



Climate adaptation and resilience in coastal zones

A review of coastal research funded by the Climate Change and Water Programme of Canada's International Development Research Centre

Synthesis Document

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1. Introduction

The Climate Change and Water program (CCW) of Canada's International Development Research Centre supports research on adaptation to the water-related impacts of climate change at the policy level and in practice. Populations living in coastal areas, especially in large coastal cities, are particularly vulnerable to the current and expected impacts of climate change, including storm surges and flooding, coastal erosion, groundwater salinization, and sea level rise. CCW supports 23 projects conducting research on coastal vulnerability, worth a total of 8.2 million CAD.

In 2013, halfway through its 2010-2015 programme, CCW commissioned the Overseas Development Institute (ODI) to evaluate how research findings from its coastal research portfolio was contributing to the scientific literature, and to inform future programming decisions.

The project sample

CCW staff identified 13 projects that had been operational for long enough for initial results to emerge, had a coastal focus, were each worth more than 300 000 CAD, and were not subject to another evaluation (Table 1).

These 13 projects worked at a variety of scales; some focused on single communities, and 7 worked at the scale of cities or subnational regions such as the Nile Delta. Projects working at large scale are particularly noteworthy because of the landscape dimensions frequently involved in coastal adaptation issues such as flood and sea level rise protection.

Geographically, the projects were distributed across sub-Saharan Africa (4 projects), Latin America and the Caribbean (3), Asia (2), and the Middle East and North Africa (3). The majority of recipients were either universities (7) or research centres (3), but also included a non-governmental organisation, an independent think tank, and an intergovernmental organisation.

Contents

This report presents a summary of the evaluation report, focused on two thematic clusters within the project sample. The first cluster relates research findings on disaster risk reduction and socio-ecological resilience. The second cluster focuses on findings from research on adaptation to slow-onset climate change.

2. Socio-ecological resilience to disasters and extreme events

This thematic cluster focused on results from six projects: 105868 *Five-City Network*, 106597 *River Plata*, 106703 *Chilika Lagoon*, 106707 *Risk Communication in Vietnam*, 106711 *Amazon Extreme Events*, and 106714

Tumbes Mangroves. This stream of research focuses on the impacts of climate variability and extreme events, and responses in terms reducing risk and strengthening resilience.

Table 1. Sampled projects

Short name	Full name	Recipient
105515 <i>Nile Delta</i>	Adaptation to the impacts of sea-level rise in the Nile Delta coastal zone, Egypt	National Water Research Centre, Egypt
105674 <i>Cape Town</i>	The power of collaborative governance: Managing the risks associated with flooding and sea-level rise in the city of Cape Town	University of Cape Town, South Africa
105814 <i>Climate Change and Health</i>	Climate change and human health in Accra, Ghana	Regional Institute for Population Studies, Ghana
105838 <i>CapaSIDS</i>	Capacity building and knowledge on sustainable responses to climate change in small island states	Instituto de Engenharia e Mecânica, Portugal
105868 <i>Five-City Network</i>	Sub-Saharan African cities: a five-city network to pioneer climate adaptation through participatory research and local action	ICLEI Africa, South Africa
106548 <i>CCARCD</i>	Climate change adaptation research and capacity development in Ghana	Regional Institute for Population Studies, Ghana
106551 <i>ARCA</i>	Establishing the Alexandria Research Centre for Adaptation to Climate Change	University of Alexandria, Egypt
106597 <i>River Plata</i>	Impacts of climate variability in the coastal areas of Argentina and Uruguay in the River Plata Estuary	Instituto Internacional de Medio Ambiente y Desarrollo, Uruguay
106703 <i>Chilika Lagoon</i>	Strengthening livelihood security and adapting to climate uncertainty in Chilika Lagoon, India	Wetlands International South Asia, India
106706 <i>Groundwater in Lebanon</i>	Climate change and saltwater intrusion along the Eastern Mediterranean: socio-economic vulnerability and adaptation	American University in Beirut, Lebanon
106707 <i>Risk Communication in Vietnam</i>	Communicating climate change risks for adaptation in coastal and delta communities in Vietnam	National Institute for Science and Technology Policy and Strategies Studies, Vietnam
106711 <i>Amazon Extreme Events</i>	Socio-cultural adaptations of Caboclos communities to extreme tidal events in the Amazon estuary of Brazil	Universidade Federal do Pará, Brazil
106714 <i>Tumbes Mangroves</i>	Impacts of climate variability and CC on the mangrove ecosystem in Tumbes, Peru	Instituto Geofísico del Perú, Peru

