



Australian Government

TORRES STRAIT REGIONAL AUTHORITY



Submission No:	7b
Date Received:	27-11-08
Secretary:	

Ms Jennie George
Chairperson
Standing Committee on Climate Change, Water, Environment and the Arts
PO Box 6021
House of Representatives
Parliament House
CANBERRA ACT 2600

Dear Ms George

Inquiry into Climate Change and Environmental Impacts on Coastal Communities

Please find attached a second submission from the Torres Strait Regional Authority to the inquiry into climate change and environmental impacts on coastal communities concerning climate change in the Torres Strait and the impact on indigenous peoples.

The submission responds to your request for further information on the need for urgent remedial action to address coastal management and climate change in Torres Strait, citing previous funding applications, requirements for further modelling/investigation and any urgent priorities that need to be addressed in a joint cooperation between both governments.

As indicated in our presentation in Darwin, coastal inundation and erosion are of immediate concern to Torres Strait Islander communities. Works to mitigate impacts on communities are required now as an urgent priority.

In addition, the potential impacts of climate change are also of significant concern to Torres Strait Island communities who are particularly worried about the impacts of sea level rise. We have proposed a program to investigate and address the impacts of climate change and coastal issues more thoroughly throughout all of Torres Strait. This proposal details a comprehensive approach to investigate, monitor and plan for adaptation to current coastal hazards as well as the potential effects of climate change including potential sea level rise, increased extreme events, changes to coastal ecosystems, water supply and health etc.

I look forward to the Government's investment in the protection of Torres Strait Island communities from both current coastal hazards as well as the potential impacts of climate change.

Yours sincerely,


Mr John Kris
Chairperson
Torres Strait Regional Authority

10 / 11 / 2008



Australian Government

TORRES STRAIT REGIONAL AUTHORITY



Submission No 2

House of Representatives Standing Committee on Climate Change, Water, Environment & the Arts:

Inquiry into climate change and environmental impacts on coastal communities

CLIMATE CHANGE IN THE TORRES STRAIT AND THE IMPACT ON INDIGENOUS PEOPLES



EXECUTIVE SUMMARY

This submission responds to the committee's request for further information from TSRA on the need for urgent remedial action to address coastal management and climate change in Torres Strait, citing previous funding applications, requirements for further modelling/investigation and any urgent priorities that need to be addressed in a joint cooperation between both governments.

As outlined in the first TSRA submission and the presentation given at the public hearing in Darwin, erosion and inundation are already serious hazards on many Torres Strait Islands and are currently impacting communities and infrastructure in the region, including housing, harbour works, business enterprises, desalination plants as well as ecosystems and cultural sites.

Work undertaken by the Torres Strait Coastal Management Committee has thus far focused on Coastal erosion issues although it is clear that inundation and climate change are also very significant issues for Torres Strait communities. The low lying nature of several islands and the extent of current inundation problems suggests that any significant sea level rise due to climate change could potentially threaten the viability of these communities. In addition other potential impacts of climate change including changes to rainfall patterns, ecosystems as well as the spread of disease may significantly impact Torres Strait Island communities.

This submission is thus divided into two parts:

Part A details works to address coastal erosion based on studies undertaken for the Coastal Management Committee to date. These include protection works for Saibai and Boigu, with some initial actions based on the community response for Masig. Some works on Warraber that are almost certainly going to be recommended by the community are also included. However, it is certain that additional long-term strategies will need to be put forward for the islands of Masig, Poruma, Warraber and Iama once the communities have responded to the options put before them.

These proposed works total \$8,583,960 which includes a 20% allowance for design modifications to address climate change impacts. These works will also greatly assist in addressing inundation although it is clear that other management actions will be required to address inundation, sea level rise and other climate change impacts in a more holistic way.

Part B of the submission proposes a program to investigate and address the impacts of climate change and coastal issues more thoroughly throughout all of Torres Strait. The proposal details a comprehensive approach to investigate, monitor and plan for adaptation to current coastal hazards as well as the potential effects of climate change. The aim of the proposal is to undertake a systematic investigation of all island communities comprehensively addressing issues of coastal erosion, inundation, and other impacts of climate change including changes to coastal ecosystems, water supply and health. It is intended that this program will build on the work by the EPA and James Cook Uni, incorporating strategies agreed to by the communities of Masig, Poruma, Warraber and Iama, but also addressing coastal management and climate change issues impacting other Torres Strait Island communities.

