

# PROCEEDINGS

**8th Early Career Researchers' National Forum & Workshop  
Griffith University Gold Coast Campus  
26-28 November 2012**

**Australian Climate Change Adaptation Research  
Network for Settlements and Infrastructure**



Tonlé Sap Lake

Photo courtesy of Amelia Travers, UQ

# ACCARNSI 8TH NATIONAL ECR FORUM AND WORKSHOP PROGRAM

## Day 1: Monday 26 November 2012

9.00	Forum Welcome: ACCARNSI Network Convenor Associate Professor Ron Cox
9.10	Presentation: Associate Professor Bill Peirson Director, UNSW Water Research Laboratory
9.30	(More or Less?) Raindrops keep fallin' on my head - The impacts of climate change on IFD design rainfalls <i>Fiona Johnson, University of New South Wales, NSW</i>
9.45	Fill in the dams <i>Paul Metzler, University of New South Wales, NSW</i>
10.00	Design-led institutional transformation for climate extremes <i>Che Biggs, Victorian Eco-Innovation Lab, University of Melbourne, VIC</i>
10.15	Q&A lead by Richard Stuetz
10.30	<b>MORNING TEA</b>
11.00	Responding to climate change as a transformative stressor through metro-regional planning <i>Tony Matthews, Griffith University, QLD</i>
11.15	Policy formulation and analysis on the interface of socio-technical systems: Systematic and interdisciplinary approach to infrastructure policy and planning <i>Araz Taeihagh, University of New South Wales, NSW</i>
11.30	Q&A lead by Bill Peirson
11.45	Climate change adaptation – A design based model for coastal settlements – The surf coast narrative <i>Phillip Barend Roös, Deakin University, VIC</i>
12.00	Uncovering the nature of household coastal climate change adaptation: A framework for the Australian coastal zone <i>Carmen Elrick-Barr, University of the Sunshine Coast, QLD</i>
12.15	Evaluating the adaptive capacity of local government in South Australia <i>Jane Doogue, University of Adelaide, SA</i>
12.30	Climate change adaptation: Including adaptation in the planning process <i>Alianne Rance, University of Melbourne, VIC</i>
12.45	Q&A lead by Rodger Tomlinson
1.00	<b>LUNCH</b>
1.45	Reform of coastal management laws in NSW: In the public interest? <i>Louise Gates, Land &amp; Environment Court of NSW &amp; Tayanah O'Donnell, University of Western Sydney, NSW</i>

2.15	The role of insurance in coastal communities <i>Joanna Burston, Griffith University, QLD</i>
2.30	Q&A lead by Ron Cox
2.45	<i>AFTERNOON TEA</i>
3.15	WORKSHOP - What will ACCARNSI post-2013 look like?
4.30	DAY 1 WRAP UP & CLOSE

## Day 2: Tuesday 27 November 2012

9.30	Using numerical models to simulate beach response under climate change <i>Fang Yuan, University of New South Wales, NSW</i>
9.45	A review of South Australian planning processes in response to predictions in sea-level rise – A Kingston SE case study <i>Michelle English, University of Adelaide, SA</i>
10.00	Developing coastal hazard adaptation strategies in Queensland. Lessons from the Townsville pilot study <i>Marcello Sano, Griffith University, QLD</i>
10.15	Q&A lead by Ron Cox
10.30	<b>MORNING TEA</b>
11.00	Spatial patterns and a systems analysis of climate change adaptation for floating communities on Tonlé Sap, Cambodia <i>Amelia Travers, University of Queensland, QLD</i>
11.15	Developing solutions for vulnerable floating communities in Cambodia <i>Chris Drummond, UNSW Water Research Laboratory, NSW</i>
11.30	Climate change adaptation for the Solomon Islands <i>Stacey Atkinson, AECOM Sydney, NSW</i>
11.45	DRR and CCA in the Pacific: An institutional and policy analysis <i>Dhakshy Sooriyakumaran, Small Giants Melbourne, VIC</i>
12.00	Presentation & Discussion: Professor Brendan Mackey Director, Griffith Climate Change Response Group
12.30	<b>LUNCH</b>
1.45	<b>FIELD TRIP - BUS TO Q1 OBSERVATION DECK, SURFERS PARADISE</b>
2.05	Q1 Observation Deck - Coastal Management Talk & Photo Opportunity
2.50	Walk to Surfers Paradise
3.00	Discussion about Surfers Paradise Foreshore Redevelopment
3.15	Drive to Seaway
3.30	Seaway - Discussion about issues including cruise ship terminal
3.50	Drive to Budds Beach
4.00	Discussion about Gold Coast Canal issues & Climate Change Adaptation
4.15	Drive back to Golden Sands on Main Beach
4.30	DAY 2 CLOSE