Key research findings

The projects with a focus on building socio-ecological resilience are all about halfway through and therefore have not produced published results. However, initial findings are beginning to emerge in all of them that potentially offer interesting and new insights into climate change manifestations and impacts on particular livelihood activities, as well as state-led and community actions that are helping to reduce vulnerability and exposure to climate extremes. In some of the projects, autonomous adaptations by communities are also being uncovered that have not been well understood in these locations or even internationally. Many of the projects study ecosystems and social aspects of resilience in parallel, looking at the impact of climate extremes on both types of systems, and bring the two together by examining the interplay between them.

The 106714 *Tumbes Mangroves* project, for example, has developed a useful framework for understanding the inter-relationships between the mangrove ecosystem, socio-economic activities and climate. Initial findings point to changes in the geology of the mangrove and the biological population brought about by El Niño. This is important because there is high demand on fisheries in Peru, and this is the first time anyone has looked at this issue in the country. High levels of precipitation, soil erosion and changes in certain nutrients are having an impact on the population of the conch, making it harder for local fishermen to find, so understanding this relationship is very important.

The 106703 *Chilika Lagoon* project has evolved from its initial design which analysed ecosystem process and social vulnerability separately, to looking at convergence and linkages between the datasets. This convergence has allowed researchers to analyse trends across larger scales – for example, thinking about how household-scale adaptations could scale up to a larger area, defined by ecosystem dynamics. This has also generated an interest in understanding the institutional

context and trying to influence this by sharing results from the socio-ecological analysis with DRR officials.

The social science aspects of the research are less innovative in some of the projects, in terms of methodology or research questions, but nevertheless are important fields of study. The social science research in the 106714 *Tumbes Mangroves* project examines social organisation, income from conch and crab fishing activities and potential new sources of income from eco-tourism.

The 106597 *River Plata* project looks at present and future vulnerability to flooding across settlements in two countries with a natural border. The natural science is innovative in looking at wind regimes and comparing increases in the height of the river caused by rainfall versus wind and how this differentially affects these communities. On the social science side, the research on adaptive capacity is not particularly innovative but participatory methods are being used to generate CCA plans with communities and local government and therefore this research should have important policy implications. The maps show that what was once exceptional in terms of flooding, will become more commonplace in the future.

The 106711 *Amazon Extreme Events* project uses innovative econometric models to understand the structure of household incomes, investment strategies and adaptive capacity. Incomes are partly derived from federal transfers, which are not only being used as safety nets to get families through hard times, but are also allowing families to invest in acai production. The researchers are using these findings to generate models of how cash transfers can help to build adaptive capacity.

The 106707 *Risk Communication in Vietnam* project is more oriented towards social science research than the other projects in this cluster. It analyses the link between communication of climate projections and collective action taken to reduce disaster risk – for example through early warning systems – as well as how better communication can improve DRR

and adaptation planning to reduce vulnerability over the long term. It asks whether uncertainties around climate projections should be communicated or not by comparing two communication approaches: communicating climate uncertainty versus communicating what neighbours have done to adapt. This is innovative in the climate change literature, although studies of communicating uncertainty and probabilities are more common in natural hazards literature and lessons from these methods and findings could be drawn on to a) strengthen the project and b) situate findings within the broader literature and compare effectiveness of communication techniques for different types of hazards, temporal and spatial scales.

The connection between livelihood activities and the ability to cope with and adapt to changes in climate – and in particular, climate extremes – was not always well articulated. The 106714 *Tumbes Mangroves* project, for example, does not refer explicitly to this link, but there is an implication that sustainable management of mangrove resources will ensure that communities whose livelihoods depend on these ecosystems are more resilient to El Niño events. Other extreme events related to climate change are not discussed directly.

The 106711 *Amazon Extreme Events* project has found that federal government funds allocated to communities to improve housing and productive activities have been used as more than just a safety net – they have led to improvements in adaptive capacity. The mechanism via which this increase in income generates adaptive capacity is still being explored. Similarly, the production of acai is thought to be contributing to a reduction in vulnerability to sea level rise and drought as demand for acai is high in local markets, so farmers can save from their income, and this palm is particularly resilient to reduction in levels of precipitation. An additional finding is that the production of this fruit is not extractive and so increased production does not produce negative externalities for the environment.

