

Climate Proofing as a Regional Development Strategy

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Abstract

Governments, industry and communities of space and interest now largely acknowledged that climate change is a reality. The exception is provided by a minority of individual climate change deniers and fringe bodies. Extreme weather events, climatic variability and change are cross cutting and impinge variously upon biophysical, socio-economic and governmental systems at all scales. The immediacy of the challenges that this situation raises is given focus by the understanding that although Australia contributes less than two percent of the world's equivalent CO₂ emissions, the lands and waters of the continent are being impacted by 100 percent of the effects global warming. This gives 'urgency' to adapting to climatic variability and climate change at regional and local scales.

As a step towards addressing this urgency, 'Climate Proofing' is being promoted as a proactive adaptation response strategy by SEQ Catchments (SEQC) and the Burnett Mary Regional Group (BMRG) through demonstration projects. This is being done in collaboration with Climate Change, Coasts and Catchments, at the Faculty of Science, Health and Education at the University of the Sunshine Coast (C4@USC). To date, this joint initiative (which commenced in 2005) has encompassed a range of demonstration activities at regional, local and community scales in the contiguous South East Queensland, Burnett Mary regions of Queensland. Additionally, 'climate proofing' has been taken up by Shell Australia and Conservation Volunteers Australia (CVA) and has been introduced through climate change forums conducted in the Gladstone, Sunshine Coast and Toowoomba regions.

1. Introduction

The Geographic Context

South East Queensland is the fastest growing region in Australia. Populations are increasing and settlements are expanding and urban and primary production land uses are located on areas that are biophysically and socio-economically vulnerable to climate change (Berry and Waterman 2009, Duffy and Waterman 2009, Laves and Waterman 2009). The contiguous coastal area from the state border to the northern limits of the Burnett River catchment has been identified by the Australian Government (Allen Consulting 2005, DEH 2006) and the Intergovernmental Panel on Climate Change (IPCC 2007) as being at risk to adverse impacts from climate change. This area encompasses rapidly changing catchment and coastal regions that are already exposed to weather and climatic hazards and risks and are experiencing the impacts of short and long term climatically induced environmental change. In short, this is a region that is facing the dual pressures of changing population and climatic conditions and these should be addressed strategically as an integral part of regional development. The South East Queensland Catchment and the Burnett-Mary catchment area that together make up the contiguous SEQ region (for this paper) are shown on **Map 1**.

Map 1: Contiguous South East Queensland Catchments (SEQC) and the Burnet Mary Region (BMR)



Purposes

This paper seeks to achieve the following objectives. First, to set the scene for regional 'climate proofing' as applied to the contiguous SEQ region and show how it serves as an effective regional development strategy. Second, to outline the success of climate proofing to date via: work undertaken by SEQ Catchments (SEQC) and the Burnett Mary Regional Group (BMRG); in workshops at the SEGA Conferences; and through other initiatives. Third, to indicate how this work could be further built on and rolled-out elsewhere in Australia through natural resources management and other regional organisations, Local Government Authorities and engaged communities.

Approach

This paper overviews and evaluates some of the core activities undertaken over the past five years to further 'climate proofing' as a proactive approach to climate change adaptation (at regional and community scales) in the contiguous SEQC and BMRG catchment regions (**Map 1**). This includes: a literature and information review; the development of regional scale climate change scenarios; and the analysis of extreme weather events. Additionally, there have been wide ranging consultations with public and private sector organisations, community based bodies and individuals with widely varying interests, perspectives and opinions on the implications of changing climatic conditions and associated environmental implications such as sea level rise. As well, it has entailed facilitation and documentation of stakeholder and community meetings and action planning processes. Capacity building has been an important element of workshop activities.

Discussions were held with a wide range of stakeholders including key Queensland government departments and agencies (at the commencement of the project in 2005) by project team members. They found mounting concerns over the potential impacts from climate change and rapid population growth on existing infrastructure and resources in the contiguous SEQC and BMRG catchment regions. Specifically, there was recognition of a growing demand for information on the realities and implications of climatic variability and change to inform policy and planning strategies. Also, there was agreement between partners that a collaborative approach should be taken toward developing and disseminating research outcomes to meet this demand.

Areas of particular concern included: the vulnerability of natural and built coastal assets from climate change induced sea level rise, storm surge and coastal erosion; liability issues arising from coastal and inland flooding, bushfires and other extreme climatic events; the ability to ensure ongoing water and food security under drying conditions; the commercial productivity of pastoral, grain growing and forest (natural and plantation) areas and the potential impacts on terrestrial and marine biodiversity.

2. The Climate Risk Challenge

Setting the Scene

Since the 1990's authors such as Kay et al (1996), Waterman (1996), May et al (1998), Eliot et al (2000), Kay et al (2005) and Abuodha and Woodroffe (2006), as well as organisations such as NCCOE (2001 and 2004), IPCC (1996, 2001 and 2007), AGO (2002) and Allen Consulting (2005), have exhorted governments and communities to recognise that adapting to climate change is a critical issue for the coastal-catchment regions of Australia.

A strong case has been made that climatic variability and change has inter-linking biophysical, socio-economic and governance systems dimensions (Waterman 1995 and 1996, Bayliss et al 1997 White and Waterman 2006, White 2006) - in short, regional development implications. By taking a proactive approach to adapting to climate change, Local Governments, regional organisations and communities of interest can be better equipped to develop and implement the policies and practices necessary to ensure that development and life-styles in coastal and inland regions are biophysically, socially, culturally and economically sustainable. That is, they are applying recognised sustainable development principles and standards.

