al., 2003; Hilbert et al., 2004; Williams et al., 2008). However, other climate related information at a scale useful for NRM planning has been very patchy. For example, studies of sea level rise have been carried out for the Torres Strait Islands (Green et al., 2009) but not for other NRM regions within the Wet Tropics Cluster yet.

Tourism, agriculture, mining, fisheries, urban development, Indigenous culture are among the highly contested regional values which are likely to be impacted by climate change. The dependence of multiple competing sectors on natural resources emphasises the challenge and requires an integrated approach (Dale et al., 2013). Changes may be required to where we grow food, what food and how it is produced in the region, and how food production can contribute to other values such as biodiversity conservation and/or tourism. Similar changes may be needed in other sectors in the region such as mining and urban development.

1.2 Co-Research Approach

The co-research approach undertaken in the Wet Tropics Cluster brings together researchers with different scientific backgrounds and NRM planners and managers from the four NRM agencies. Central to this approach has been the establishment of a Brokering Hub with representatives from research and practice (Figure 2). This co-research approach draws on the growing evidence that transdisciplinary research methods are of critical importance to solving sustainability problems and achieving climate adaptation (e.g. Jahn et al., 2012; Lang et al., 2012).

The Brokering Hub consists of two project leaders who coordinate and manage the activities of the Wet Tropics Cluster, representatives from each of the four regional NRM agencies, researchers representing three science nodes and the national project team. The three science nodes are: (1) science synthesis, (2) participatory scenario and knowledge integration, and (3) prioritisation and opportunities (Figure 2).

In addition, the Brokering Hub is supported by a knowledge broker to facilitate the exchange of knowledge between all members of the Brokering Hub and to develop strategic linkages between researchers and NRM planners to understand their exact information needs (Bohnet et al., 2013).

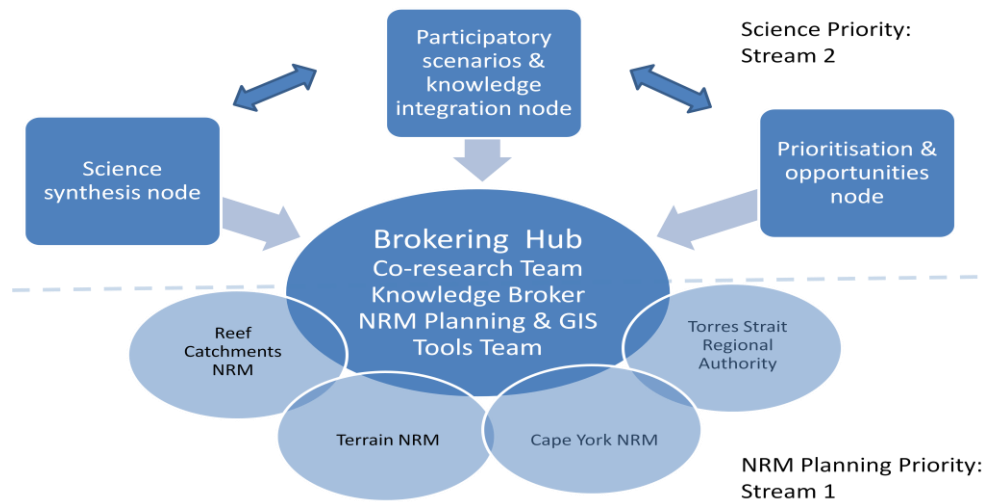


Figure 2. Co-research approach that promotes collective learning through collaboration (Source: Bohnet et al., 2013).

This synthesis of climate change knowledge and planning practice was carried out by the ‘Participatory scenarios and knowledge integration node’ with two aims in mind. First, to establish a baseline of the climate related information and knowledge held by the four NRM organisations to date and how this knowledge has informed NRM planning or on-ground action. This baseline is considered important background for the research carried out by the ‘Participatory scenarios and knowledge integration node’. Second, this practice synthesis is also aimed at informing and supporting the social science part of the science synthesis carried out by the ‘Science synthesis node’. We present a synthesis of the planning practice of the four regional NRM agencies, highlighting how climate information has informed their NRM plans to date and how local knowledge and experiences have been integrated.

2.0 Methods

The research for this synthesis involved two stages. The first stage was a desktop review of climate related information used by the four regional NRM organisations of the Wet Tropics Cluster in the last five years. Older documents were included where they were of particular relevance, such as the Terrain Wet Tropics Aboriginal Cultural and Natural Resource Management Plan.

In stage one the four NRM organisations were asked to provide all past and present planning practice related information as well as planning documents on activities that addressed the impacts of climate change. In total we reviewed 47 documents (Appendix 1). Broad government policy and program documents, such as national climate modelling research or review documents were excluded from the review as our interest was specifically on regionally relevant information that influenced and supported regional NRM planning prioritisation. We do however recognise that government policy and funding programs influence how the regional organisations define their NRM programs.

The planning documents were interrogated for the following broad topics (Appendix 2):

- Document type, year, content and source of information
- Type of data collection exercise and its purpose
- Who undertook the study or research activity
- Level and type of community and Indigenous consultation
- Scale and funding of the NRM climate related planning activity
- Translation and use of information to plan for climate change impacts

Information from the review of these documents was entered into an Excel spreadsheet, then subsequently summarised into tables in Word.