Areas of convergence

Findings from several projects illustrate that vulnerability to climate change is mediated through local climatological conditions as well as institutional arrangements. In the 106714 *Tumbes Mangroves*, Peru, productive resources are most affected by the El Niño phenomenon and in particular through the uncertainty this creates around sustainable extraction of conch and prawns. Climate change may have an impact on El Niño but it is not the primary cause of changes in ecosystems. Nonetheless, the over-exploitation of natural resources also undermines people's resilience and capacity to cope with extreme events and longer-term impacts of climate change.

Adaptation in this context will require a better understanding of how these resources are affected by climate extremes and slow-onset events, although the project does not look directly at these manifestations of climate change. It does however look at the local informal institutions governing resource extraction and wider supply chain management, both of which are key components of resilience to a range of external shocks and stresses. A combination of strategies is therefore needed to improve adaptive capacity in this context, and at different scales of governance. Similarly, the 106597 *River Plata* and 105868 *Five-City Network* projects identify land-use practices and other formal and informal urban development processes that contribute to increasing exposure to climate extremes.

Opportunities

IDRC has supported a number of interesting research projects on topics of DRR and disaster resilience, all with important and very specific policy implications, which makes a welcome change from what are sometimes very general normative ideas produced in this field. The natural science components are particularly strong and original in all the projects reviewed. There is an opportunity for IDRC to support more innovative social science elements, and to encourage the development of more challenging research questions of relevance to the

broader theoretical literature on disaster vulnerability, DRR and resilience. Specifically, research that looks at how governance systems and communities have coped with and learned from experiences of dealing with extreme events would make a vital contribution to this literature. Further studies on different methods for communicating risk, uncertainty, probabilities and scenarios are

also needed in the climate change field, particularly as these relate to local contexts and knowledge. Research could usefully encourage more trans-disciplinary approaches with scientists with different disciplinary backgrounds working more collectively to define the research problem and questions, alongside other stakeholders with non-scientific backgrounds.

3. Adaptation to slow-onset climate change

This cluster focused on the research from 8 projects: 105515 *Nile Delta*, 105674 *Cape Town*, 105814 *Climate Change and Health*, 105838 *CapaSIDS*, 105868 *5 City Network*, 106548 *CCARCD*, 106551 *ARCA*, and 106706 *Groundwater in Lebanon*. Research in this cluster focuses on understanding and adapting to climate change over long time periods, usually 100 years.

Key research findings

Research in this cluster has focused on locally important knowledge gaps and policy problems, but some findings also have wider resonance and significance to the academic literature. However, some findings have wider resonance. For example, the Nile Delta is considered a global hotspot of vulnerability to sea level rise (SLR), and CCW-supported work has helped improve understanding of risks and vulnerabilities there.

In Egypt, both 105515 *Nile Delta* and 106551 *ARCA* found that land losses to SLR in the Nile Delta would be significantly less compared to projections from previous studies (e.g. Dasgupta et al., 2009; Nahry & Doluschitz, 2010), mainly due to the inclusion of key infrastructure such as defensive works. 105515 Nile Delta projected losses of just 1-3% of the eastern Delta study zone by 2100 under

1m SLR scenarios, and results suggested that that managed retreat and transformation of coastal land-use would be more cost effective than the construction of sea walls and hard defences in the study area. Using similar methods for the whole Delta, 106551 *ARCA* found that SLR scenarios of approximately 1m would inundate 22% to 29% of the Delta, assuming no adaptation and without accounting for existing infrastructure. Also, between 32% and 54% of inundated areas would be undeveloped lands and wetlands: less than 5% of impacted land would be urban space.

105674 *Cape Town* developed fine-scale risk mapping and explored institutional aspects of risk management in Cape Town. Results show that due to coastal development, SLR, and increased frequency and intensity of storm surges, Cape Town will be at greater risk of coastal flooding in the future, and that building control, coastal zone management and set-back areas could be more efficient adaptations than the construction of hard defences. Research considered the contribution of institutional dimensions to vulnerability, and results suggest that the success of adaptation initiatives is conditioned as much by their socio-

political context as they are by the degree of risk posed or protection afforded.

105838 *CapaSIDS* combined the impacts of both SLR and increased flooding from precipitation events with socio-economic studies to identify exposed and vulnerable areas. These results are important because little similar research has been conducted in lusophone Africa or African small island developing states.