Arguably, there is broad agreement across a wide spectrum of public and private sector stakeholders that 2006 and 2007 were the years when the world started to become more acutely aware of the threat of global warming and its potentially devastating impacts to catchment-coastal systems and remote, rural and urban communities. This is expressed in terms of threats to: food and water supplies; human health; building and infrastructure; natural and cultural diversity; and regional, national and global economies. Al Gore's *An Inconvenient Truth*, released in May 2006 became the third highest-grossing documentary in the United States (BBC Website). The *Stern Review*, published in October 2006, warned that the failure to avert the consequences of global warming would result in a worldwide recession (Stern Review, 2006).

The 2001 IPCC Third Assessment Report (IPCC 2001a, b and c) emphasised the potential scope of impacts and the need for adaptive responses and raised the anthropogenic nature of the causes of global warming. The human dimension of the effects of greenhouse gas emissions and the resultant impacts were this was given a clear focus in the Fourth IPCC Assessment Report in 2007. Specifically, when seeking to attribute causation to the changes in climatic conditions the IPCC (2007) reported that '*most of the observed increase in globally averaged temperatures since the mid 20th century is very likely (95%) due to anthropogenic gas concentrations*'.

CSIRO and BoM (2007) have argued that '*we have already observed changes to our climate that are more rapid than anything the earth has experienced for at least the last 1 800 years*'. Likewise, the 2008 Garnaut Report to the Australian Government highlighted the physical, biological, economic and social risks and consequences of increasing greenhouse gas concentrations and *the need for immediate action* (Garnaut 2008).

Extreme weather events, climatic variability and change are cross cutting and impinge variously upon biophysical, socio-economic and governmental systems at all scales. This situation raises immediate challenges when seeking to ensure that the development of urban, regional and remote communities is sustainable. Focus is given to this situation is given by understanding that: *although Australia contributes less than two percent of the world's equivalent CO2 emissions the lands and waters of the continent are being impacted by 100 percent of the effects global warming*. This gives 'urgency' to adapting to climatic variability and climate change at regional and local scales. Climate proofing is one strategic way of ensuring that climate change adaptation is integrated across all facets of regional development.

Linking the terms: climate proofing-regions-regional development

'Climate Proofing' has been adopted by international bodies such as the Asian Development Bank (ADB 2006), the World Bank (WB 2006 and 2008a and b) and a range of European organisations as the term used to describe the suite of actions

needed to make areas and assets resistant to climate variability and change and to make communities and people more resilient (Hay et al 2004, ADB 2006, WB 2006 and 2008a and b). Specifically, Hay et al (2004) stated that ‘climate proofing’ provides a proactive approach for raising governmental, industry and community awareness, and initiating ‘no-regrets’ actions to meet the challenges of changing climatic conditions and rising sea levels, by reducing risk. They have also argued that adaptive responses are needed at multiple scales. It follows, that, as pointed out by White (2006), regional, local and community level ‘Climate Proofing’ activities are one way of preparing governments and civil society in SEQ to meet the ‘climate challenge’.

The term *region* is somewhat nebulous. Waterman (2001) has argued that operationally ‘region’ is hard to define; yet, it is a term used in ways that reflect a wide variety of spatial entities which have been drawn up based on different attributes. This diversity of purpose is illustrated in **Figure 1**. To some people the definition of a region doesn’t matter, to others it is an important term because it gives a sense of identity or place and is a focus for their future lifestyle and livelihood because of the comfort the concept gives. Operationally, region is a term used at different scales and for different purposes. Regions can focus attention, give a sense of purpose and provide a framework for a distinctive set of governmental actions. For example, using catchments as regional boundaries (as illustrated in **Map 1**), provides a specific spatial context that is relatively easy to delineate and understand.

Figure 1: Overview Framework for Regions and Regionalisation

POLITICAL	ADMINISTRATIVE	SERVICE
GOVERNMENTAL REGIONAL OVERLAYS		
• Jurisdictional	• Statistical	• Metropolitan
• Functional		
SOCIO-ECONOMIC AND CULTURAL REGIONS		
<ul style="list-style-type: none"> • Indigenous • Extractive Materials • Primary Industry • Coastal and Maritime • Conservation 		REGIONAL PATTERNS OF SETTLEMENT AND INFRASTRUCTURE: NODES AND NETWORKS <ul style="list-style-type: none"> • Cities, Towns, Villages • Rural and Remote Communities • Transportation Links • Communication Nets • Destination Areas
NATURAL RESOURCE BASED REGIONS <ul style="list-style-type: none"> • Climatic Zones • Geological Provinces • Catchments and Basins 		
<ul style="list-style-type: none"> • Topographical • Bioregions • Oceanic • Coastal • Primary production 		
UNDERLYING BIOPHYSICAL CHARACTERISTICS AND CONDITIONS		
ATMOSPHERIC	TERRESTRIAL	MARINE

Waterman (2001) stated that: *Regional development can be viewed as a holistic process whereby the natural and physical environmental, economic, social and cultural resources of regions are harnessed for the betterment of people in ways that reflect the comparative advantage offered by the inherent and geographically different characteristics of the area.* From this perspective, regional development is seen as a broad multidisciplinary process that operates in a range of geographic delineations and scales. It is not solely looking at economic outcomes alone. To be effective it must consider the physical, biological, economic social and cultural dimensions and activities within the regional boundaries.