## Day 3: Wednesday 28 November 2012

### GCCM Cross Over Workshop

#### 'Coastal Community Engagement under a Changing Climate'

9.00	Workshop Welcome: ACCARNSI Coastal Settlements Node Convenor Professor Rodger Tomlinson
9.10	Climate Change Education and Communication <i>Peta Williams, Griffith University, QLD</i>
9.30	Coastal community engagement: learning today is succeeding tomorrow <i>Naomi Edwards, Griffith University, QLD</i>
9.50	Speaker 3 <i>Anne Leitch, CSIRO</i>
10.10	Speaker 4 - TBC
10.30	Q&A
10.45	<i>MORNING TEA</i>
11.15	Workshop Briefing - Rodger Tomlinson
11.20	Workshop
12.45	<i>LUNCH</i>
1.15	Workshop (continued)
2.00	Workshop outcome presentations
2.30	Speaker 5 and Wrap Up <i>Paul Burton, Deputy Director, Urban Research Centre, Griffith University</i>
3.00	<i>AFTERNOON TEA &amp; CLOSE</i>
3.30	Buses depart for Gold Coast Airport and Brisbane Airport

INFRASTRUCTURE

**Fiona JOHNSON**

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**(MORE OR LESS?) RAINDROPS KEEP FALLIN' ON MY HEAD - THE IMPACTS OF CLIMATE CHANGE ON IFD DESIGN RAINFALLS**

*Fiona Johnson & Janice Green*

**Abstract:**

Design rainfalls are widely used in the engineering profession in many aspects of the urban landscape including infrastructure design and flood planning levels. The Bureau of Meteorology has recently released revised Intensity-Frequency-Duration (IFD) design rainfall data for Australia. This dataset is based on historical rainfall data and improves the previous IFD data through greater spatial coverage of stations, increased record lengths and the use of current best practice statistical analysis techniques.

As part of the analysis for the current IFDs, an extensive stationarity assessment of the historical rainfall data was undertaken. This did not find clear evidence of trends in the Annual Maximum Series rainfall data and recommended that the full historical record be used for the analyses. However it is expected that anthropogenic climate change will have an increasing impact on infrequent rainfall events. Strategies are therefore required to provide advice to practitioners for cases when design rainfalls are used for infrastructure and planning decisions with long design lives.

This presentation will discuss some of the issues associated with providing advice on changes to design rainfalls in the future and will outline the current research questions that are being considered in the Australian climate change research community to address these problems. However given that planning and infrastructure investment decisions are being made every day, there is a need to provide interim advice to practitioners. The Bureau of Meteorology and Engineers Australia currently recommend that sensitivity analyses are used with increases in IFDs of 10%, 20% and 30% in conjunction with a risk assessment framework to assess the impact of these changes on urban systems.

INFRASTRUCTURE

**Paul METZLER**

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**FILL IN THE DAMS?**

**Paul Metzler**

**Abstract:**

Fresh and sustainable water resources have been an ongoing issue in Australia since the time of first settlement with the location and quantity of fresh water influencing growth and development throughout the nation. Western New South Wales, predominantly comprising farming lands, has relatively low annual rainfall compared to the east coast. This means water supplies from dams, bores and river systems have to be managed efficiently to maintain the agricultural industry through periods of drought. Further, persistent concerns regarding environmental flows to the major river systems now seriously constrain the development of new dam-based water supplies in Western NSW. Investigation into limiting water losses due to evaporation is an important issue in safeguarding the future. By filling in typical farm dams with a coarse grained sand or gravel to create a groundwater dam, evaporation losses can be significantly reduced and even with the reduction in volume can be significantly more efficient. The efficiency of farm and groundwater dams is compared across four locations in semi arid and arid regions of western NSW, being Canberra, Wagga Wagga, Mildura and Menindee. A new demand model implementing drinking rates of livestock with respect to daily maximum temperature allowed water usage to be better estimated over seasonal changes. Historical and Climate of the 20<sup>th</sup> Century GCM (Global Climate Model) data allowed a comparison to be made of the model's accuracy in predicting the climate in outback NSW over the past 40 years. The model was then projected into the future with an A2 emissions scenario comparing the efficiency of the two dam types from 2081 to 2100. Reliable water supplies, available from groundwater and farm dams are compared over these periods. Reductions in the diversion of potential environmental flows from downstream river systems are also quantified.