106706 *Groundwater in Lebanon* is researching the impact of climate change on groundwater, particularly on saltwater intrusion into coastal aquifers. The initial project framing was in terms of greater seaward pressures on aquifers resulting from SLR generating more saltwater intrusion. To date, evidence from the project has been that salinity is instead highly correlated with population density and is driven by inland abstraction and recharge rather than climate change.

Findings from 105868 *Five-City Network* were mainly related to processes for building stakeholder engagement, and the project appears to have focused on the delivery of practical information, tools and other support to urban planners. This focus recognises that adaptation is a process of social and institutional change embedded within a political economy rather than a series of strategies or technical planning (e.g. Pahl-Wostl, 2009). Rigorous critical investigations of this perspective would make strong contributions to the literature, in the future. One research finding was that city planners and politicians were more interested in risk assessments addressing upstream and downstream aspects of food, water, energy and master supply chains, not just in terms of direct physical impacts and spatial planning. This perspective of urban systems as an economic nexus vulnerable to climate change bears further investigation in the future.

105814 *Climate Change and Health* is something of an outlier in the project sample, focusing on urban health. The project stressed investigation of community perceptions and mental models regarding climate change rather than vulnerability assessments or identification

of adaptation options. The project's work on processes of building engagement between communities and urban authorities parallels work in 105868 *Five-City Network*. It is particularly interesting in the case of developing community action on unblocking sanitation and drainage lines following the identification of flood risk. This could make a contribution as a policy brief or 'how to' toolkit, but would be difficult to exploit as a contribution to the literature.

Results from 106548 *CCARCD* cover a range of topics including relationships between climate variables and malaria prevalence. Some small grant-supported research has explored issues relevant specifically to coastal environments. One line of research has correlated small relative SLR changes with groundwater salinization and linked this with impacts on agriculture and as a possible driver of migration. Future work will focus on geospatial assessments of household exposure to flooding and SLR-driven inundation, and relationships between climate change and food security mediated through artisanal fisheries.

Areas of convergence

In terms of physical risk, four of the projects addressed vulnerability to sea level rise or coastal flood risk: 105515 *Nile Delta*, 105674 *Cape Town*, 105838 *CapaSIDS*, and 106551 *ARCA*. These were among the first projects in Africa to offer fine-resolution downscaled projections of inundation due to SLR. In general, their findings provide more nuance to concerns about vulnerabilities to SLR, highlighting the key drivers of vulnerability as demographic growth and urbanization of coastal space. These are comparable to the findings of 106706 *Groundwater in Lebanon* that demographics are more immediate and more significant drivers of vulnerability than projected SLR. While SLR may exacerbate risk over the course of a century, the greater risk is generated by concentrating assets and people in flood-prone areas, or by over-exploiting coastal aquifers for irrigation.

Projects also considered other factors of physical risk, in particular flood risk. In

line with research findings from elsewhere, a number of projects identified flood risk in unplanned and informal urban areas as highly significant (105868 *Five-City Network*, 105674 *Cape Town*, 105838 *CapaSIDS*). 105674 *Cape Town*, for example, identified storm surge hotspots and areas at risk from downstream flooding, and highlighted cases in which existing infrastructure was a source of vulnerability due to inappropriate design. Aside from flood risk, 105515 *Nile Delta* concluded that SLR effects on groundwater levels will have more significant consequences than direct inundation, including impacts of groundwater salinization on urban and sanitation infrastructure.

An unsurprising but general finding reported by several projects (105868 *Five-City Network*, 105674 *Cape Town*, 105838 *CapaSIDS*) was that policymakers are less concerned by slow onset SLR than by flood-risk in the near term. An interesting finding from 105868 *Five-City Network* was that policymakers were concerned less by direct physical risk than by climate change disrupting upstream and downstream supply chains.

In terms of policy responses, 105515 *Nile Delta*, 106551 *ARCA* and 105674 *Cape Town* projects examined approaches to coastal defences. They concluded that while infrastructure dominates thinking, there are significant opportunities in governance and soft, or ecosystem, options. 105515 *Nile Delta* concluded that while hard defences remain cost effective in areas of concentrated infrastructure, they do not protect against groundwater and water table impacts, and are poor value for money in rural areas. 105674 *Cape Town* identified set-back areas and building control as the most effective options to reducing flood risk. Both 105515 *Nile Delta* and 105674 *Cape Town* found that although coastal ecosystems such as wetlands and dune systems have historically been economically undervalued and affected by degradation, with some rehabilitation they could form important and cost-effective components of a coastal defence strategy.