The second stage of the review involved interviews with staff from these NRM organisations with the purpose to fill any knowledge gaps and clarify questions that arose from the desktop analysis. Of particular interest were questions regarding the current practice of integrating local and Indigenous knowledge into NRM planning, and the use of specialist reports for NRM climate-related planning.

For stage two, the research team carried out semi-structured interviews with a total of six staff members from the four NRM organisations. The interviews followed some common themes:

- Background of the interviewee including role/s within NRM organisation
- Research and consultancy work on climate change
- Translation and use of climate change information for NRM planning
- Engagement and NRM climate change objectives

Questions were open ended, allowing follow-up prompts for clarification or further exploration of the topic discussed (Appendix 3).

3.0 Results of the Desktop Review

The NRM documents reviewed across the four Wet Tropics Cluster regions reflected their different priorities, areas of investment, major funding programs and climate preparedness to address the impacts of climate change and the people and industries in those areas. Diversity in NRM planning across the regions was represented in the planning approach, content and strategic priorities, and their currency and scale. Generally plans covered a five year period across the four regions.

The Torres Strait Regional Authority (TSRA) was the most advanced of the four NRM organisations with a regional climate change strategy that addresses the impact of environmental change for each island (TSRA, 2010a) as well as land use plans for 15 inhabited islands (TSRA, 2010b). TSRA's land use plans were published more recently than the other regional NRM plans and are broadly inclusive of other sectors including infrastructure, energy, and housing, with their primary focus on sustainable development (TSRA, 2009; TSRA, 2010b). TSRA's on-ground NRM plans are in development. Innovative work on participatory scenario planning is underway in the Torres Strait (Butler et al., 2013). Technical reports for the TSRA included coastal risk and vulnerability studies, environmental and engineering assessments as well as climate change modelling.

Cape York's NRM's documents were largely reports from workshops, meetings, and community consultations covering topics of governance, fire management and cultural heritage (Cape York Natural Resource Management, 2012; Cape York Natural Resource Management, 2013). Fire management practice and biodiversity were key issues covered across multiple Cape York NRM documents. Their documents included the only country-based plans from the four regional organisations. While these documents addressed NRM issues more broadly, they were also relevant to climate change action. Terrain NRM also funded country-based plans for Giringun Aboriginal Corporation although these were not supplied by the NRM organisation.

Terrain NRM provided eight relevant documents: two carbon farming specialist reports (Department of Sustainability, 2012a; Department of Sustainability, 2012b); two carbon sequestration documents (van Oosterzee et al., 2009; Terrain NRM et al., 2012); two NRM planning documents (Far North Queensland NRM Ltd and Rainforest CRC, 2004; Far North Queensland NRM Ltd., 2005); a baseline greenhouse gas emissions report (North Queensland Climate Alliance et al., 2007); and one Aboriginal Cultural and NRM plan (Wet Tropics Aboriginal Plan Project Team, 2005). The other documents Terrain NRM referred to were government climate change policy and program documents. These documents were excluded from our review since they did not provide specific regional-scale information relevant to climate change adaption in the Wet Tropics. Terrain NRM was the only regional organisation that used community events to promote their NRM plan.

The Reef Catchments NRM plan was informed by the State of the Region report (Reef Catchments, 2008), a statutory state-level document. The level of community consultation in the Reef Catchment NRM plan was not detailed in the document. Reef Catchments NRM also provided a modelling study on the impact of climate change on soil and water quality.

3.1 Material content: How climate was being addressed in and through NRM

Research into the impacts of climate change across the four NRM regions reflected the diverse environmental issues and interests in those areas. Reef Catchments' main climate related research document was in the sugarcane industry, in which a Reef Rescue study that looked at the impact of climate change on soil and water quality (Biggs et al., 2012). Climate featured broadly in the Reef Catchments NRM plan, with a focus on response actions to possible impacts on soil and water quality, fire and degradation of the coastal environment and capacity building to adapt to environmental change. Both Terrain and Reef Catchments NRM identified the need to better understand the impacts of climate change in their NRM regional footprints.

TSRA had the highest number of technical reports addressing climate change impact. Studies included climate modelling, bathymetric and ocean movement, hydraulic engineering and flood vulnerability assessments (Suppiah et al., 2010; TSRA, 2011a; TSRA, 2011b; TSRA 2012a). While both TSRA and Terrain NRM contracted regional level greenhouse gas emissions (GHG) baseline studies there is no indication at this stage how the TSRA studies are being utilised (TSRA 2012b). However, TSRA is involved in innovative planning work. TSRA is the first of the four Wet Tropics Cluster regional organisations to undertake scenario planning, under the Australian Government's Commonwealth National Environmental Research Program (Butler et al., 2013). Scenario planning on Masig Island supported community-driven alternative future scenarios for sustainable development. The outcome of this work will be incorporated into policy and planning documents in 2014.

