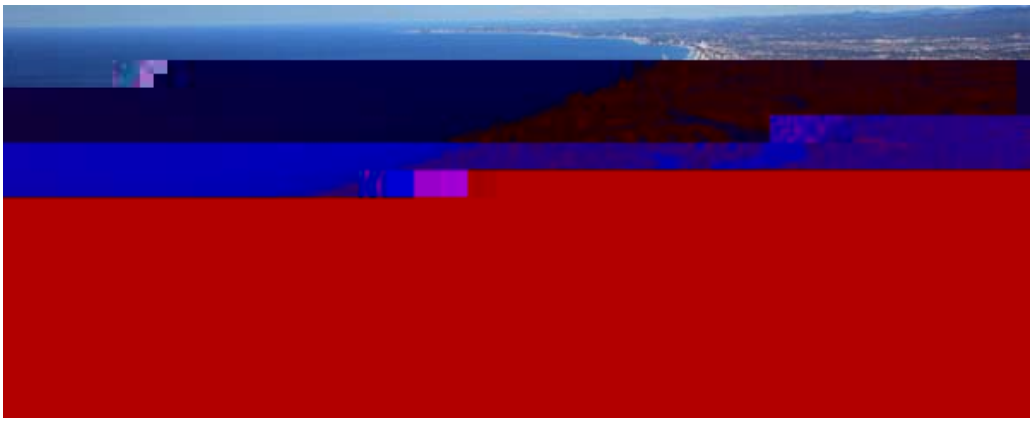
Australian Climate Change Adaptation Research Network for Settlements and Infrastructure

1st National Forum and Workshop for Postgraduate Researchers

The University of New South Wales, Sydney
May 14 – 15, 2009



Abstracts

Coastal Settlements

Natalie Lockart1 11
University of Newcastle, Engineering

Name: Edward Boydell
Email: edward.boydell@anu.edu.au
Organization: Australian National University, Fenner School of Environment and Society
Research Area:

Name: Michael Leonard
Email: mleonard@civeng.adelaide.edu.au
Organization: University of Adelaide SA, Civil, Mining and Environmental Engineering
Research Area: Coastal Settlements
Title: Methods for non-stationary hydrologic extremes and joint probability interactions

The majority of Australia's population is concentrated along its coastline and is vulnerable to flooding exacerbated by potential climate change. A the turn of the century

Name: Peter Ampt
Email: p.ampt@unsw.edu.au
Organization: University of NSW, Institute of Environmental Studies
Research Area: Infrastructure
Title: Wellington Working Farms Project: A small rural community's approach to adapting to the changing climate

Small communities in the Murray Darling Basin face considerable challenges in adapting to climate change. On top of existing trends such as declining agricultural profitability, diminishing services, rural to urban drift and increasing indigenous birth rates; climate change will bring declining irrigation water entitlements, marginalization of existing land uses, restriction of domestic water supplies and many other additional burdens with the associata0(ei0(y)2)-4(i)-6it3ei0(y)2it4 -6leoP5 Td [3 Tc 0(ma)6(ll cr)-e(hi)2it,

Name: Anup Chakrabortty
Email: a.chakrabortty@student.adfa.edu.au
Organisation: UNSW@ADFA, ACME
Research Area: Infrastructure
Title: Design, manufacture and analysis of a durable beam for infrastructure applications

In Australia there are more than 20000 timber bridges, most of which are 60 plus Years old and need major rehabilitation or replacement. Fiber Reinforced polymer (FRP) composites can be thought of as a best solution to this problem due to their numerous advantages such as high stiffness to weight ratio, corrosion resistance, ease of transportation and low maintenance cost. However, the use of FRP composites in highway structures is making limited progress due to their high initial cost. This cost can be reduced with large a volume automated process like" pultrusion".

However, when pultruded profiles are used as primary structural elements i.e. beam, they suffer from secondary modes of failure such as web buckling, compression face buckling and usually give catastrophic failure without warning. In this innovative approach High Strength Concrete (HSC) block and Carbon Fiber Reinforced Polymer (CFRP) laminate are bonded with Glass Fiber Reinforced Polymer (GFRP) pultruded profile at its top and bottom flange. The role of HSC block is to alleviate the compression of face buckling of the GFRP profile and CFRP laminate to increase the overall stiffness of the beam. The whole system is then wrapped with GFRP laminate to eliminate the debonding of GFRP-concrete interface and to have a full complete composite action. In the design, concrete element is allowed to fail first. This result in a most desired pseudo ductile behaviour of the beam for civil structures. Experimental investigation have shown that with this approach a successful design of a durable, economical and light weight beam for infrastructure application is possible.