BUILT ENVIRONMENT, INFRASTRUCTURE

## **Che BIGGS**

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### **DESIGN-LED INSTITUTIONAL TRANSFORMATION FOR CLIMATE EXTREMES**

*Che Biggs et al*

#### **Abstract:**

When managing disaster risk, government and private sector institutions often rely heavily on ‘probability’ or ‘expert’ assessments of the likely type, extent and frequency of negative impacts. This approach can come unstuck when disasters occur outside what has been predicted and planned for. This research project (Transforming Institutions for Climate Extremes) seeks to explore how prepared our communities, our decision-makers and decision-making processes are for the challenges of ‘new’ climate conditions.

It addresses this challenge by using design-led scenario-based approaches to explore institutions’ capacity to respond to disruptive climate conditions. Its primary objectives are to:

1. Test and refine a ‘scenario-based’ method for designing local climate change adaptation strategies.
2. Identify institutional barriers and opportunities to building local resilience to climate extremes
3. Understand what local and state level policy changes would enable communities to build resilience to climate extremes.

This presentation will outline results of the project so far including early ‘learnings’ for the design of local adaptation strategies, improving climate change adaptation policy and supporting institutional changes necessary for addressing the more extreme impacts of climate change.



BUILT ENVIRONMENT

**Tony MATTHEWS**  
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## RESPONDING TO CLIMATE CHANGE AS A TRANSFORMATIVE STRESSOR THROUGH METRO-REGIONAL PLANNING

*Tony Matthews*

### **Abstract:**

This paper characterises climate change as a 'transformative stressor'. It argues that institutional change will become increasingly necessary as institutions seek to reorientate governance frameworks to better manage the transformative stresses created by climate change in urban environments. Urban and metropolitan planning regimes are identified as central institutions in addressing this challenge. The operationalisation of climate adaptation is identified as a central tenet of a comprehensive urban response to the transformative stresses that climate change is predicted to create. Operationalisation refers to climate adaptation becoming incorporated, codified and implemented as a central tenet of urban planning governance. This paper has three purposes. First, it examines conceptual perspectives on the role of transformative stressors in compelling institutional change. Second, it establishes a conceptual approach that characterises climate change as a transformative stressor requiring institutional change within planning frameworks. Third, it reports emergent results and analysis from an empirical inquiry which examines how the metro-regional planning regime of Southeast Queensland (SEQ) has responded to climate change as a transformative stressor via institutional change and the operationalisation of climate adaptation.

BUILT ENVIRONMENT, INFRASTRUCTURE

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**POLICY FORMULATION AND ANALYSIS ON THE INTERFACE OF SOCIO-TECHNICAL SYSTEMS: SYSTEMATIC AND INTERDISCIPLINARY APPROACH TO INFRASTRUCTURE POLICY AND PLANNING**

*Araz Taeihagh*

**Abstract:**

The interdependence and complexity of socio-technical systems requires the development of tools and techniques to aid in the formulation of better policies. A new framework and a systematic approach for the formulation of policies have been proposed. Focus has been directed to the interactions between policy measures, inspired by concepts in engineering design and complexity science. Furthermore, an agent-based approach to create a virtual environment for the exploration and analysis of different configurations of policy measures in order to build policy packages and test the effects of changes and uncertainties while formulating policies has been developed. By developing systematic approaches for the formulation and analysis of policies it is possible to analyse different configuration alternatives in greater depth, examine more alternatives and decrease the time required for the overall analysis. Moreover, it is possible to provide real-time assessment and feedback to the domain experts on the effect of changes in the configurations. These efforts ultimately help in forming more effective policies with synergistic and reinforcing attributes while avoiding internal contradictions. The results demonstrate the usefulness of these computational approaches in addressing the complexity inherent in the formulation of policies. The proposed framework and methodologies have been applied to the formulation of policies that deal with transportation systems and environmental issues. We intend to expand the work on policy formulation and analysis for integrating transportation and electricity networks in the built environment. Furthermore we are developing novel approaches to enhance application of LCA and sustainability analysis of infrastructure to include additional spatial and temporal factors respectively.