The cost for this proposed program is \$3,575,000 (over 3 years) with a likely implementation costs once adaptation plans are developed of \$50+million, owing to the low lying nature of many of the communities.

PURPOSE

To respond to the committee's request for further information from TSRA on the need for urgent remedial action to address coastal management and climate change in Torres Strait, citing previous funding applications, requirements for further modelling/investigation and any urgent priorities that need to be addressed in a joint cooperation between both governments.

INTRODUCTION

The TSRA established a Coastal Management Committee in 2006 to enable a whole-of-government coordinated response to coastal issues in the Torres Strait region. The initial focus of the committee was on erosion issues on the 6 most significantly affected Torres Strait islands, Boigu, Saibai, Poruma, Warraber, Masig and Iama. To assist the committee the Queensland EPA undertook a rapid assessment of sea erosion issues for the 6 islands which included management recommendations. At about the same time, James Cook University was commissioned with NHT funding, to examine the erosion problems on Masig, Warraber and Poruma, the objective being to provide the communities with options to manage coastal erosion in ways that work with, rather than against the natural processes. Iama was added to this study at a later time. At the present time, only Masig have responded to the options put forward (see tag A), and the communities of Poruma and Warraber have been asked to expedite their responses. Options for Iama were only put before the community for consideration on 1 October 2008. Community support for any action is vital.

Whilst focussing on coastal erosion both studies have also highlighted the significance of inundation issues and potential future sea level rise. The recommended erosion management actions will also greatly assist in addressing inundation although it is clear that other management actions will be required to address inundation, sea level rise and other climate change impacts in a more holistic way.

This submission is thus divided into two parts: the first details works identified by the coastal Management committee to date. These include works to address coastal erosion based primarily on recommendations of the EPA report, with some initial actions based on the community response for Masig. Some works on Warraber that are almost certainly going to be recommended by the community are also included. However, it is certain that additional long-term strategies will need to be put forward for the islands of Masig, Poruma, Warraber and Iama once the communities have responded to the options put before them.

The second part of the submission proposes a program to investigate and address the impacts of climate change and coastal issues more thoroughly throughout all of Torres Strait. Given the low lying nature of many of the Torres Strait island communities it is likely that inundation and sea level rise in particular will have a significant impact on many communities. No specific studies of storm surge and other contributors to extreme water levels have been undertaken although recent inundation events indicate this is a significant issue on several islands requiring both emergency response planning and longer term mitigation. The need for a specific storm surge study was also a recommendation of a recent disaster risk study for Torres Strait which ranked this as a high risk for many communities. The proposal details a comprehensive approach to investigate, monitor and plan for adaptation current coastal hazards as well as the potential effects of climate change. This program will also address existing coastal erosion and inundation issues on the island communities that have not been investigated to date. For example, on Mer, the area of the main village is low and several houses are close to the water line. The aim of the proposal is to undertake a systematic investigation of all island communities comprehensively addressing issues of coastal erosion, inundation, and other impacts of climate change including changes to coastal ecosystems, water supply and health. It is intended that this program will build on the work by the EPA and James Cook Uni, incorporating strategies agreed to by the communities of Masig, Poruma, Warraber and Iama, but also addressing coastal management and climate change issues impacting other Torres Strait Island communities.

PART A: REQUIREMENTS FOR URGENT ACTION

As outlined in the first TSRA submission and the presentation given at the public hearing in Darwin, erosion and inundation are already serious hazards on many Torres Strait Islands and are currently impacting communities and infrastructure in the region, including housing, harbour works, business enterprises, desalination plants as well as ecosystems and cultural sites.

Working through the Torres Strait Coastal Management Committee actions to address coastal erosion in the short-term were identified by the Queensland EPA for Boigu, Saibai, Warraber, Poruma, Masig and Iama. These involve a mix of measures ranging from sand relocation around structures to major sea wall upgrades. The EPA report is attached (Tag B)

The EPA study has been supplemented by more detailed engineers costing of identified works (Tag C) and by a more detailed investigation by James Cook University examining long term sustainable coastal erosion solutions at Masig, Poruma, Warraber and Iama.