Name: Fiona Johnson
Email: Fiona.johnson@student.unsw.edu.au
Organisation: University of NSW, School of Civil and Environmental Engineering
Research Area:

Name: Natalie L ockart
Email: Natalie.lockart@studentmail.newcastle.edu.au
Organization: University of Newcastle, Engineering
Research Area: Infrastructure
Title: Natural climate variability and implications for infrastructure

Natural climate processes are known to act to greatly impact on Australian rainfall and streamflow. The main climate mechanisms known to impact Australia are the El Nino/Southern Oscillation (ENSO), the Indian Ocean Dipole (IOD), the Southern Annular Mode (SAM) and the Interdecadal Pacific Oscillation (IPO) which can modulate the impacts of ENSO. These mechanisms have been shown to influence rainfall across Australia. In particular the SAM influences the southern half of the continent and ENSO the north east of the continent. The extreme states of these climate modes are associated with drought (El Nino conditions) and floods (La Nina conditions).

The aim of this study is to develop an Australia-wide model of these natural climate processes which can be used for short and long term prediction of rainfall. This will include assessing the role and importance of the different climate modes across Australia. The knowledge gained will help with prediction of temperature and streamflow associated with rainfall. Prediction of future climate states will allow for improved management practices and development of policies concerning infrastructure (e.g. upgrade of or development of new dams and pipe networks, drainage and flood control systems such as levees) and transport infrastructure management (e.g. maintenance of roads, culverts and retaining walls) to improve drought security, reduce the impact of floods and to increase protection of infrastructure in times of elevated fire risk associated with El Nino conditions.

Name: Li Wang
Email: z3232289@student.unsw.edu.au
Organisation: University of NSW, Institute of Environmental Studies
Research Area: Infrastructure
Title: Climate Change and Agricultural Adaptation in the Yellow River Basin China: the Potential for Adaptive Policy and Management

The Yellow River Basin covers 9 provinces and regions in China, Qinghai Tibetan Plateau and North China and is experiencing vital challenges from climate change and global warming. Incorporating 15% of China's farmland, the basin contributes to more than 160 million people's livelihood Its agricultural production has been pivotal to China for hundreds of years. Increasing temperatures and decreasing rainfall, as well as melting glaciers, have been observed in the basin over the past 50 years. A trend to become warmer and dryer will have significant effects on the local agricultural sustainability and farmers' livelihood. Local communities rely mostly on the agricultural production are facing huge impacts from climate change. Irrigated agriculture, the biggest consumer of the water in Yellow River Basin, will be greatly affected by increased water scarcity driven by the two key factors of increased human use and climate change.

This presentation will outline some of the arising hard realities for the Yellow River Basin. It will also consider the potential to engage farmers and decision makers in

Name: Ivan Iankov
Email: ian.iankov@unisa.edu.au
Organisation: University of SA, ISST – Transport Systems
Research Area: Urban Management, Transport and Inclusion
Title: Modelling of Australian road transport greenhouse emissions in carbon constrained economy

This paper outlines a proposed methodology for development of model for projection of future road transport GHG emissions in carbon constrained Australian economy. The methodology is based on three milestones: a) determining the emissions rates for all essential vehicle classes in all necessary year categories; b) determining future composition of Australian vehicle fleet – that is what are the classes and years of manufacture that vehicles belong to; c) estimating future vehicle-kilometres travelled for all essential vehicle classes and year of manufacture categories. The methodology utilises an iterative approach that captures the social economical realities and therefore will provide accurate predictions. In the iterative methods all parameters are used as inputs and outputs to the model in search of equilibrium. Central stage in this research is played by the concept of rebound effect. The paper presents a framework for verification of hypothesis that road transport activities are closed to saturation and therefore more affordable transportation will cause limited increase of vehicle-kilometres travelled. To the knowledge of the author there is no available statistics for rebound effect in Australia or at least the published vehicle-kilometres travelled data has not been analysed in such manner. Therefore, the conclusions for rebound effect from this research could have significant assistance for future policies discussions. The proposed modelling will assist in decisions for important policy problems such as role of vehicles fuel economy standards and emissions trading in the effective mitigation of current Australian vehicle fleet to sustainable one.

Name: Kate Fairlie
Email: kate.l.fairlie@student.uts.edu.au
Organisation: University of Technology Sydney, DAB/Built Environment
Research Area: Built environment, innovation, institutional reform
Title: Visualising Carbon

The focus internationally on climate change adaptation has undoubtedly centred on carbon emissions reductions. Much has been made of carbon neutral cities (also known as zero-carbon or carbon constrained cities) yet, as one report on the Abu Dhabi Masdar development states: "the goal is actually best described as zero carbon dioxide emissions: to reach the zero emissions target, the developers will turn to a system of carbon credits." (Technology Review, March/April 09)

Thus such cities and the future 'carbon-constrained world' are likely to give rise to increasing demands on land for (renewable) energy generation and carbon offset generation– which will exist in competition with land resources required for food generation, settlements and national parks. Increasing interactions between carbon

Name: Tani Faletau
Email: sanedan@gmail.com
Organisation: University of NSW, Institute of Environmental Studies (IES)
Research Area: Institutional reform
Title: Transcending the Past: Renovating Climate Change Policy in Small Pacific Island States, Tonga

Name: Cathryn Hamilton

Name: Melchior Mataki
Email: m.mataki@murdoch.edu.au
Organisation: Murdoch University, Environmental Technology Centre/School of Environmental Science
Research Area: Infrastructure and institutional reform
Title: Intertwining Adaptation and mitigation: the case of solid waste management

Most of the published studies on solid waste management (SWM) and its linkage to climate change have focused on the connection between SWM and green house gases (GHGs) emission and mitigation. Some of these studies have been captured in the analysis by Bogner et al. (2007) for the IPCC 4th Assessment Report.