COASTAL SETTLEMENTS

**Phillip Barend ROÖS**

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**CLIMATE CHANGE ADAPTATION: A DESIGN BASED MODEL FOR COASTAL SETTLEMENTS – THE SURF COAST NARRATIVE**

*Phillip Barend Roös*

**Abstract:**

Living with Nature – is the motto of communities along the Surf Coast in Victoria, a traveller’s paradise with some of Australia’s best surf beaches, bustling resort towns, spectacular scenery, lush rainforests and cascading waterfalls. These communities survive today because of the high visual and natural attributes they are situated within that underpins their existence and economic survival.

Change these landscape attributes and you have a dramatic effect upon their context, economic, social and environmental sustainability. How can these coastal communities be resilient under future climate effects? Drawing upon recent literature on coastal climate change in the Great Ocean Road Region, this paper reviews the changes in the landscape of these settlements in transition.

The results are used as inputs to a proposed Design Based Adaptation Model (DBAM) which can inform adaptive planning and design responses of the physical and social infrastructure, through the visions of changing landscapes under future climate effects.

COASTAL SETTLEMENTS

**Carmen ELRICK-BARR**

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**UNCOVERING THE NATURE OF HOUSEHOLD COASTAL CLIMATE CHANGE ADAPTATION:  
A FRAMEWORK FOR THE AUSTRALIAN COASTAL ZONE**

*Carmen Elrick-Barr*

**Abstract:**

Numerous Australian households are likely to be affected by the impacts of climate change. For example, the impact of a 1.1m rise in sea level has been projected to affect up to almost 250,000 existing dwellings. Households will have to implement adaptation strategies if they are to reduce impacts on well-being. The ability to implement strategies and the effectiveness of those strategies will be influenced by, and in turn influence, adaptation at other scales—it is the nature of such cross-scale interactions that define local vulnerability. Therefore, understanding the role of households in the adaptation process is crucial to uncovering the nature of vulnerability in the Australian coastal zone and mechanisms to reduce it.

This study analyzed household adaptive capacity frameworks as a tool to uncover the nature of household adaptive capacity in the Australian coastal zone. Theoretical frameworks were identified and their practical application at the household scale examined. Asset-based, socio-cognitive, resilience and integral frameworks highlight determinants of adaptive capacity. However, practical assessments are constrained by what is measurable in context and the focus remains on coping to the exclusion of adaptation. Importantly, objectives and agency are rarely captured at the household scale. Findings suggest that uncovering coastal household's role in the adaptation process will require comparative assessments that link objectives to action.

PLANNING&POLICY

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## EVALUATING THE ADAPTIVE CAPACITY OF LOCAL GOVERNMENT IN SOUTH AUSTRALIA

*Jane Doogue & Doug Bardsley*

### **Abstract:**

Local government plays a key role in adaptation to climate change. Now, under more pressure from higher levels of government, and as climate change risks on a local scale become more quantifiable, the onus is increasingly on councils to develop and implement climate change adaptation policies and plans. In South Australia, each of the 68 local government jurisdictions governs within a unique geographic, economic, political and social context. The extent to which individual councils are planning or acting to adapt to climate change also varies greatly, raising questions about what key factors influence an individual council's capacity to effectively adapt. Research is developing an analytical framework that enables evaluation of individual councils' adaptive capacity. A set of twelve indicators is proposed, reflecting key aspects of community and council, with an overall 'capacity index' enabling comparisons to be made across the councils of South Australia. Interviews with representatives of selected councils have been used to gain a more in-depth understanding of local governments' adaptive capacity. It is hoped that outcomes of the research will benefit the local government sector, individual councils, and government agencies, by proposing a method to evaluate councils' capacity to respond to climate change, and further suggesting ways to increase local government's capacity to plan and act in the face of climate change.