Waterman (2001) also made the point that regional development encompasses matters and activities such as:

- natural biodiversity, cultural and heritage conservation;
- water resource provision and management;
- land use planning and environmental management;
- agricultural, fisheries, minerals and energy developments;
- labour markets research and employment generation;
- education, training and professional development;
- industry policy and industrial promotion and support;
- provision of infrastructure and community services; and
- tourism and recreation.

Arguably, to deliver across this spectrum of activities and interests requires an integrated approach. Such an approach is necessary if there is to be a more cohesive and adaptive way to develop and implement regional development policy, and to achieve responsive outcomes during times of rapid biophysical, social and economic change. Waterman (2003) points out that this is illustrated by the current situation with regions and communities facing the pressures of the increasing populations, and the challenge of changing weather patterns and climatic conditions.

3. 'Climate Proofing' as a Regional Development Strategy: Focusing on the climate change-regional development nexus

Recent publications from scientists and institutions such as Pittcock (2003; 2005), Bureau of Meteorology (BoM 2003, CSIRO and BoM 2007) and CSIRO (2001a and b) as well as consultants to government as illustrated by Kay et al (1996; and 2005a and b), May et al (1998), Allen Consulting (2005 and 2006), and Abuodha and Woodroffe (2006) have laid a solid foundation of broad scale literature on: climate change science; potential impacts and implications; mitigation; and adaptation to changes (such as sea level rise) at national, regional and local scales. Collectively, the rapidly increasing body of information on climate change provides: inventories and listing of the vulnerabilities of natural and human systems; delineation of geographic areas and assets that are at risk; and adaptation strategies that reduce risk. For example, the 2005 *Climate Change Risk and Vulnerability Report* to the Australian Greenhouse Office (Allen Consulting, 2005) acknowledged the importance of a regional approach for four main reasons:

- *Many practical adaptation strategies need to be applied at a regional scale rather than a sectoral scale*
- *Climate change impacts vary from region to region*
- *Some regions are more affected by climate change than others because of the negative synergies between climate change and other stressors such as population pressure or existing use of land and other natural resources; and*
- *Two or more vulnerable sectors may be important to a particular region, with the risks and vulnerabilities of the region depending on the cumulative effect of climate change on a number of sectors.*

Figure 2: Suggested Framework for an Integrated Approach for Assessing, Climatic and Related Environmental Changes and Initiating Climate Proofing Responses (after May et al 1997 and Waterman et al 2000)