Cape York and Terrain NRM are leading studies on carbon biosequestration with both organisations undertaking assessments for carbon farming in their regional areas (van Oosterzee et al., 2009; van Oosterzee et al., 2012). Terrain's Degrees Celsius Joint Venture identified and used a variety of GHG sequestration and abatement methodologies, including avoided deforestation and degradation in farm forestry, selective logging, reforestation and revegetation and it identified landholders who were interested in aggregating their carbon with Degrees Celsius (van Oosterzee et al., 2009). In addition, carbon farming feasibility studies in indigenous protected areas in the Wet Tropics region were carried out by a consultant (Department of Sustainability, 2012a; Department of Sustainability, 2012b). These studies suggest that policy changes will be required for CFI to be economically viable, considering up-front costs and the years required for return on investment, although other outcomes such as ecosystem services and cultural benefits are real and attainable.

Cape York NRM demonstrated the highest number of community consultation events with strong Traditional Owner representation and interest for a return to fire and land management practices based on Indigenous ecological knowledge. Interest in fire management was for capacity building and the use and transfer of Indigenous knowledge at the local and sub-regional levels (TierraMar Consulting, 2013). Cape York NRM contributes fire scar information to the North Australia Fire Information website. While climate change and its impacts were not directly cited in the Cape York NRM community consultation documents, fire management, biodiversity, cultural heritage and conservation all featured strongly in community workshops. The threat of weed and feral animal infestation were present across the plans.

The Cape York country-based NRM plans included in this review were based on an asset approach, and included aspirations for cultural heritage, fire management and economic development. The plans identified drivers, threat processes and potential shocks to land and sea management. This structure for country-based plans was adopted across several plans. Common themes across the documents provided by TSRA, Cape York NRM and Terrain's Bama Indigenous NRM plan were the strengthening of cultural and natural heritage alongside economic development.

Terrain is the only NRM organisation with a separate Indigenous-driven NRM plan (Wet Tropics Aboriginal Plan Project Team, 2005). While there was no mention of climate change in this plan, its impacts are directly relevant to the Indigenous NRM goals and hopes for Country. Terrain is also the only NRM agency that considered its regional climate as an asset, and that climate is the driving factor supporting the wet tropics region's exceptional biodiversity (Far North Queensland NRM Ltd and Rainforest CRC, 2004). Climate change was identified as a threat to the existing climate asset. Action on climate change was broadly addressed in NRM planning and included goals to increase community awareness and understanding of the impact climate change, practical changes to reduce GHG emissions, increased sourcing of green energy, research on quantifying the impact of climate change, revegetation, and the development of strategies to address climate change adaptation.

3.2 Type and level of consultation

Technical reports across the four NRM regions did not appear to involve a high degree of on-ground consultation. From the documents that were provided, it was difficult to determine the type and level of consultation for climate related planning. This was the case for Reef Catchments NRM where two documents were received: one research report and the NRM plan that was informed by the State of the Region report.

The level of consultation in TSRA's land use plans for sustainable development was unclear although community involvement is evident through the documents, such as in the cultural heritage section. TSRA's Masig participatory scenario planning workshop funded through the National Environmental Research Program was highly participatory and used visual engagement tools to communicate Indigenous perspectives.

Documents from Cape York NRM showed consultation with Traditional Owners, Indigenous and non-Indigenous people at various levels ranging from workshop planning and feedback gatherings to strategic discussion meetings. Strong Traditional Owner engagement was evident from the Cape York planning material, such as their fire management video and country-based plans.

In the Wet Tropics, both Terrain's NRM plan and the Bama plan involved wide consultation with technical working groups and advisory committees for oversight. Membership of the working groups and committees included community members with both technical and non-technical skills. The Bama plan was driven by Traditional Owners and included input from research organisations (e.g. CSRIO, James Cook University), state and federal departments and, statutory authorities, TAFE, and NGOs.

3.3 The scales of planning

The NRM planning documents reflected topographical features, tenure, industry and the natural resource assets of each NRM region. The two documents provided by Reef Catchments NRM were written at the regional and Great Barrier Reef catchment scales. TSRA's climate change strategy document was a regional scale document while the other TSRA documents focused on individual islands. Cape York NRM planning documents were Country, landscape, and catchment scale and included regional level strategic plans. Landscape is the preferred scale on Cape York for fire and biodiversity management. Terrain NRM documents were based on a regional strategy. Its biosequestration projects aim to pay for ecosystem services using a regional aggregation approach to carbon trading.

3.4 Translation of information

The first round of Australian Government funding to produce NRM plans from 2004 to 2008 was under the national Natural Heritage Trust 2 program. Regional NRM organisations were encouraged to identify 25-year resource condition and five-year management action targets in their NRM plans. Under the succeeding Caring for our Country program NRM plans were not directly invested in, and hence many were not updated or developed. For example, Cape York NRM does not have a regional NRM plan yet. A new raft of NRM plans will be developed under the current funding arrangement. These new plans are highly likely to have a different format than previous plans. TSRA will not be updating their current land use plans and has not applied for funding. Instead TSRA works within a broader organisational Land and Sea Management planning process that ranges from regional level strategies to on-ground work ranger plans. Translation of information for NRM planning reflects the policy direction of the day and the specific regional institutional arrangements.