COASTAL SETTLEMENTS

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**CLIMATE CHANGE ADAPTATION: INCLUDING ADAPTATION IN THE PLANNING PROCESS**

*Alianne Rance*

**Abstract:**

Adaptation is no longer considered the poor cousin to mitigation. Movement in policy arenas highlighted particularly in the Australian Government Productivity Commission's Issues' Paper entitled 'Barriers to Effective Climate Adaptation' suggest that new legislation or even broad governance to clarify approaches for adaptation planning is. End users may be legally required or encouraged to utilize a particular approach for conducting their adaptation planning process. Until then, a proactive, 'no-regrets' participatory approach, adopted by coastal property developers would ensure a new generation of robust, adapted communities promoting cost effectiveness.

This presentation discusses the application of such an approach and the inclusion of 'Adaptation Measures' within a unique marina development on Port Phillip Bay; Wyndham Harbour. A multi-phase Adaptation Strategy can be included in such developments, with a unique monitoring and evaluation phase ensuring ongoing vulnerability reduction and adaptation effectiveness whilst maintaining commercial viability. This approach is a component of a wider PhD project currently being undertaken at the University of Melbourne.

COASTAL SETTLEMENTS

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**REFORM OF COASTAL MANAGEMENT LAWS IN NSW: IN THE PUBLIC INTEREST?**

*Tayanah O'Donnell & Louise Gates*

**Abstract:**

Legislating to plan for and adapt to the increasing pressures placed on coastal resources due to sea level rise, coastal development and existing use rights is inherently difficult, involving, as it does, the establishment of priorities and trade-offs. Although amendments to coastal protection laws introduced in 2010 attempted to deal with many of the issues faced by communities and decision-makers, these measures proved problematic, and coastal protection laws are now, once again, subject to reform. Stage 1 of these changes is discussed and analysed.

It is revealed that the balance has now shifted towards greater private responsibility and local initiatives, with the State and Commonwealth governments playing only minor supportive roles. This is evident with greater allowances for individuals to build coastal protection works, repeal of the NSW Sea Level Rise Policy, including the sea level rise benchmark of 90cm by 2100, and repeal of the requirement to include information about coastal risks in s 149 planning certificates. Other States are facing similar experiences. These changes have ignited a renewed importance for the application of the 'public interest' test by the courts, especially for local government decision-makers, in adapting to coastal climate change and in finding a balance between competing interests of development, existing property rights, and preservation of coastal environments and ecology.

COASTAL SETTLEMENTS

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## THE ROLE OF INSURANCE IN COASTAL COMMUNITIES

*Joanna Burston*

### **Abstract:**

Insurance is often touted as a market-based solution to the risk faced by coastal communities due to the hazard presented by oceanic inundation. Here, the role of insurance in the coastal zone within a risk-mitigation framework including hazard identification, community education, land-use planning, mitigation infrastructure and building standards, is discussed.

The role of insurance is to transfer the risk of loss faced by individual property owner for the cost of a premium. Insurers' price policies based on their annualised risk, and the spatial resolution at which this pricing is calculated depends on the availability of data. Increased availability of high-resolution data including hazard mapping and LiDAR elevation data allows for the technical pricing of many hazards at a street-address level. Street-address pricing means that each property owner pays the premium for their localised risk, so that the burden of risk is not averaged across the community. This creates an economic mechanism for risk management, as more expensive premiums in hazardous locations may discourage development by affecting property values.

The types of hazards that face coastal communities, such as inundation due to storm surge, tsunami, and waves, coastal erosion, and sea level rise, and the application of insurance to each are discussed. Inconsistencies in the industry are highlighted. A topical case study of the perception of insurance pricing due to sea level rise in the Gosford local government area is presented.

Climate change is not a critical issue in the eyes of insurers, as each policy is taken out one year at a time, but may cause insurance premiums to rise over time as the hazard posed by inundation increases to the point of becoming uneconomical.



COASTAL SETTLEMENTS, INFRASTRUCTURE

**Fang YUAN**

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## USING NUMERICAL MODELS TO SIMULATE BEACH RESPONSE UNDER CLIMATE CHANGE

*Fang Yuan & Ron Cox*

### **Abstract:**

Climate Change has become the focus of attention for many engineers and scientists since the turn of this century. One of the most pressing climate change issues is global sea level rise. Under the latest sea level projection by Church and White (2011), there will be at least 100 million people living in low-lying areas at risk of inundation, and billions of dollars worth of coastal developments and infrastructure will be threatened as a result of shoreline retreat by 2100. Hence, understanding the response of shoreline changes under accelerated sea level rise is essential for coastal management and adaptation planning. When presenting the shoreline response to sea level rise, the majority of scientists and engineers are still applying Bruun's theory despite its incapability in simulating onshore transport and bar movements. Coastal zone is a dynamic place which is affected by wave and wind climate, including seasonal variability. In order to accurately simulate the coastal response under climate change effects, beach recovery processes need to be included. A modified numerical model (SBEACH) is presented in this study with the potential to simulate coastal response with the capability of predicting onshore sediment transport, shoreline erosion or recession, beach recovery, as well as offshore bar movements. A diverse coast line response to sea level rise is also proposed.