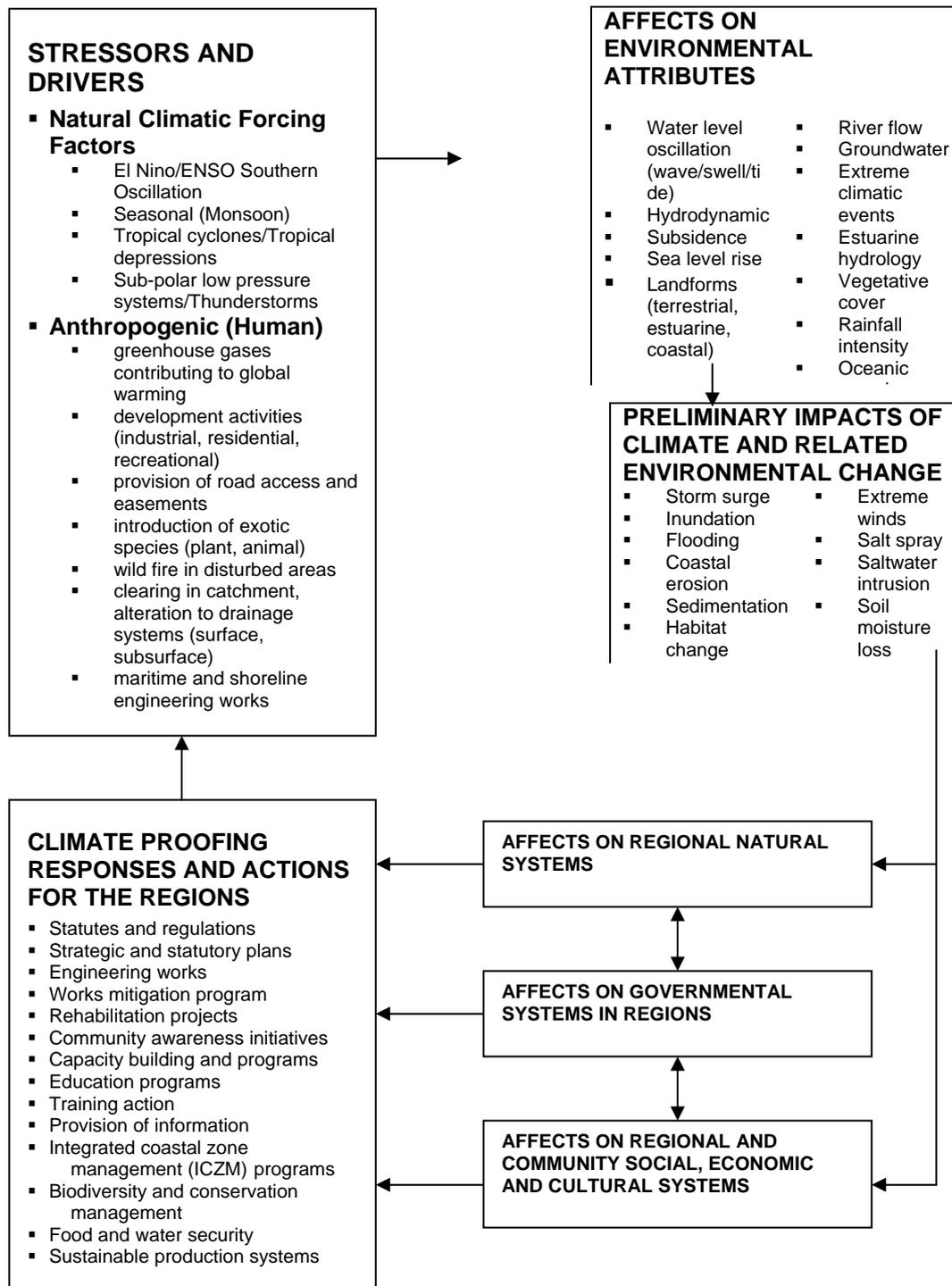


Figure 2 is a suggested framework for assessing climatic and related environmental changes and initiating climate proofing responses as a regional development strategy. This framework links the range of natural and anthropogenic forcing factors to the effects of the environmental attributes and preliminary impacts. In turn, these are linked to the effects on natural systems and community social, economic and cultural systems of the regions on regional governance systems.

The effects on these three systems are then focused onto climate proofing responses and actions for the regions. The list of climate proofing responses and actions for the regions is indicative only and illustrates that actions can come from the top-down (governmental) and the bottom up (community based). As an adaptive and integrated process, climate proofing provides a vehicle for focusing the potential impacts of changing climatic conditions and the adaptive responses onto a spatial framework that is: accommodating a broad spectrum of biophysical environmental conditions; diverse socioeconomic activities; and multiple governance arrangements. Collectively, these responses and actions encompass the broad ambit of regional development and can be addressed strategically.

4. Climate Proofing South East Queensland

Waterman (2009) reports that 'Climate Proofing' is being promoted as a climate change adaptation strategy by South East Queensland Catchments (SEQC) and the Burnett Mary Regional Group (BMRG). This is being done in collaboration with *Climate Change, Coasts and Catchments* at the Faculty of Science, Health and Education at the University of the Sunshine Coast (C4@USC through the SEQ 'Climate Proofing' Demonstration Project. This initiative commenced in 2005 and is a practical response to the growing public and private concerns over the vulnerability of coastal and inland regions to the projected impacts of climatic and associated environmental changes (White and Waterman 2006). In particular, it is responding to a key question being asked by stakeholders from across industry sectors, communities of space and interest and members of the public: *What can we do to adapt to climate change?*

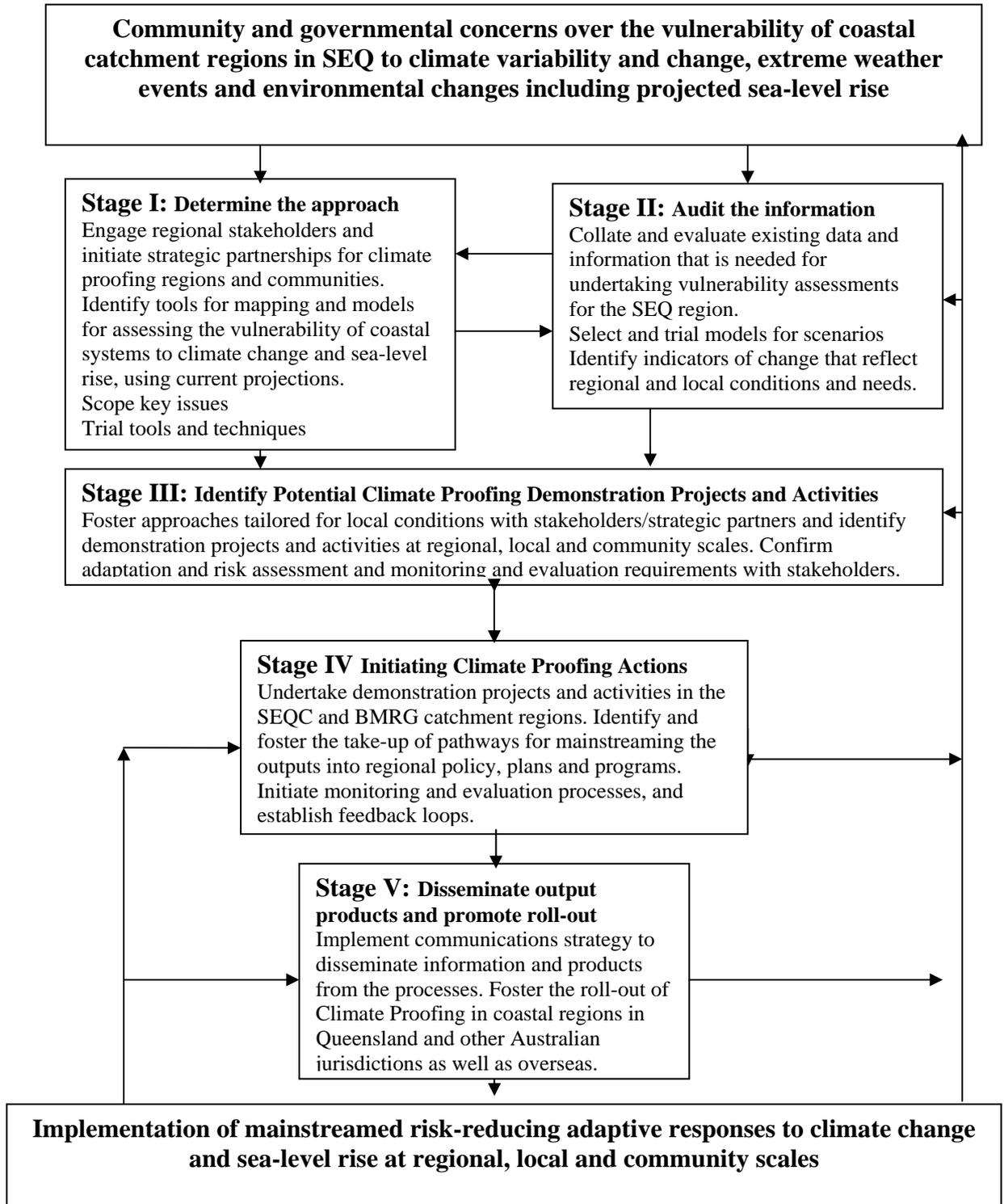
White and Waterman (2006) and Waterman (2009) reported that the SEQ 'Climate Proofing' Demonstration Project has three broad aims. First, to strengthen the essential links between *community perspectives and governmental policy* on adapting to climate and the available *tools and techniques* for reducing risks and impacts at local and regional scales. Second, to equip statutory land use and environmental planners, natural resources managers, primary producers and other industry sectors in the coastal regions, with the tools and techniques that will enable them to mainstream climate change adaptation into policy, plans and project implementation. Third, to raise community awareness on the challenges of climatic variability and extreme weather conditions, and the need to: foster improved response preparedness and embed enhanced resilience.