For the six island communities for which detailed information is available, summaries of issues and identified short-term works are outlined below:

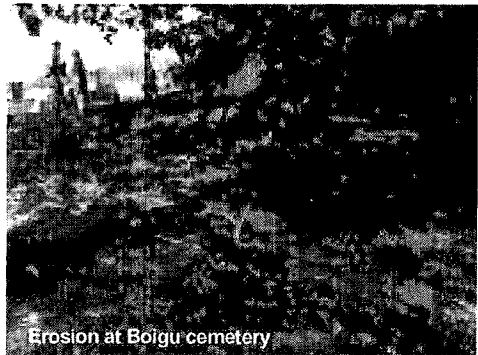
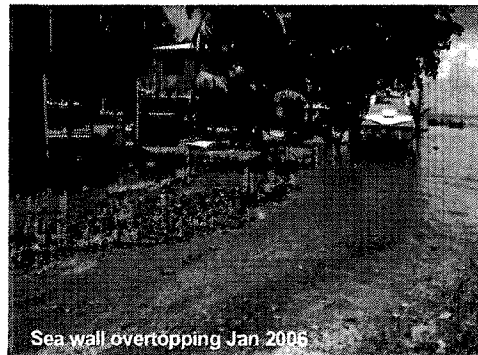
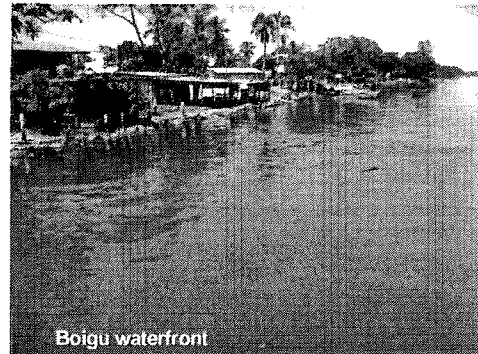
BOIGU

Boigu is a low flat island 15km by 5km wide. It consists of tidal, estuarine and freshwater wetland with only a very small part of the island above the Highest Astronomical tides (HAT). The township is located on the raised part of the island which is at most, 2m above HAT. The shoreline on the seaward side of the town has been protected for most of its length by 'Seabee' concrete block revetment and rock seawall. While the Seabee wall is in reasonably good repair, the rock revetment is subject to localised slumping and crest lowering. Both walls get over topped during king tides, inundating the township.

The town cemetery is located on a low narrow plain immediately adjacent (3-10m) to a mangrove wetland. The narrow beach is subject to episodic erosion which is impacting gravesites, greatly concerning the community. Erosion is most severe at the western end of the block wall.

Works proposed at Boigu include:

- Construction of a low CB wall seaward of the cemetery.
- Reconstruction of the rock seawall using a combination of concrete CB blocks and reuse of existing rock over a shorter section. This will also require the inclusion of a wave overtopping wall further landward and scour protection in behind.
- Construction of a wave overtopping wall immediately landward of the CB block wall and scour protection in between. Refer to Attachment C for design and cost details.



SAIBAI

Saibai is a low flat island approximately 18km by 7km wide. It consists of extensive tidal, estuarine and freshwater wetlands with only limited areas of the island above the highest astronomical tide level. The township sits on a long narrow ridge about 3km in length on the north western side of the island. Seawalls have been constructed along the entire length of the township out of cement, rock and rubble.

The low lying town is at most 2m above HAT.

Inundation in some areas of town is common during king tides and during storm events. The central section of the wall faces into the predominant wet season northwest wind, and there is consequent high wave impact and erosion risk. Although some sections of this wall are well constructed, many sections of the wall require reconstruction. The road at the end of the airstrip requires attention. Old areas of the wall are of serious concern due to the close proximity of a road.

The wall is potholed and subject to toe undercutting, which results in collapse of the wall. The vertical wall may be the reason for accelerated erosion, which causes significant reflection of wave energy, resulting in lowering of the adjacent sea bed.

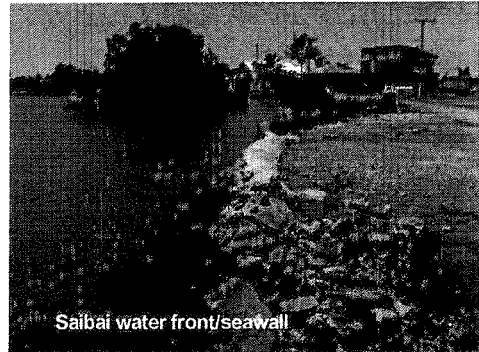
Proposed works for Saibai include: Replacement or reconstruction of existing seawalls to protect development against future sea erosion.