COASTAL SETTLEMENTS

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**A REVIEW OF SOUTH AUSTRALIAN PLANNING PROCESSES IN RESPONSE TO PREDICTIONS IN SEA-LEVEL RISE – A KINGSTON SE CASE STUDY**

*Michelle English*

**Abstract:**

State and local governments in South Australia are subject to unrelenting pressure for expansion and intensification of coastal settlements, in particular for new dwellings and land division for residential development. The planning system must incorporate adequate adaptation strategies to mitigate risks to coastal communities posed by projected sea-level rise. A case study of Kingston SE, a coastal town in South Australia, is used to highlight current limitations of the South Australian planning system to adequately consider predicted sea-level rise and the potential risk this poses for regional coastal communities. The Kingston District Council is representative of local government authorities in regional South Australia that are significantly under resourced and have limited adaptive capacity to plan for climate change impacts. Indicative coastal vulnerability mapping for Kingston shows that existing residential development is likely to be affected by predicted sea-level rise, particularly during an extreme event or combination of extreme events. Development in the residential zone is not required to be referred to the Coast Protection Board, and the minimum floor levels specified in the Kingston District Council's planning scheme do not allow for predicted sea-level rise in combination with an extreme event. It is recommended that planning for sea-level rise in South Australia could be strengthened by expanding the scope of referrals to the Coast Protection Board and its power of direction; the incorporation of high-resolution coastal vulnerability mapping of coastal settlements onto hazard overlays of planning schemes; and through improved recognition of hazard risks in zone boundaries and policy.

COASTAL SETTLEMENTS

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**DEVELOPING COASTAL HAZARD ADAPTATION STRATEGIES IN QUEENSLAND:  
LESSONS FROM THE TOWNSVILLE PILOT STUDY**

*Marcello Sano, Rodger Tomlinson & Bruce Harper*

**Abstract:**

Queensland's coastal communities are frequently challenged by natural hazards such as tropical cyclones and by the constant, long-term dynamics of sandy shores responding to climatic forces. Climate variability and change, including sea level rise, changes in cyclones patterns and in the mean wave climate will likely add additional pressure on coastal communities across Queensland. The recently released Queensland Coastal Plan (2012) introduced requirement to local councils to incorporate a Coastal Hazard Adaptation Strategy for localities in high coastal hazard areas. We present here the approach and lessons learned from testing the draft Guidelines for Preparing Coastal Hazard Adaptation Strategies (DERM, 2011) in Townsville, under a joint project of TCC, LGAQ funded by the CAPS program and executed by a multidisciplinary team under the direction of GHD, an engineering firm, with the participation of Griffith University Centre for Coastal Management. A set of coastal adaptation options, collected in a Compendium, was used to identify the best approach to adapt the Council's hazard prone areas and to sustain current uses and future developments. The selection process was supported by the use of spatial information, including the outcomes of advanced models to predict the impact of storm tides. A comprehensive stakeholder engagement process was designed to inform multi-criteria and cost-benefit analysis; the outcomes were finally used to identify the best combination of options available for the Council. This pilot test, running from November 2011 to July 2012, provides a reference example to councils developing Coastal Hazard Adaptation Strategies in the years to come.

REGIONAL RESPONSES

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**SPATIAL PATTERNS AND A SYSTEMS ANALYSIS OF CLIMATE CHANGE ADAPTATION FOR FLOATING COMMUNITIES ON TONLÉ SAP, CAMBODIA**

*Amelia Travers*

**Abstract:**

Tonlé Sap is an extensive, complex hydrological system highly vulnerable to climate change and global change impacts. The lake area varies seasonally by a factor of 3 or more and the river flows reverse direction. The lake is essential to Cambodian food supply through large fish catches and extensive floodplain agriculture and is listed as a biosphere reserve due to the high biodiversity of the region. Water-based housing communities are widely distributed throughout this system and the communities and infrastructure are vulnerable to global change impacts. The vulnerability of these communities to climate change and other anthropogenic environmental modifications is discussed within a systems thinking framework to demonstrate the interconnected nature of the problem.