Translation of technical reports across the regions was done by specialists in the form of report recommendations and options. In other planning related documents, information was translated into action statements, priorities or targets. Terrain and Reef Catchments NRM plans were based on an asset based approach and Management Action Targets (Far North Queensland NRM Ltd and Rainforest CRC, 2004; Reef Catchments, 2008). It was unclear how information was translated into quantifiable targets. The climate change targets for both regions were based on improving understanding of and capacity to respond to the impacts of environmental change, and mitigate long-term impacts through carbon sinks.

TSRA translated technical consultant recommendations and options into on-ground plans. Information in TSRA's land use plans were categorised into themes of best practice, strategies, and consideration for action for each topic, including land tenure and native title, the natural environment, cultural heritage, community and infrastructure.

Results of the Cape York NRM workshops and planning on country activities were translated into action plans for country by Traditional Owner groups and relevant stakeholders. Unlike the Terrain and Reef Catchments NRM plan, resource condition or management action targets were not used. Translation of GHG emissions and carbon sequestration specialist reports into NRM plans was unclear.

4.0 Results of the Interview Analysis

The results of the interviews with NRM staff reinforced our findings from the information reviewed during stage one and also uncovered further documents which were subsequently included in this review. Some of these documents include the Degrees Celsius design document and the Indigenous CFI feasibility studies. This section will present key findings that complement the results from the document review.

The first observation from the interviews was the level of movement of staff between positions within and among NRM agencies. While the NRM practitioners were highly experienced, their transience between programs meant that sustained longer-term outcomes were potentially limited. The TSRA respondent had the longest tenure of all interview respondents, three years. Longevity would have been especially important in the climate program for Terrain where climate change was broadly and individually defined and incorporated by each NRM program manager. While the broad approach taken by Cape York, Terrain and Reef Catchments NRM to addressing climate change in NRM allowed flexibility, it also meant that consistent action to address climate change was absent.

TSRA was the only NRM agency with a regional scale climate change strategy that directly influenced consultancy, research studies and planning work. TSRA also has a unique planning process with multiple strategy and planning documents directed at different scales that engage different actors. Local community engagement is greatest with on-ground plans. A comment made by the TSRA respondent was that the agency is able to support multi-scale planning involving stakeholders that are affected by the planning because they work with discrete social-ecological island communities.

In Terrain NRM, incorporation of climate change relevant action was left to the discretion of each program manager, this included stakeholder consultation. Climate change action had previously been included in the coastal management, biodiversity and wetlands and waterways programs. Terrain NRM was also engaging in climate change policy through the Far North Queensland Regional Organisation of Councils (FNQROC) and the Cairns and Far North Environment Centre (CAFNEC). Through FNQROC Terrain NRM funded climate science and insurance information sessions for council mayors and CEOs, focusing particularly on local government liability in planning. This work led to the development of climate action groups at the local government level. Terrain's funding of climate change work through CAFNEC triggered the GHG baseline study and it also resulted in the brief establishment of the North Queensland Climate Alliance.

4.1 Engaging communities and stakeholder groups about climate change

The NRM agency staff we interviewed considered awareness-raising of the impacts of climate change a key component of their role with their clients. They also mentioned that their work needs to be based on the best available science. Terrain's NRM activities are incentive and education based. Reef Catchments staff mentioned that their challenge is to work with industry groups that are not yet ready to accept the evidence for human-induced climate change. TSRA is working with communities who are directly impacted by the amplifying effects of climate change on natural seasonal variability.

There were mixed responses from staff regarding consultancy and research reports. Most respondents assessed technical reports as useful for work plans and for generally improving individual knowledge. Other comments included, inappropriate report recommendations and a few were unsure how the reports were later used by the relevant programs. Suggestions from interviewees to improve the usefulness of consultancy and research reports included making reports more relevant to current issues and to the people affected. This included spatial representation of information that will allow people to look at the broad and local environmental conditions of where they live. Improved availability of information, including videos and written material and better communication strategies to the wider community was also mentioned. One interviewee also mentioned the need for demonstrated solutions.

The four NRM agencies are engaging their stakeholders on different issues of climate change at multiple scales. Each NRM staff identified which key stakeholder groups they need to engage in future climate related work. These included the sugar industry, and Landcare groups in the Mackay Whitsunday region; Terrain NRM named the Wet Tropics Management Authority, Port Authority, regional council and local government for the Wet Tropics region; and for TSRA and Cape York NRM it continues to be the community, industry and Indigenous groups they currently work with.

4.2 Scale

The scale for planning across the regions differed and reflected their various programs and NRM issues. While Reef Catchments NRM has a regional NRM plan, they also plan at catchment scale which includes the three main settlement areas of Mackay, Sarina and Proserpine. At the operational level their planning is also occurring at the property and paddock scale. Terrain NRM works at local government, regional and bioregional scales as well as 'on country' or site when they are working with Indigenous groups. It was also pointed out that the scale of work will be influenced by the particular NRM issue, resource availability and time frame for the project work. For climate change, the general agreement across the NRM agencies is to work at a broader scale and to address issues that cut across regional and state borders.