MASIG

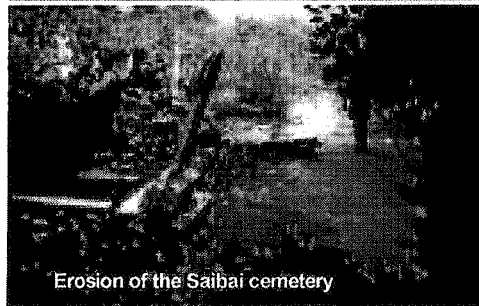
The shoreline of Masig is in a natural state except in the vicinity of the marine facility on the north western side and some minor rubble dumping on the eastern spit. Severe erosion is occurring to the east of the marine facility and moderate erosion is evident on the south eastern side. Since construction of the marine facility, sand has accumulated to the southwest of the ramp and severe erosion has occurred immediately

east of the ramp. Facilities adjacent to the ramp, including a desalination plant for community water supply, Commonwealth Government boat storage area and other development are under imminent threat from erosion. Further east, land supporting old closed forest vegetation is being eroded.

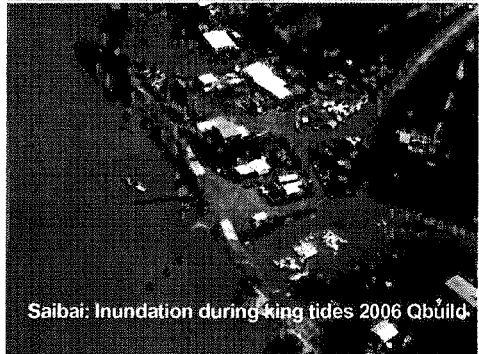
The ramp is acting as a barrier to natural movement of sand, with sand build up on one side and erosion on



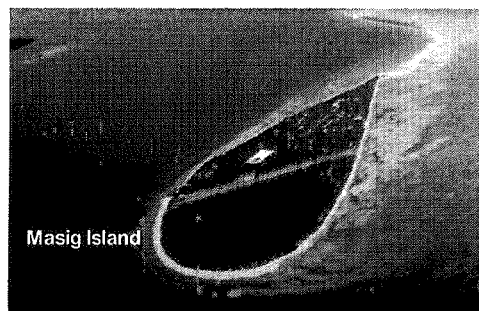
Saibai water front/seawall



Erosion of the Saibai cemetery



Saibai: Inundation during king tides 2006



Masig Island



Masig town front

the other. Sand build up will eventually interfere with ramp operation.

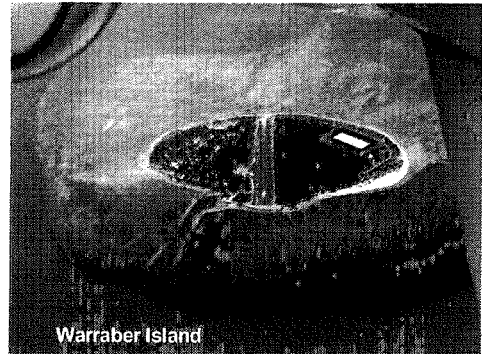
Immediate proposed works for Masig include: a trail of sand relocation around the marine facility and dune/bund building in front of the cemetery.

The Masig community has recently responded to options put forward by the JCU Coastal Erosion project funded by NHT (see Tag A). The response takes a long term perspective, and indicates how the community wishes to be involved in adaptation to climate change. The works proposed in this document are short-term measures within a longer-term programme involving some works and other adaptation measures.



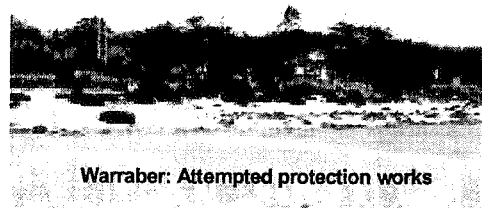
WARRABER

Warraber is a small circular coral cay, approximately 1.4km long by 0.7km wide. Following the construction of the marine facility, a sea wall was built to protect part of the town from erosion. The western section of the wall is derived from the coral rubble used in the excavation of the marine facility, and is founded on beach rock. The eastern section of this wall consists of unconsolidated coral rubble with undetermined foundations. The construction standard declines eastward, with tires and rubble used at the eastern end.