The approach being followed for the SEQ 'Climate Proofing' Demonstration Project, has three components. First, fostering integrated approaches to climate change adaptation through '*risk reduction*'. Second, identifying and developing tools and techniques for integrated vulnerability assessment and management that address regional, local and site specific environmental conditions. Third, initiating and supporting community awareness and capacity building to equip local and regional stakeholders to deal with current climatic variability and projected climate change and sea-level rise. White and Waterman (2006), White (2006) and Waterman (2009)

make the case that vulnerability and adaptation assessment, together with the accompanying integrated environmental management, can be tailored to the geographic realities of specific regions and localities, including the capacities of communities. That is, it can be applied as a regional development strategy. The demonstration project is being undertaken using a staged approach, as illustrated in **Figure 3**.

The vulnerability and risk reduction approach shown in this figure was initially developed for application in the more remote wet-dry tropical regions of northern Australia (Eliot et al 2005) and modified for application in the coastal regions of SEQ (White and Waterman 2006, White 2006).

Figure 3: Staged Approach for Climate Proofing Coastal Regions and Communities in SEQ (After White and Waterman 2006)



Community awareness and capacity building are integral parts of 'climate proofing' and encompass the communication strategies used for preparation and dissemination of information on climate change adaptation. As well, it encompasses running workshops, short courses and training programs for practitioners.

Additionally, it includes the provision of accredited post-graduate programs in areas such as Climate Change Adaptation, Integrated Coastal Zone Management, Environmental Change Management that are currently being delivered by the University of the Sunshine Coast. Tools and techniques available for capacity building for climate change adaptation and ICZM practitioners include the *SimCLIM* suite of models developed by the International Global Change Institute (IGCI) for climate proofing regions (Warrick et al 2005, Warrick and Cox 2007, Warrick 2009). These models project scenarios and allow practitioners to develop and cost risk reducing adaptive responses to climate-driven change.

Other tools available include, for example, models developed by the Queensland Department of Primary Industry, the Australian National University and international bodies. The tool kit is rapidly expanding and new methods and techniques including modelling and field techniques should be incorporated into regional, local and community scale projects as they emerge. Information on the tools and techniques is accessible through www.eianz.org under climate change education. This material was collated as a collaborative initiative between the Environment Institute of Australia and New Zealand (EIANZ) and the University of the Sunshine Coast (USC).

5. Work Undertaken and Outcomes to Date

Since 2005 the annual SEGRA Conferences have been a key player in introducing 'climate proofing' to regional development practitioners. SEQC commenced the SEQ climate proofing demonstration project in 2005 and the BMRG in 2007. In 2009 Shell Australia and Conservation Volunteers Australia (CVA) initiated 'climate change' forums in a number of regional communities. **Table 1** provides a brief chronology of work undertaken to date through SEGRA, SEQC, the BMG and the Shell Australia-CVA initiative. A summary of the activities to date in the context of the diagrammatic structure given in **Figure 3** is provided in **Table 2**. Collectively, the actions, activities, outcomes and products needs to be seen as 'work-in-progress' reflecting the successful initial steps of a long-term collaborative initiative.

Establishment of the *SEQ 'Climate Proofing' Demonstration Project* has provided a vehicle for strengthening the essential links between community perspectives and governmental policy on climate change adaptation (White and Waterman 2006). Additionally, it is helping to make stakeholders more aware of tools and techniques that are available for reducing climate related hazards and risks and reducing the impacts of climatic variability (including extreme events) at regional and local scales. Further, feedback from stakeholders confirms that the demonstration project is providing essential new information and an impetus for planners, natural resources managers, primary producers and other industry sectors to gain the professional skills necessary to meet the challenges of climatic variability and extreme storm and drought conditions.