5. Discussion and Conclusions

This review provides a snapshot of the planning practice of the four Wet Tropics Cluster regional NRM organisations. It reflects their different histories, distinct political and geographic localities and NRM contexts. NRM planning for climate change is at different stages and focuses on different issues across the four regional NRM agencies. TSRA is well advanced on the path of planning to implement measures that will assist adaptation by its communities to the threat of rising sea levels. Terrain NRM is implementing the early stages of its carbon farming project with landholders and Cape York is coordinating a strong capacity building fire management program.

This review of planning practice on climate change highlighted differences in planning approaches, NRM priorities and engagement across the four regional NRM agencies. TSRA have a climate change strategy that directs research, consultant studies and action into planning across the region. The strategy supports on-going action on climate change even if staff transitions to other positions. Terrain's Degrees Celsius project focused specifically on land-holder incentive-based carbon farming. This is an advanced program that supports income generation to landholders for the provision of ecosystem services. Cape York NRM has invested in strengthening indigenous knowledge and practice on fire management. Where climate change was not made explicit either through a strategy or program for action by the regional NRM agency, staff implemented climate relevant work at their own discretion. This leads us to the following key message:

Consistent and enduring action on climate change requires a climate change strategy or project that (i) has organisational support and appropriate resources; and (ii) aligns with both policy and community interests.

Science and consultancy studies were most useful when: (1) they addressed relevant issues in the region; (2) they were made available for staff to use; (3) the information was translated into a form that could be used for planning; and (4) it focused on the scale where those affected were included in the decision-making and could therefore make sense of it. For example, TSRA translates climate related research into actions and engages the relevant stakeholders in the planning process. Terrain NRM's biosequestration feasibility and design studies were specifically targeted to establishing carbon farming, where interest was present in the community. Cape York's fire management evaluation study supported continued work in this area. However, not all interview respondents stated they knew how consultant reports were used for or translated into NRM planning. Diverse reasons underpin this gap including the movement of staff and the time lag between a consultancy study and the translation and use of that information into planning documents and strategies.

Different levels of knowledge integration occurred in the planning process across the four regional NRM agencies. Translation of information for the NRM plans was largely driven by the regional NRM agencies. Country based plans in Cape York were Indigenous-interest driven. It was however unclear how Cape York NRM was working across the country-based plans, apart from fire management which cuts across countries.

Fire management in Cape York is an exemplar of Indigenous driven knowledge integration that combines science and traditional knowledge.

The translation and framing of the causes and impacts of climate change is a key role for regional NRM organisations who engage across multiple scales and interest groups. In engaging Indigenous and community groups, primary producers, industry, and government, regional NRM organisations communicate information according to the level of interest and knowledge they believe those groups hold, and they negotiate their wording to engage stakeholders in a dialogue on the likely impacts of climate change. In Cape York for example, climate change is not explicitly mentioned but fire and biodiversity management are key programs that are of cultural significance and directly address the impacts of climate change. Cape York NRM may need to introduce new language if a climate change program is to be established. Framing climate change and developing strategies across diverse groups that work at different scales and that perceive climate change differently is a critical role of the regional NRM agencies. This leads us to the following key message:

Framing climate change to improve understanding of its causes and impacts and to address barriers that prevent dialogue about required behavioural change is a critical skill and role the regional NRM organisations need to strengthen.

The four regional NRM organisations translated information into different forms for use by practitioners. Reef Catchments and Terrain NRM translated information into management action targets in their regional NRM plans. Under the Natural Heritage Trust, federal government supported NRM targets. TSRA have best practice options in their land use plans. Cape York's Country-based plans identified actions for Country for each plan section.

Translation of climate-relevant information, of the causes and impacts of climate change, has to be targeted for the particular groups involved with and affected by an NRM issue.

Involvement of Indigenous groups in clearly defined climate change plans and action is in its nascent stage across the four regional NRM organisations. Cape York NRM is the most advanced with their country-based plans, and although these don't specifically identify climate change, they address the relevant topics of fire and biodiversity management. The study into Indigenous carbon farming in the Terrain NRM region poses questions about the inclusion of other climate relevant Indigenous programs.

There is scope to work with innovative approaches to engage with and include Indigenous perspectives on climate change in NRM planning.

The regional NRM organisations occupy a unique position in the policy-society interface acting at multiple levels of government from national, state, regional council and local government. The regional NRM organisations have established an evolving relationship with council and local government that may change with funding programs and other factors. Regional NRM organisations are taking an increasing role in translating science for use by their stakeholders. NRM agencies may consult communities on visions and priority interests in their local landscapes, but they see

themselves having a greater role in bringing and translating science to their stakeholder groups. At the regional level, NRM organisations are also negotiating the interests of different stakeholder groups when developing their NRM and operational plans. They continually negotiate government policy changes with regional interests. As one interviewee stated, government program funding strongly influences priorities of the day, which had not until quite recently, been climate change.