A third set of findings highlighted communities engagement in coastal planning and adaptation, and the potential for participatory approaches to catalyse new forms of governance. The use of participatory approaches may be particularly appropriate in spatial and/or urban planning, although relatively untested in the context of climate adaptation (e.g. McCall, 2003; Fairhurst, Rowsell & Chihumbiri, 2012). 105515 *Nile Delta* and 105838 *CapaSIDS* both demonstrate that in these contexts, PAR approaches depend on support from key authorities if they are to achieve impact, particularly in cases requiring large-scale interventions such as landscape management or large infrastructure investments. By contrast, 105674 *Cape Town* and 105868 *Five-City Network* demonstrate the potential for these approaches to negotiate between multiple stakeholders in spatial planning and adaptation, and to affect policy and practice when the key actors are engaged. 105868 *Five-City Network* concluded that adaptation is dependent on a process of social and institutional change more than a series of strategies and plans, and that participatory approaches can catalyse and facilitate that change. 105674 *Cape Town* also highlighted that the mobilization of participation in planning and governance has to be understood within the wider socio-political and institutional contexts in which it is attempted.

The majority of these projects are framed in terms of generating knowledge to meet immediate development challenges rather than theoretical or methodological contributions to the literature. However, this local perspective generates value. These investigations of climate change impacts and adaptations on the ground provide evidence as to how climate change generates specific challenges for development policy, but that these challenges are not insurmountable. A common finding is that climate change will exacerbate development challenges in many coastal areas, but that key drivers of vulnerability are demographic change and urbanization and that strengthened governance and planning can do much to reduce vulnerability.

Opportunities

The reviewed projects have made significant contributions in a number of areas, but few have focused on issues of water resources or water supply and sanitation. These are both issues that will be highly significant as coastal zones become more highly populated, with greater water demand, and impacted by SLR, flooding, and other climate-related impacts. Both 106706 *Groundwater in Lebanon* and 105515 *Nile Delta* have shown how these issues conflate in coastal space with degradation of the coastal aquifer and reduced drainage. They suggest that, especially with adaptation investments in coastal defences, many communities will be more directly impacted by changes in groundwater than

by direct inundation. These impacts will affect the performance of sanitation, drainage, and water treatment infrastructure, and constitute major challenges for governments and communities. Future research could consider issues of water supply and alternative sources of water, including desalination, particularly in densely populated areas. This is related to the need for research to consider climate impacts on coastal areas, and particularly coastal cities, as more than just direct physical impacts in particular spaces. The upstream and downstream systems that supply, serve and maintain those spaces and their populations are also important elements to understand, and in which to strengthen resilience and adapt to climate impacts. 4. Future funding directions

4 Future Funding Directions

These 13 projects offer a wide base for CCW to build on with future grants. Work in the thematic cluster on disaster risk reduction and socio-ecological resilience has explored linkages between local climatological conditions, institutional arrangements and vulnerability, and between ecosystem degradation and over-exploitation of natural resources and vulnerability to climate change and disasters. The second thematic cluster focused on adaptation to climate change, and has advanced understanding of vulnerabilities to physical climate impacts, identified and assessed policy responses, and explored participatory action research (PAR) approaches to urban and spatial planning.

All projects used a mixture of methods and approaches in their work, although some had stronger bio-physical bases (e.g. 106714 *Tumbes Mangroves*, 106703 *Chilika Lagoon*, 105515 *Nile Delta*) and others had a stronger focus on social sciences (e.g. 105814 *Climate Change and Health*, 105868 *Five-City Network*). However, in general the conceptual frameworks linking these different

methods, and linking research questions with methods and activities could be strengthened. For example, although several projects contributed to institutional development and adaptive capacity (see Section 3.4), few were able to connect this with theoretical or conceptual perspectives on adaptation as a process of social and institutional change. Other projects used parallel entry points to assessing vulnerability without reconciling, or exploiting interlinkages between, them.

As an example of the contrary, the project 106707 *Risk Communication in Vietnam* has an elegant design framed by a limited number of easily evaluable research questions. However, some other projects lacked clarity about their epistemological or methodological underpinnings, were overly complex, and were driven by project objectives and activities rather than research questions. For these complex projects, means of integration across disciplines, methods and sectoral silos were not always clear in the proposals, or subsequent project reports and research deliverables.