However, the potential impacts of climate change on SWM have not been flagged out clearly in the literature (Bebb and Kersey 2003), and even the IPCC 4th assessment report fell short of the mark. This paper explores two pertinent questions to contribute to alleviating the lacunae described above: (i) how can SWM infrastructure (e.g. landfills,

Name: Trevor Nottle
Email: trevor.nottle@adelaide.edu.au
Organisation: University of Adelaide, Arch./Land arch./Urban Design
Research Area: Built environment - innovation
Title: The impact of climate change on hoe gardens in the Adelaide Plains

This paper summarises a 3yr research project into the likely impacts of climate change on home gardens of the Adelaide Plains. Results show:
Participants believe climate change will have moderate to extreme impacts.
Participants, by and large, follow water use restrictions.
Participants are aware of the soil types of their locations but few understand their 'terroir'.
Participants are still, to a large extent, dependant on tap water to water their gardens.
The use of rain-water tanks is growing despite there being no government subsidy for this usage.
Participants employ a range of short term strategies.
Few participants are highly discouraged by water restrictions.
No participants are considering utilizing high-end irrigation technology in the short term.
Short term strategies focus strongly on changes in plant selection, placement and applying criteria for drought hardy/tolerant plants.
Participants have a range of long term strategies to manage the impacts of climate change on gardens.
Significant strategies are partial revamping of gardens, gradual change, and installation of rain

Name: Timothy O'Leary
Email: tim.oleary@unisa.edu.au
Organisation: University of SA, Institute for Sustainable Solutions & Technologies
Research Area: Built environment, innovation, institutional reform
Title: Adaption to climate change through enhanced energy performance of housing

The background to this research which is at an early stage of progress (year one, PhD) is that housing in Australia consumes huge resources and contributes significantly to climate change effects through greenhouse gas emissions. There are however major anomalies surrounding the question of environmental performance, cost and affordability in modern housing in Australia:

- The effectiveness of initiatives aimed at reducing the environmental impacts of housing, yet reducing the capital and longer term costs are not fully understood.
- Cost effective design and procurement of housing currently is difficult to achieve without a more rapid response and adaption to newer climate change realities.
- Housing economic life span prediction is problematic, as maintenance issues, technological developments and adaption or suitability to future occupancy must account for evolving climate change scenarios.

The essential aim of the research presented to the ACCARNSI forum surrounds the question of how can we measure and predict the costs and/or benefits of building more energy efficient homes in Australia? together with an underlying examination of the general volume housing industries capability and role in providing sufficient and cost

Name: Renu Varshney
Email: z3079379@student.unsw.edu.au
Organisation: University of NSW, Faculty of the Built Environment
Research Area: Built environment, innovation, institutional reform
Title: Sustainable urban design using Information Technologies: Building Information Modelling and Geographical Information System

There is an increasing pressure on architects, urban designers and planners to redefine design processes to

- reduce green house gas emissions caused by the built environment
- create buildings and cities so they are adaptable and/or resilient to the consequences of climate change.

The consensus among experts is to leverage Information Technologies (IT) for design analysis as a prerequisite to achieving sustainable design outcomes. During the last few years two new IT concepts with a spatial focus have emerged: Building Information Modelling (BIM) and Geographical information System (GIS).

Urban sustainability and climate change issues have traditionally been looked at from various perspectives such as economic, social, ecological, and conceptual models like DPSIR (Drivers-Pressure-State-Impact-Response). This research is based on the premise that the spatial element is fundamental to all these perspectives; and that the assessment of the performance of the built environment is an indispensable step in the pursuit of sustainability, and adapting to climate change.

This research therefore approaches urban sustainability and the consequences of climate change from a spatial view point and aims to

- understand the synergies between BIM and GIS to evaluate and analyse performance of buildings and urban settlements for sustainability. This analysis includes a range of sustainability indicators with a focus on energy consumption
- propose strategies for implementing these sustainability analysis practices using BIM and GIS in the current industry scenario.

The method involves identifying suitable sustainability indicators, developing a BIM and GIS based methodology for their analysis, document their strengths and weaknesses; and propose strategies for existing practices to incorporate such analyses in their operations. The expected outcome of the research will be to establish a practical methodology for current architectural design industry to employ BIM and GIS for sustainable urban design.