At the community level, organisations and individuals have joined together to identify and prioritise actions needed to help them 'Climate Proof' Coochiemudlo and Bribie Islands. 'Climate Proofing Communities' is catching on and initiatives are starting to roll-out as part of the SEQ 'project as well as in other Queensland and Australian locations.

Other initiatives include: moves to 'climate proof' the Noosa '*Man and the Biosphere Reserve*'; embedding 'climate proofing' as part of the interactive education processes at the Dolphin Education Center at the Tangalooma Resort on Morton Island; disseminating educational and capacity building material through the Queensland

Rural Women's Network; and fostering awareness raising by the Queensland Murray Darling Committee.

Table 1. Chronology of *Climate Proofing* work undertaken to date through SEGRA, SEQC and BMRG and the Shell Australia-CVA initiative

Year	Workshop and Forum Activities	SEQ Catchments (SEQC)	Burnett Mary Regional Group (BMRG)
2005	SEGRA Climate proofing (CP) workshop, Yepoon	Phase I: Awareness and Capacity Building Workshops	
2006	SEGRA CP workshop, Launceston	Phase I: Awareness and Capacity Building Workshops Applied research on regional climate change scenarios	
2007	SEGRA CP workshop, Wollongong	Phase II, Part 1: Community climate proofing activities on Coochiemudlo Island Bribie Phase II, Part 2: Climate change and ecosystem services mapping project	Scenarios Building and Planning Project encompassing: <ul style="list-style-type: none"> • regional climate change scenarios • coastal vulnerability, • settlements and infrastructure • water security; and • farm and plantation forestry sectors
2008	SEGRA CP workshop, Albury	Phase II: Part 3 Climate proofing biodiversity corridors	Regional CP workshops
2009	SEGRA CP workshop, Kalgoorlie-Boulder Shell Australia and Conservation Volunteers Australia Climate Change Forums: Gladstone Region, Sunshine Coast Region, Toowoomba Region, Adelaide	-World Environment Day Festival for the Sunshine Coast Region at the University of the Sunshine Coast -Finalising climate proofing biodiversity corridors and continuing 'Coochie and Bribie' activities -Roll-out of promotion of climate proofing through conference presentations and community based awareness raising activities	Finalisation of working papers, scoping reports and ' <i>planning for climate change</i> ' awareness raising materials for the Burnett-Mary Region as source information for Regional Local Government Authorities and community based organisations. Information dissemination and evaluation

Table 2. Overview of Work Undertaken for SEQ Demonstration Project

Stage	Actions, Activities and Outcomes	Products and
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		Comments
I	<p>Project conceptualisation</p> <ul style="list-style-type: none"> -Strategic partners frame and agree multiple approaches -Initial stakeholder engagement meetings held with community organisations and Local Governments in SEQ and Burnet Mary regions <p>Phase I Climate Proofing initiated by SEQC</p> <ul style="list-style-type: none"> -Successful awareness raising, issues scoping and capacity building workshops held in SEQ region by SEQC and C4@USC 	<ul style="list-style-type: none"> -Concept flyers promoting climate proofing -Conference presentations and papers -Capacity building with hands-on use of SimCLIM -USC commenced professional development programs in climate change adaptation and Integrated Coastal Zone Management
II	<ul style="list-style-type: none"> -Auditing regional and local scale Digital Elevation Models (DEM) and meteorological data -Identifying key information requirements for vulnerability assessments and climate proofing activities 	<ul style="list-style-type: none"> -Honors thesis on model selection and information auditing -SimCLIM trials at regional scale
III	<p>Confirm approaches with stakeholders</p> <p>Phase II Climate Proofing initiated by SEQC Including climate proofing Coochiemudlo and Bribie Islands</p> <p>The <i>Building Local Government Resilience through Scenario Planning Project</i> initiated by the BMRG focus on Climate Change Implications for:</p> <ul style="list-style-type: none"> • <i>Coastal vulnerability.</i> • <i>Water Security</i> • <i>Residential, Tourism and Recreational Pressures on Infrastructure</i> • <i>Plantation and farm forestry.</i> 	<p>Reports to SEQC on mapping climate change dimensions of ecosystem services and biodiversity corridors</p> <p>SimCLIM applied to regional climatic conditions in areas covered by SEQC and BMRG Regional scenarios</p> <p>Scoping Reports and Working Papers for scenario themes for BMRG</p>
IV	<ul style="list-style-type: none"> -Climate proofing meetings and workshops on Coochiemudlo and Bribie Islands -Community groups on islands set priorities for actions to suit local conditions and needs -BMRG State and Local Government stakeholder focused workshops for coastal and catchment LGA's 	<p>Initial set of climate change projections for the SEQ-BMRG region.</p> <ul style="list-style-type: none"> - observed climate change over the last 60 years is consistent with global predictions -trends are indicative of expected future changes.
V	<ul style="list-style-type: none"> -Running 'Climate Proofing Regions' workshops as part of annual SEGRA Conferences -Initiation of interstate activities(eg GEDC and CVA) 	<ul style="list-style-type: none"> -Dissemination of SEQC and BMRG Working Papers and Scoping Reports -Conference papers and public presentation

6. Discussion and the Way Forward

Extreme weather events and increased climatic variability affects everyone. Sound arguments have been made that adaptive responses need to be understood and adopted by governments, non-governmental organisations and communities of space and interest. This is the essential first step if policy and practical responses to changing weather and climatic conditions are to be mainstreamed into planning and on-the-ground action at regional and local scales.