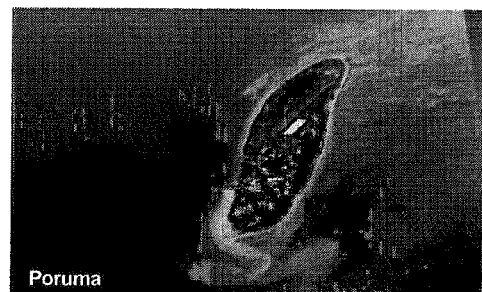
The marine facility (Port) has probably prevented some natural replenishment of sand along the seawall and is worsened by the presence of the rock wall, which concentrates the erosion at the eastern end.

The closeness of the erosion to the township means that retreat of development is not a practical option. Proposed immediate works for Warraber are therefore construction and replacement of the eastern end of the existing sea wall. The community of Warraber has yet to respond to long-term adaptation measures put to them by the JCU Coastal Erosion study.

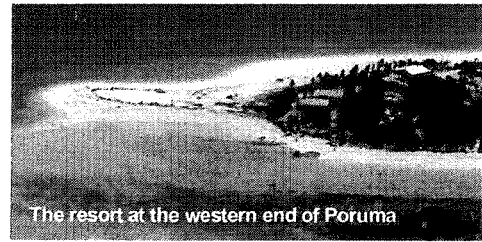


PORUMA

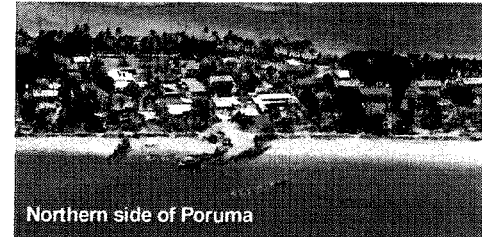
Poruma is a long narrow coral cay approximately 2km by 0.3km. It is slightly higher than the other inhabited coral-cay islands, and is unusual in having a high dune along much of its southern shore. Erosion at Poruma has been a mix of short and long term process, probably related to the loss of sand from the reef platform, with a gradual retreat of the some sandy beaches and exposing the underlying beach rock. Hopley and Rasmussen (1998) have indicated that



long-term changes in the wind direction may have caused the island to reorientate causing a long-term loss of sand from the island. A considerable amount of sand has been lost from the south western end of the island. Although the majority of infrastructure is not at immediate risk of erosion, the road and resort on the western side of the township are at threat of erosion and possibly storm surge.



The Poruma community have yet to respond to the options for adaptation to climate change put forward by the JCU coastal erosion project. However, significant works to provide protection to the resort are likely to be necessary. There are no obvious small-scale and immediate measures identified that are likely to mitigate the problems.

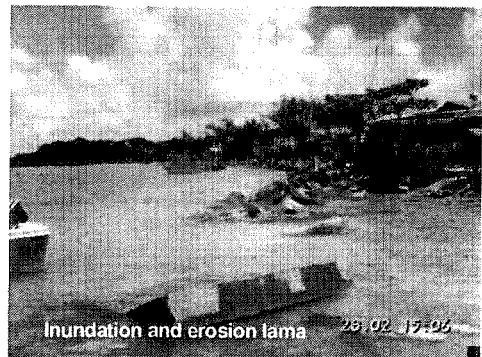


IAMA

Iama Island belongs to the central island group and consists of large steep masses of granite outcrop surrounded by coral reef flats. The township is located on the north-western side of the island. Parts of the township are subject to inundation during king tides. The beach fronting the town has been modified by the construction of a marine facility and a seawall to the north. The harbour has effectively split this section of coast into 2 compartments. The seawall was constructed because of persistent erosion along the northern coast and reconstruction is necessary due to recent damage to the wall and the poor initial design. Seasonal shoreline change occurs on the beach south of the harbour.



Further studies to determine options for long-term solutions to the problems of Iama have very recently (1 October 2008) been presented to the community for their consideration. Some works are likely to be proposed following the community deliberations.