Climate change impacts on the Tonlé Sap region are likely to include: altered volumes and timing of water flows, changing fish production and extent of floodplain agricultural lands. Changes to the vegetation communities around the lake may impact on fish stocks. These changes are likely to coincide with significant impacts on the hydrological regime due to increased impoundment and diversion of water in the upper Mekong catchment as well as local pressures such as vegetation clearing. Both the Vietnamese and Cambodians living on and around Tonlé Sap suffer endemic poverty, malnutrition and lowered social capital. These factors will all lower the capacity of communities to adapt to change. Policy and adaptation options must consider how these socioeconomic factors will influence the nature of development and adaptation projects.

REGIONAL RESPONSES

**Chris DRUMMOND**

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**DEVELOPING SOLUTIONS FOR VULNERABLE FLOATING COMMUNITIES IN CAMBODIA**

*Chris Drummond*

**Abstract:**

The impacts of climate change are expected to be particularly severe amongst developing nations. In Cambodia, communities that live in the flood affected areas on and around the Tonlé Sap Lake are especially vulnerable to a changing environment as there is extreme poverty and livelihoods depend on the lake. Future projections include higher lake water levels, more extreme storm events, changes to seasonal flooding patterns and reduction in aquatic productivity. Communities already face the challenges of poor sanitation and nutrition which are likely to be intensified by climate change.

Live and Learn Environmental Education is currently working to develop appropriate sanitation and agricultural solutions that address immediate concerns and increase the resilience of these communities to climate change.

Floating and small-scale biodigesters have been developed to convert human and animal waste to gas for energy and treated waste for fertiliser. These systems capture biogas to be used for cooking which provides a more sustainable fuel source than conventional methods. The biodigestion process also reduces pathogen inputs to the water body while providing sanitation that is more resilient to flooding.

Floating gardens for the Tonlé Sap Lake are also being developed which promote nutrition and improve resilience to changing water levels by reducing dependency on land availability. These gardens utilise the fertiliser created through the biodigesters and improve food security by extending the growing season which is normally restricted by seasonal flooding.

These projects seek to address the current problems that these communities face while simultaneously enhancing their adaptive capacity and resilience to climate change.

REGIONAL RESPONSES

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**CLIMATE CHANGE ADAPTATION FOR THE SOLOMON ISLANDS**

**Stacey Atkinson, Ron Cox & Keith Joseph**

**Abstract:**

As a Small Island Developing State (SIDS) and Least Developed Country, the Solomon Islands is challenged by limited resources, poor infrastructure, high population growth, remoteness, vulnerability to natural disasters and dependence on foreign aid. It is a combination of these challenges exacerbated by the effects of climate change that SIDS such as the Solomon Islands are recognised as the most vulnerable to climate change.

Community surveys were conducted in conjunction with site visits to four Solomon Island coastal locations to provide an understanding of site conditions, community awareness of climate change, impacts, vulnerabilities, adaptive capacity and to identify areas of misconception and the need for education. The sites were chosen based on accessibility and for their varying geographical and demographic circumstances.

For effective adaptation, all factors influencing the Solomon Islands vulnerability, including a combination of socioeconomic challenges, a susceptibility to extreme climate and factors exacerbated by the effects of climate change, must be considered. Community perceptions and responses to climate change must also be included in the assessment of appropriate adaptation action to ensure the long term sustainability of projects implemented. Adaptation strategies identified for the Solomon Islands within the paper can assist similar SIDS within the Pacific region.

REGIONAL RESPONSES

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**DRR AND CCA IN THE PACIFIC: AN INSTITUTIONAL AND POLICY ANALYSIS**

*Dhakshy Sooriyakumaran*

**Abstract:**

This presentation highlights key findings of a recent study by UNISDR (The United Nations International Strategy for Disaster Reduction) titled *DRR and CCA in the Pacific: An Institutional and Policy Analysis*.

The study provides an analysis of the current level of integration of DRR and CCA in the region, with an emphasis on the institutional and policy environment. The study shows that despite the fact that there is typically a low level of integration at the operational level, countries are making efforts to develop Joint National Action Plans (JNAPs) for DRM and CCA, as well as move towards integrating their institutional platforms for DRR and CCA.