Globally, governments and civil society have to become involved in various ways to implement measures to deal with the challenges presented by climatic variability and change. Climate proofing is one approach that is rapidly being taken up in developed and developing countries (World Bank 2006 and 2008a and b) as a way of focusing the responses to extreme weather events, climatic variability and changing climatic and associated environmental conditions such as rising sea levels, prolonged drought and increased incidences of bushfires.

Regional scale 'climate proofing' demonstration activities in the contiguous catchment regions of SEQ by SEQC and the BMRG (**Map 1**) have encompassed climate change scenario modelling, coastal vulnerability assessment, evaluating risks to settlements and infrastructure, water security, and forestry. Over the past two years, the SEQC demonstration activities have had a specific focus on climate proofing coastal communities. As indicated in **Table 1**, this is being done through community based projects at Coochiemudlo Island and Bribie Island. In both locations the communities of interest have come together to: strengthen alliances; establish governance mechanisms suited to their circumstances; set priorities; and initiate a range of on-the-ground activities.

SEQC have also undertaken regional scale assessment activities in relation to woody vegetation assemblages in biodiversity corridors, plantation forestry, and the provision of ecosystem services. The Shell Australia-CVA initiative has raised awareness and stimulated responses for communities of interest to become involved in climate proofing. All of these actions make strategic contributions to regional and community development.

Understanding the biophysical, social and economic dimensions and responses for adapting to climatic variability and change is a critical issue for coastal catchment regions. Adaptation needs to be mainstreamed into local and regional development policy, plans, programs and projects of governments and business. 'Climate proofing' provides a framework to focus 'no-regrets' adaptive responses to current climatic variability and projected change (especially the increasing frequency of extreme events) as a regional development strategy. This is illustrated by the ways in climatic and associated risks and climate proofing responses can be viewed in relation to regional development themes, as shown in **Table 3**.

A case has been made by authors such as Hay et al (2004), and Warrick (2006) that 'Climate Proofing' is a cost effective approach for: making areas and assets resistant to climate variability and change; and to make communities and people more resilient. Further, it is an approach that can be readily applied by regional natural resources management bodies, as demonstrated by the informal collaboration between SEQC, the BMRG and other bodies (eg Shell Australia and CVA, Noosa Man-and-the-Biosphere Reserve Board) to foster adaptive actions and activities at regional, local and community scales.

Table 3: An Example of the Relationship of Selected Regional Development Themes to Climatic and Associated Risks and Climate Proofing Responses

Regional Development Theme	Possible Climatic and Associated Risks and Impacts	Examples of Climate Proofing Responses
Sustainable agricultural, horticultural, viticultural and forestry production systems	<ul style="list-style-type: none"> -Extreme weather by way of prolonged droughts, floods, bushfire -Soil loss from wind storms -Seasonal changes in temperature and rainfall conditions affecting productivity -Seasonal flooding and waterlogging of catchment areas 	<ul style="list-style-type: none"> -Strategic land utilisation planning and practices to meet changing climatic conditions including moving commercial activities to regional areas more climatically suited to forestry, grain growing , fruit and vegetable cropping and grazing regimes -Enhanced in-ground water storage and catchment management
Mining and mineral processing	<ul style="list-style-type: none"> -Extreme and prolonged heat waves affecting working and plant operating conditions -Heat impacts on railway lines and roads -Flash flooding at mine and industrial sites and cutting transport corridors -Extreme storm risks to port and terminal facilities 	<ul style="list-style-type: none"> -Selecting mining and other outdoor equipment to ensure maximum human comfort and reduction in health and safety risks -Site planning and water run-off management for extreme storm events -Appropriate disaster risk and emergency management response
Water security for rural, industrial and residential users	<ul style="list-style-type: none"> -Reduction in annual precipitation -Seasonal shifts in rainfall -Increasing rates of evaporation 	Climate adapted water capture and storage systems based on climate change scenarios and extreme event analysis
Establishment and maintenance of urban and peri-urban residential and industrial development	<ul style="list-style-type: none"> -Health and amenity impacts from extreme weather by way of prolonged droughts and heatwaves, -Localised flooding -Bushfires -Damage from high winds from cyclonic and extreme storm events -Coastal erosion -Storm surge flooding 	<ul style="list-style-type: none"> -Site selection, land release and subdivision design to take account of climatic and associate environmental risks -Strengthened building codes and infrastructure design practices -Appropriate disaster risk and emergency management response -Property insurance and other financial incentives against development in risk prone areas
Maintenance of tourism and outdoor recreational areas	<ul style="list-style-type: none"> -Stress from heatwaves -Increased wind speeds causing unsafe water sport conditions -Un-seasonal flash flooding impacts on tracks and waterways 	<ul style="list-style-type: none"> -Relocation into climatically more conducive areas based on climate change projections and extreme event analysis -Modifying on-ground activities to meet changing conditions

This paper makes the case that climate proofing is an effective regional development strategy in that it is cross-cutting and broad in coverage across the areas of interest to regional development practitioners. Initiating and supporting community awareness as well as capacity and resilience building to better equip local and regional stakeholders to deal with projected climate change and sea-level rise is essential to the success of the implementation of regional development strategies. International experience has shown that climate change adaptation needs to be owned and implemented by a diverse suite of stakeholders at regional, local government and community levels (DEH 2006). As an ongoing collaborative initiative involving SEQC, BMRG, SEGRA, Shell Australia-ACV and the University of the Sunshine Coast, the *SEQ Climate Proofing Demonstration Project* shows how this is being done and provides an approach that can be readily applied elsewhere in Australia.