Multi-disciplinary research is highly challenging, particularly for researchers working in innovative areas with which they are unfamiliar, like climate change adaptation. In these contexts clear conceptual frameworks are extremely important, but are also challenging for researchers to develop. The evaluation team recommends that CCW work with recipients to strengthen conceptual frameworks in future projects, especially given the importance of good research design to achieving sound results, strong publications, and strengthened evidence-based decision-making.

While physical impact modeling is an important part of scientific enquiry related to climate change, it is relatively expensive. In climate adaptation research, there are also issues of modeling uncertainties that are difficult to resolve in developing countries where data, and knowledge about system dynamics and parameters, is often incomplete. Instead, CCW can also build on social science strengths, including institutional and political economy analysis, which can provide useful entry points to work on adaptation, adaptive capacity and resilience that also addresses underlying drivers of vulnerability. This can play a valuable role in generating locally-grounded perspectives to critique the theoretical literature on disaster risk reduction and climate adaptation.

CCW can play to the strengths of its partners by supporting work that focuses on adaptation from the perspective of decision-makers. This would be particularly powerful when joined with social science research on institutional and governance regimes and how these shape vulnerability and choices in different biophysical contexts. The evaluation team suggest that CCW consider framing this in terms of an emphasis on “development-first” or “decision-centric”¹ approaches to

climate adaptation and resilience rather than “science first” approaches (e.g. Hallegatte, 2012; Ranger 2013). This framing provides several advantages for research partners in developing countries. In particular it helps development research by helping to address immediate development needs in ways that are climate resilient and reduce risk, and provides a methodological approach to managing deep uncertainty that is more appropriate for making development decisions.

A related strength that CCW can build on is in action research approaches that build adaptive capacity in institutions and governance processes for adaptation at the city level or in spatial planning. Projects such as 105515 *Nile Delta* and 105674 *Cape Town* have shown the potential to make significant advances in specific contexts, and to make important contributions to local and national debates on coastal adaptation as well as produce publications relevant to the literature.

In terms of gaps to address, the evaluation team have noted elsewhere the opportunity for CCW to strengthen its portfolio of work on water issues in coastal areas under a changing climate. Water security can be used as a broad framework under which to organise, but key issues are likely to include access to reliable quality and quantities of water for drinking and supplementary irrigation, impacts on groundwater in particular, the climate resilient design and maintenance of irrigation and WASH infrastructure, and research to enhance delivery of both informal and formal WASH services.

The evaluation team also noted a number of emerging issues that CCW is well positioned to address in future research. One area is to build on work done by

affected by climate change, and then move towards the identification of crops, technologies and techniques which it then encourages farmers to adopt. A ‘decision-first’ approach might start by considering the constraints and tradeoffs small farmers have in managing and using irrigation, what bottlenecks are simplest to resolve, and then move towards identifying adaptation options that are feasible. Many projects may run these processes together and in parallel, but conceptual approaches are usually framed as ‘science first’ as this is a more traditional academic approach.

¹ Many IDRC projects begin by consulting with end-users and client groups to identify knowledge needs. However, a “decision-first” approach implies moving beyond this type of consulting to making the decision-maker’s perspective the entry point for analysis. For example, in addressing client knowledge needs for maximizing water productivity, a ‘science-first’ project might begin by asking questions about water demand of different crops, how they might be

106707 *Risk Communication in Vietnam* and others in research on communicating risk, uncertainty and probabilities and how this affects knowledge creation and collective action to reduce risk.

Another area is research on how acceptable levels of risk vary between communities and across livelihood activities, and how external/scientific assessments of risk and local ‘indigenous’ perceptions can be brought closer together.

A third area is investigation of different livelihood activities that undermine resilience to some hazards and increase resilience to others, to produce a more nuanced understanding of how risk varies in relation to different climate extremes.

Finally, rural communities in coastal areas are often highly dependent on marine natural resources, and more research is need to consider the potential for sustainable use of natural resources to buffer the impacts of extreme events and climate change. This line of research

would examine different kinds of social and economic organisation and how these balance the trade-offs between extraction and protection.

A final observation, related more to research impact than substance, comes from the evaluation team’s own personal experience, as well as being reflected in interviews conducted during this exercise. This observation is that whether projects are able to achieve development outcomes and influence policy from evidence appears to depend more than anything else on having politically savvy project leaders who are able to build networks of influence with key stakeholders, and leverage relationships between their project and ongoing policy initiatives. The evaluation team would suggest that CCW consider how that might be addressed in evaluation criteria for selecting future projects in ways that go beyond written research-to-policy strategies in project proposals.

The Evaluation Team

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