COSTINGS for works recommended for immediate action

Location	Proposed works	Costings
Boigu	Seawall construction and upgrade	\$1,561,500
Saibai	Seawall construction and upgrade	\$3,786,000
Warraber	Sea wall construction and upgrade	\$951,000
Masig	Implementation of Masig Plan : Trial sand relocation	\$187,500*
	Dune maintenance	\$17,000 * Ongoing cost of \$150,000 to \$200,000 pa until longer term strategies are implemented
	Project Management (10%)	\$650,300
	Sub total	\$7,153,300
	20% for increased costs and modification of design to cater for climate change	\$1,430,660
	Total	\$8,583,960

Note the works identified thus far address coastal erosion issues on Saibai and Boigu, and some initial works on Masig and Warraber. Further works are likely to be required, along with funding for other community based adaptation processes (such as staged relocation of foreshore structures) once the communities have considered options put before them, and land-use plans that are currently being developed have been completed. Further studies and works are required to address inundation and sea level rise problems.

Previous (unsuccessful) funding applications for these works through the Natural Disasters Mitigation Program are Attached (tag D).

PART B: PROPOSAL TO ADDRESS COASTAL MANAGEMENT AND CLIMATE CHANGE ISSUES IN TORRES STRAIT.

In addition to erosion issues, inundation is also a very significant hazard in Torres Strait, particularly at Boigu and Saibai, but also on parts of the other Islands. Considering the extent of current inundation issues, any increase in mean sea level will have direct impact on these communities potentially threatening their viability. In addition there are many other potential impacts of climate change which may substantially impact Torres Strait Islander communities. Some of these include:

- Potential changes from rising temperature on human health through heat stress.
- Potential changes to marine ecosystems including impacts on fish species, turtles and dugongs.
- Potential changes to rainfall impacting water supply, gardens etc
- Potential changes to the frequency and intensity of extreme events.
- Potential inundation of water storages, sewerage systems and other essential infrastructure
- Potential southward movement of tropical diseases and disease-carrying mosquitoes
- Potential changes to wind (strength, seasonality etc) – impacting island dynamics including erosion patterns, as well as inter island travel.
- Potential changes to resource and energy demands (i.e., demand for more fresh water resources and power to run air conditioners and refrigeration) from rising temperature.

The concept proposal outlined below details a more comprehensive approach to investigate, monitor and plan for adaptation to coastal hazard and climate change issues throughout all of Torres Strait. The aim of the proposal is to comprehensively address issues of coastal erosion, inundation, and other impacts of climate change including changes to coastal ecosystems, water supply and health.

The proposal covers

- Basic data collection and monitoring including a tide gauge network, and accurate bathymetry (targeted nearshore surveys) and topographic mapping
- Climate science (eg detailed modelling of regional sea level rise, winds, waves, storm surge, water chemistry etc) to determine changes to key regional climate variables.
- Island process modelling / impact assessment – to determine impacts of coastal hazards and climate change on an island by island basis.
- Dredge feasibility study - A feasibility study to examine the potential for dredging for harbour maintenance and possibly beach renourishment or sand placement to address sea level rise.
- Adaptation planning – to determine the best suite of adaptation measures to address impacts of coastal hazards and climate change at the community level. (This would build on current projects and address the islands that have yet to be included and more fully address climate change issues – particularly sea level rise at Boigu and Saibai).
- Identification of sustainable energy options suitable for Torres Strait and ways of encouraging more sustainable practices in the region.
- Implementation of adaptation plans. Potential options/works/costs to address sea level rise/inundation.

DATA/MONITORING

Assessment of the impacts climate change requires some knowledge of local conditions. For instance to assess the impacts of projected sea level rise requires knowledge of current water levels (tides, mean sea level, highest astronomical tide, as well as extreme water levels), data on adjacent land levels (topography), and ideally, near-shore bathymetry (to undertake inundation modelling).

Both the EPA report and a recent draft paper by Green et al (2008) identify lack of tide data as a key issue particularly to the northern and central islands. Current estimates of highest astronomical tide (HAT) are known to be inaccurate, presenting a serious limitation on our ability to quantify inundation risk. Whilst a recent 1 month deployment by Griffith University will assist in refining these estimates, long term records are needed to monitor sea level changes, and to improve our understanding of sea level extremes.