Science needs to find a niche role that will support each regional NRM organisation in their different social, political and ecological operating context. This includes the governance of science so that science can provide timely and useful information that regional NRM organisations can use at the regional and local policy context and address wider stakeholder needs. For example, Terrain NRM's FNQROC and Degrees Celsius projects were at the forefront of using science and economics to respond to and engage government policy at the national and local levels, with outcomes of practice change and increased awareness.

Regional NRM organisations are continually evolving to their policy, NRM, political and socio-economic context. They are playing a major role in translating science into planning and management, and in determining the most relevant science for their regions.

Regional NRM plans are about planning and management that is underpinned by the best available science. These plans are also about the political and policy environment of the day since NRM priorities are a negotiated outcome among multiple stakeholders and on-ground actions are influenced by the availability of funding and the policy context.

References

- Australian Government, 2013. Regional Natural Resource Management Planning for Climate Change Fund <http://www.environment.gov.au/cleanenergyfuture/regional-fund/index.html>
- Biggs, J., Thorburn, P., Crimp, S., Higham, W., Thompson, P., Park, S., Attard, S., Masters, B. 2012. The Effect of Climate Change on Adoption of Best Management Practices to Improve Water Quality in the Mackay-Whitsunday region. Commonwealth Scientific and Industrial Research Organisation (CSIRO), Canberra.
- Bohnet, I.C., Hill, R., Turton, S.M., Bell, R., Hilbert, D.W., Hinchley, D., Pressey, R.L., Rainbird, J., Standley, P.-M., Cvitanovic, C., Crowley, G., Curnock, M., Dale, A., Lyons, P., Moran, C., Pert, P.L. 2013. Supporting Regional Natural Resource Management (NRM) Organisations to Update their NRM Plans for Adaptation to Climate Change. Conference Paper Presented at the 20th International Congress on Modelling and Simulation. 1-6 December 2013 Adelaide, Australia.
- Butler, J.R.A., Rainbird, J., Skewes, T., McGrath, V., Nai, F., Bohensky, E., Maru, Y., Morseu, F. 2013. Masig Yesterday, Today and Tomorrow: Community Future Scenarios and Adaptation Strategies. Department of Sustainability, Environment, Water, Population and Communities and Reef and Rainforest Research Centre. National Environmental Research Program, Tropical Ecosystems Hub.
- Cape York Natural Resource Management, 2013. 2012/13 Priorities for Fire Management and Biodiversity Conservation Investment on Cape York. Outcomes from workshop 14-15 May 2012.
- Cape York Natural Resource Management, 2012. Fire Workshop. Cape York Natural Resource Management.
- Dale, A., McKee, J., Vella, K., Potts, R. 2013. Carbon, Biodiversity and Regional Natural Resource Planning: Towards High Impact Next Generation Plans. Australian Planner, DOI: 10.1080/07293682.2013.764908.
- Department of Sustainability, Environment, Water, Population and Communities, 2012a. Opportunities under the CFI Reforestation Methodology Jabalbina Yalanji Aboriginal Corporation. Report prepared by GHD for the Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- Department of Sustainability, Environment, Water, Population and Communities, 2012b. Indigenous opportunities under the CFI reforestation methodology. Summary report. Report prepared by GHD for the Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- Far North Queensland NRM Ltd and Rainforest CRC, 2004. Sustaining the Wet Tropics. A Regional Plan for Natural Resource Management 2004 – 2008. FNQ NRM Ltd, Innisfail.
- Far North Queensland NRM Ltd, 2005. Sustaining the Wet Tropics. A Regional Plan for Natural Resource Management 2004-2008. Regional Investment Strategy 2004-2007. FNQ NRM Ltd., Innisfail.