The report also outlines some of the challenges and barriers to integration, evolving good practice towards integration, and provides recommendations for regional and national stakeholders for further action. This report explores how and why the fields of DRR and CCA have developed in parallel globally as well as in the Pacific, rather than being more integrated.

The rationale and benefits for integration, such as easing the burden of programming assistance, minimising duplication and conflicts in policy development, and making efficient use of scarce resources are also examined in the report.

In light of the findings from the report, the presentation will also explore what Australia and other countries can learn from efforts to integrate DRR and CCA in the Pacific.

COASTAL SETTLEMENTS

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## CLIMATE CHANGE EDUCATION AND COMMUNICATION

*Peta Williams, Daniel Ware & Sally Obst*

### **Abstract:**

Education in climate change is paramount to developing a more sustainable and aware community and reducing the vulnerability of the community to potential future impacts. An aware community can take action to reduce the impacts of climate change, lobby to the government and be more successful in adapting to the changing climate.

A key source of information for the general public is the media. Climate change has received wide recognition within the media, particularly over recent years as the issue has become increasingly politicised. Unfortunately, in many cases the sensationalism of the media has led to mis-information and promotion of a doomsday message. This use of 'fear' as a tool for communication has assisted in developing barriers to successful education of the community and can be counterproductive leaving the audience feeling disempowered and distant to the issue, particularly if the audience has a low level of self-efficacy.

There are a further number of key barriers to education in climate change, in particular the temporal and spatial features of climate change which lead to an attitude of climate change being a distant future threat occurring in a distant place. Other examples include credibility in information sources, reluctance to lifestyle change, pressure of social norms, free-riding and institutional barriers, lack of leadership and action by government and lack of supportive initiatives (Lorenzoni, 2007; Fritze et al., 2009).

The provision of information does not necessarily lead directly to successful behaviour change. A successful education program must move past only the provision of information and directly address the audience and their perceived barriers. A key outcome of an education program is to increase the audience's self-efficacy and provide tangible and achievable actions. Additionally it is important to reinforce that small actions, when undertaken as a collective group, can lead to effective impacts and support a community's adaptation to climate change. The audience is more likely to respond to positive message that shows a positive future of adaptation to climate change than a doomsday image as so often presented (Genovese, 2008).

This paper will explore the barriers to communication and education in climate change and provide examples of a range of climate change education programs conducted throughout Australia. Keeping the topic of climate change on the agenda and providing key actions that can successfully be undertaken by the community is paramount to making a positive change for the future.



COASTAL SETTLEMENTS

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**COASTAL COMMUNITY ENGAGEMENT: LEARNING TODAY IS SUCCEEDING TOMORROW**

*Naomi Edwards, Peta Williams & Marcello Sano*

**Abstract:**

Identifying strengths and weaknesses in coastal community engagement is essential to catalyse future change, considering that the focus of current coastal community engagement has begun to integrate climate change adaptation initiatives. Given such, there is a need to have monitoring and evaluation in place to review its strengths and weaknesses. In addition, to identify the key indicators that mobilise change catalysts and the strategies that reinforce the aims, goals and objectives of community engagement. However, what must not be ignored is the opportunity to promote community engagement as a means of monitoring and evaluation to further social activity.

The Gold Coast provides a unique opportunity to capture diverse motivations, interests and concerns of those community members engaged in community based coastal management. BeachCare, CoastEd, SurfRider Foundation, National Surfing Reserves, Seagrass-Watch and lobbyist groups such as Kirra Point Incorporated – just to name a few – represent the various active collectives and programs that have formed to address the needs within the Gold Coast’s congested coastal space. These initiatives provide the opportunity for thousands of community members to be engaged in coastal management and are regarded as successful. However, what lacks amongst the various groups and collectives are qualitative, participatory approaches to monitor and evaluate such ‘success’. Only determining success through quantitative statistics and ad-hoc awards misses the whole point of coastal community engagement and limits scope to build on today’s strengths to support future action. Therefore, monitoring and evaluation can provide rich means to integrate lessons learnt to secure success in climate change adaptation.

This presentation aims to present the concept of qualitative, participatory approaches to evaluation and monitoring and how such principles could be integrated into already established coastal community engagement programs on the Gold Coast.