The question that now can be raised is: where to next? Or, how can this approach be applied elsewhere in Australia? Experience with the SEQ demonstration project and following up on the contacts made through the Shell Australia-ACV initiative has shown that there is a great willingness within communities for people to be engaged in '*doing something about adapting to climate change*'. Presentations made at conferences and community based workshops over the past three years have focused on the need to take adaptive actions with respect to interrelated areas of issue such as:

- vegetation cover, biodiversity, habitat and wildlife conservation, and commercial and native forests;
- food and water security within catchment contexts especially with the objective of maintaining productive farming, grazing and horticultural activities;
- marine biodiversity and resources including commercial fisheries and conservation areas;
- built environments, infrastructure and waste reduction and management; and
- human health, safety and quality of life.

Emphasis is given to starting with the 'low hanging fruit' by undertaking activities that can have immediate results and be done on the basis of 'no regrets' in that they are essential measures to ensure effective integrated environmental management. For example, selecting appropriate garden and rehabilitation species that can survive in changing environmental conditions or initiating measures to make life styles more 'climate adapted' in terms of human comfort and health promotion. Existing organisations and community groups need to:

- endorse climate proofing as an approach to dealing with extreme weather and adapting to changing climatic conditions;
- seek more information on the possible impacts of climatic variability and change on their region and community and themselves;
- set directions and for climate proofing that meet local expectations and understanding, geographic realities and accessible resources; and
- build on the inherent strengths within the communities of space and interest and celebrate successes.

An eight step risk reduction approach has been suggested to enable interested organisations and groups move forward. This stepped approach has been informed by the input from community meetings and follow-up discussions. The framework is summarised in **Table 4** and provides an answer to the question: *Where to next?*

Table 4: Eight Steps Towards ‘Climate Proofing’ Regions and Communities - A Risk Reduction Approach

Step	Objective	Activities and Tasks
1	Increase level of understanding	Facilitate accessing and disseminating information on regional weather and climatic conditions, climate risks and impacts and what this could mean for regional communities and residents
2	Build strategic partnerships	This is a long term set of collaborative activities necessary to give action to the climate proofing as an adaptive approach to addressing climate change
3	Inventory resources that are at risk	This encompasses the biophysical, social and economic ‘values ‘ of the communities of space, interest and spirit that could be impacted by changing climatic and environmental conditions
4	Assess vulnerabilities and risks	This entails quantitative and qualitative assessments of extreme weather events, greater climatic variability and scenarios of climatic and associated environmental changes.
5	Identify and prioritise the ‘hot spots’ for on-the-ground actions	<ul style="list-style-type: none"> • Where are they, and what are the impacts? • What are the long and short term risks and how can they be reduced? • How long will it take and who will do the work? • What will it cost and who will pay?
6	Prepare and implement a simple ‘no regrets’ <i>Climate Proofing Action Plan</i>	Strategic partners should develop and implement a <i>Climate Proofing Action Plan</i> based on the assessment of vulnerabilities and risks for the priority hot spots and tailored to the geographic and resource realities of the region, the communities, and individual needs
7	Evaluate what is being done and what has been achieved	An essential step in continuous improvement in implementing the <i>Climate Proofing Action Plan</i> and mainstreaming climate change adaptation into policies and plans at all scales
8	Spread the word on ‘climate proofing’	<ul style="list-style-type: none"> • Disseminate information on projects and outcomes • Celebrate the successes and the benefits of ‘climate proofing’ for communities and individuals • Promote ‘climate proofing’ as a bottom-up suite of adaptive responses the are tailored to regional and local realities

8. Concluding Remarks

Arguments have been presented to show that 'climate proofing' is an effective strategy in that it is cross cutting and addresses the core dimensions of regional development. The ways in which this approach has been promoted in the contiguous South East Queensland and Burnett Mary Regions are outlined.

An overview has been provided of the work undertaken to date as part of the SEQ Climate Proofing Demonstration Project and the products of the suite of activities at regional and local scales. Work to date has resulted in: raised awareness; enhanced capacity; and products that can inform planners and decision makers on selected topics. Of particular note regionally focused climate change scenarios have been developed for SEQ and the Burnett-Mary regions.

An indication has been provided on how the project-work to date in SEQ could be built on and rolled-out to by regional bodies (such as Regional Development Commissions in Western Australia and NRM groups), Local Government Authorities (LGA's) and communities as a long-term regional development strategy. The 'bottom-up' approach outlined has been implemented at very low cost and has had great support at the community level. As such, it is easy to take up because it is building on the organisational and governance strengths inherent in regional communities and the personal and professional skills and experience within civil society.

To conclude, climate proofing as a bottom-up approach to adaptation that aims to make areas, assets, communities and individuals more resilient to the impacts of climate change can be a useful regional development strategy.

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