- Green, D. Alexander, L., McInnes, K., Church, J., Nicholls, N., White, N. 2009. An assessment of climate change impacts and adaptation for the Torres Strait Islands, Australia. *Climate Change*. Published Online, DOI 10.1007/s10584---009---9756---2.
- Hilbert, D.W., Ostendorf, B., Hopkins, M. 2001. Sensitivity of tropical forests to climate change in the humid tropics of North Queensland. *Austral Ecology* 26: 590–603.
- Hilbert, D.W., Bradford, M., Parker, T., Westcott, D.A. 2004. Golden bowerbird (*Prionodura newtoniana*) habitat in past, present and future climates: predicted extinction of a vertebrate in tropical highlands due to global warming. *Biological Conservation* 116: 367-377.
- Jahn, T., Bergmann, M., Keil, F. 2012. Transdisciplinarity: Between mainstreaming and marginalization. *Ecological Economics* 79: 1–10.
- Kanowski, J. 2001 Effects of elevated CO₂ on the foliar chemistry of seedlings of two rainforest trees from north---east Australia: implications for folivorous marsupials. *Austral Ecology* 26: 165–172.
- Lang, D.J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., Thomas, C.J., 2012. Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustainability Science*, Supplement 1: 25–43.
- North Queensland Climate Alliance, Wet Tropics Management Authority, Marsden Jacob Associates, 2007. Greenhouse Gas Emissions in the Wet Tropics Region: A Preliminary Inventory. Wet Tropics Management Authority, Cairns.
- Reef Catchments, 2008. Reef Catchments Mackay Whitsunday Isaac NRM Plan 2008-2013. Reef Catchments Mackay Whitsunday Isaac NRM, Mackay.
- Suppiah, R., Bathols, J., Collier, M., Kent, D., O’Grady, J. 2010. Observed and Future Climates of the Torres Strait Region, Prepared by CSIRO Marine and Atmospheric Research for the Land and Sea Management Unit of the Torres Strait Regional Authority.
- Terrain NRM Ltd, The Cairns Institute (JCU), Biocarbon Pty Ltd, Fitzroy Basin Association, 2012. Resilience and Opportunity: Regions and the Roll Out of Australia’s Greenhouse Gas Abatement Programs. A Manual for Queensland’s NRM regions. Queensland Government’s Department of Environment and the Australian Government’s National Environment Research Program’s Great Barrier Reef and Tropical Ecosystem’s Hub.
- TierraMar Consulting, 2013. Evaluation of CYNRM Fire Program. TierraMar, Sutherland.
- TSRA, 2009. Boigu Sustainable Land Use Plan Part 2. Torres Strait Sustainable Land Use Plan Part 2. Report prepared by CONICS for Torres Strait Regional Authority.
- TSRA, 2010a. Torres Strait Climate Change Strategy 2010-2013. , Report prepared by the Environmental Management Program, Torres Strait Regional Authority.
- TSRA, 2010b. Hammond Sustainable Land Use Plan Part 2. Torres Strait Sustainable Land Use Plan Part 2. Report prepared by RPS Environmental Consultants for Torres Strait Regional Authority.

- TSRA, 2011a. Poruma Sea Wall Feasibility Study, Report prepared by AECOM for Torres Strait Regional Authority.
- TSRA, 2011b. Torres Strait Extreme Water Level Study, Report prepared by Systems Engineering Australia Pty Ltd for Torres Strait Regional Authority.
- TSRA, 2012a. Inundation Management of Saibai, Boigu and Iama Islands. Drainage and Seawalls. Report prepared for the Torres Strait Regional Authority by AECOM.
- TSRA, 2012b. Torres Strait - Options to Reduce Regional Carbon Footprint, Report prepared by CAT Projects for Torres Strait Regional Authority.
- van Oosterzee, P., Preece, N., Dale, A. 2009. Project Design Document in Compliance with the Climate, Community and Biodiversity Standards. Degree Celsius JV, BIOCARBON Pty Ltd., Terrain NRM Ltd., Innisfail.
- Van Oosterzee, P., Preece, N., Standley, P., Felderhof, L. 2012 Cape York NRM Ecosystem Services Scoping Study. BIOCARBON, Atherton.
- Wet Tropics Aboriginal Plan Project Team, 2005. Caring for Country and Culture – the Wet tropics Aboriginal Cultural and Natural Resource Management Plan. Rainforest CRC and FNQ NRM Ltd, Cairns.
- Williams, S.E., Bolitho, E.E., Fox, S. 2003. Climate change in Australian tropical rainforests: an impending environmental catastrophe. Proceedings of the Royal Society of London B 270: 1887-1892.
- Williams, S.E., Shoo, L.P., Isaac, J.L., Hoffman, A.A., Langham, G. 2008. Towards an Integrated Framework for Assessing the Vulnerability of Species to Climate Change. PLoS Biology 6 (12): 2621-2626.

Appendices

Appendix 1 - Type of Documents Reviewed

NRM Body	Material	Document Aim	Observations
Reef Catchments	1 research report 1 NRM plan (2008)	-Modeling, APSIM (Validate that Reef Rescue farm management practice meets water quality targets under different climate scenario conditions) -NRM Plan (2008)	No work has been undertaken yet to plan for or accommodate Climate Change (CC)
TSRA	7 consultant reports 15 Land Use Plans 1 CC strategy document	-Assessment report as part of TSRA greenhouse mitigation program. - Specialist report outline of potential impacts CC, identifies priority response and pre-emptive measures. - A study that quantitatively assesses the risks of extreme ocean water levels and inundation hazards in Torres Strait generally and in particular at each established community. -Assessment and suggestions of solutions to address inundation on Torres Straits' three most vulnerable habitable areas. - Feasibility of engineering works to protect critical community infrastructure and foreshore - type of works and costs - Identifies the main drivers that dominate observed variability and trends in climate. -Report provides climate change projections for simulated variables. Identify uncertainties in climate change projections. -LUPs provide decision support tool and guideline for each community to plan for and manage impacts of future development, in a sustainable way. -Participatory scenario planning -Climate change strategy	-Consultant reports were completed after the land use plans. -Recommendations from the reports have yet to be included in plans. Comprehensive LUPs that takes into account the biophysical environment, energy use, and cultural and social environment. Focus on: * CC and its physical impact on the communities *CC adaptation and actions to mitigate its impacts.
Cape York NRM	1 - Video 2- Board documents 5-community engagement-consultation documents 3 NRM relevant	-Board documents - strategic and principles based approach to strengthening regional planning in Cape York and a planning framework. -Community consultations on regional issues, land management and conservation, priority fire and biodiversity conservation	-Variety of documents and activities that are engaging the CC topic. Each of these documents focus on different scales with broad topics from governance to fire management on-country.