Proposed tide gauge network:

- 4 additional gauges (northern, eastern, central and western islands) estimated cost of \$800,000 plus \$50,000 pa ongoing maintenance.

- High resolution island mapping (LIDAR) estimated cost \$600,000

- Targeted High resolution bathymetric Mapping (LADS) estimated cost \$600,000

Tide gauges would ideally be incorporated in the Qld EPA storm tide monitoring network potentially forming part of an inundation warning system as well as providing useful information to local fishermen etc.

Other data requirements are yet to be identified.

CLIMATE SCIENCE

No specific regional scale modelling of changes to climate variables has as yet been undertaken within Torres Strait.

Modelling of projected changes to regional sea level, temperature, rainfall, wind, waves, and water quality is required before impacts on local communities can be assessed and local adaptation plans developed. This modelling would be based on regional downscaling examining changes to average condition, seasonal variability and extremes.

Estimated cost \$200,000

ISLAND PROCESS MODELLING / IMPACT ASSESSMENT

This would utilise coastal hydrodynamic/process and other studies/models and to examine existing hazards like storm surge as well as the impacts of projected changes in sea level, winds, and other climate variables to each island. This would build on existing studies by JCU at Iama, Poruma, Warraber and Masig but will also look at other islands and include:

- assessment of storm surge and other contributors to extreme water levels and their potential future change,
- assessment of potential changes to erosion processes,
- assessment of the impacts of sea level rise,
- assessment of potential changes to island ecosystems,
- other potential climate change issues (eg spread of diseases),

These studies would aim to identify key issues under current conditions and potential future impacts on island communities from climate change.

Estimated cost \$500,000

DREDGING FEASIBILITY STUDY

The need to maintain harbours at a reasonable depth and the possibility accessing off-reef sand resources for island beach renourishment means that dredging may be a particularly cost effective way of addressing coastal erosion and inundation issues in the Torres Strait. This study would aim to examine the alternate models undertaking dredging activities in the Torres Strait and their cost effectiveness along with identification of any significant environmental issues.

Estimated cost \$100,000

ADAPTATION PLANNING

A broad climate change strategy will be developed to identify key issues and ways of building resilience within island communities.

Detailed adaptation plans would be developed for each Island community. These would be based on the results of the impact modelling– these would be based on assessment of all available options, cost/benefit analysis and community views. For example to address sea level rise and inundation all options would be canvassed including abandonment and relocation, coastal defence and land filling, together with emergency response.

Estimated cost \$200,000

SUSTAINABLE ENERGY STUDY:

Identification of sustainable energy technologies suitable for Torres Strait and ways of encouraging more sustainable practices in the region

Estimated cost \$100,000

IMPLEMENTATION OF ADAPTATION PLANS

Funding will be sought for implementation of adaptation plans once developed. It would be anticipated that these may involve considerable cost (\$50+ Million) owing to the low lying nature of some of the islands, the extent of current inundation problems and the likely impacts of sea level rise.

Estimated cost \$50+million

TIMING

DATE	Year 1	Year 2	Year 3	Year 4	Year 5 and beyond	
Data/ Monitoring	Installation of Tide gauges					
	LIDAR mapping					
	LADS mapping					
	Assessment of other needs					
Ongoing data collection						
Climate Science	Regional scale climate change modelling					
Island Modelling		Island by Island Coastal process modelling				
Dredging feasibility study		Dredging feasibility study				
Planning	Identification of immediate adaptation strategies					
				Detailed Adaptation Plans for each Island		
				Seek funding		
Energy efficiency Study	Examination of sustainable energy technologies suitable to Torres Strait					
Implementation	Implementation of immediate adaptation/mitigation strategies					
				Implementation of adaptation/mitigation plans for each Island eg identified works etc		

COSTING FOR CLIMATE CHANGE PROGRAM

Capital cost over 3 years (includes 10% project management)	\$3,575,000
Potential implementation costs years 4-5 (to be revised)	\$50+million

ATTACHMENTS:

- Tag A Masig Island Community response to JCU options
- Tag B EPA Reports
- Tag C Engineering costings (Coastal Engineering Solutions 2007)
- Tag D Previous NDMP Applications

Approval: _____

Mr John T. Kris
 Chairperson
 Torres Strait Regional Authority
 07-40690700
 Date: / /2008