	<p>plans</p> <p>1 strategic plan</p> <p>1 evaluation document</p> <p>1 biocarbon scoping document</p>	<p>actions/investment.</p> <p>-Evaluation of fire project.</p> <p>-Scoping of biocarbon.</p>	<p>-Fire was the main CC related topic as well as biocarbon sequestration.</p> <p>-Broader NRM governance framework being discussed.</p> <p>-Greater number of community workshops-consultation documents.</p>
Terrain	<p>3 – consultant reports (biosequestration and GHG)</p> <p>1 NRM plan</p> <p>1 Bama plan</p> <p>2 Indigenous CFI feasibility studies</p>	<p>-Reports to assist Terrain to prepare for and take advantage of the Carbon Farming Initiative (CFI) as well as an inventory of anthropogenic GHG emissions.</p> <p>-Terrain NRM and strategic investment and Bama NRM plans</p> <p>-Indigenous CFI feasibility study</p>	<p>-No indication how the consultant reports are being considered for NRM planning.</p> <p>-Other documents suggested by Terrain were of government CC program and policy.</p> <p>-On the website.</p>

Appendix 2 - Questions used to Interrogate the NRM Plans (Stage 1)

Type of Information and Who

What kind of information is it?

Where did it come from?

How was it collected or received?

Who was consulted?

Scale

What is the scale of the information?

Is this the same scale as implementation of the NRM program/project?

Funding

Who funded the climate change program/project?

Whose initiative was it?

Were the funding priorities consistent with the regional climate change priorities?

Use and Translation of Information for NRM Planning

- Was the collected information useful for NRM planning?
 - o How was the information translated into something that is useful for NRM at the regional scale?
 - o Who was involved in the translation of information?
 - o Was there climate change actions coming out of the translation of the information?
 - o Are these actions being implemented by the NRM groups (and any identified stakeholders)?
 - o Is there monitoring/evaluation of the effectiveness of these actions?

Appendix 3 - Interview Questions (Stage 2)

NRM Climate Change Impacts and Adaption Research Program - Wet Tropics Cluster Project

Knowledge to manage land and sea: a framework for the future

Questions to inform Practise Review and subsequent Science Synthesis

October 2013

Name:

ID:

NRM group:

Date:

Place:

Interviewer:

Length of interview:

Interview Preamble

This interview is part of the Wet Tropics Cluster project, which is focusing on the co-production of knowledge that is useful to update or develop NRM plans for adaptation to climate change. In this interview we are particularly interested in how climate change information has been prioritised, translated and used for planning in your NRM organisation.

The information from these interviews will feed into the Practice Review and will also inform the Science Synthesis and the research carried out by the Participatory Scenarios and Knowledge Integration Node of the project.

Your responses will be treated as confidential and we will ensure that you are not personally identified in the reporting of the results. However, we would like to include your name in our list of interviewees to illustrate that we have represented key informants. **Is that Okay with you?**

[With your permission, this interview will be tape recorded and your statements summarised. Is that alright with you?]

Our discussion will include:

- Some background on your role and responsibilities in your NRM organisation
- Climate change research and consultancy in your NRM region
- Translation and use of climate change information
- Engagement
- Scale

Do you have any questions before we start?

SECTION 1: Context

1. How long have you been working on NRM related issues?

2. What is your role/s within your organisation?

3. For how long have you been in this role?

SECTION 2: Research and Consultancy

4. How have you/your organisation defined and prioritised research or consultancy work on climate change in your region?

4.a What level of community consultation was involved?

4.b Who (which community sectors, individuals, others) was consulted?

4.c At what stages did consultation occur – defining the topic, prioritising solutions from report recommendations for catchment-regional NRM plans, implementing the results?

4.d Who was involved when?

SECTION 3: Translation and Use of Climate Change Information for NRM Planning

5. How did you translate or incorporate climate related consultancy recommendations or research results into your planning processes?

5.a Who is/was involved? – Has it been done?

5.b Do you have any suggestions for improving the translation of information?

6. What process have you used to translate or incorporate stakeholder views on climate change into your planning processes?

7. How have you used consultancy and research reports in the past to improve your NRM planning or engagement with your primary stakeholders to address NRM issues?

7.a Have the reports been useful?

7.b Do you have suggestions for how they could be improved?

7.c Who were your primary stakeholders you engaged with to address NRM through climate related action?

SECTION 4: Engagement and NRM Climate Change objectives

8. How did you define your NRM objectives in the past around climate change?

9. How have you engaged stakeholders in the past to define your NRM objectives and develop catchment or regional NRM plans?

9.a How did you incorporate **climate change** into your plans?

9.b Did you implement those **climate change** components?

SECTION 5: Scale

10. What scale(s) do you usually plan at?

10.a What factors determine the scale of your planning?

10.b At what scale(s) have you planned to address **climate related NRM** activities?

10.c What factors influence the scale you work at for **climate change**?

IN CLOSING

11. Do you have anything else you would like to add? Any final comments?