Seminar on

Coastal Protection and Adaptation to Climate Change

Grand Copthorne Waterfront Hotel

Level 2, Riverfront Ballroom

16 Jan 2013

Jointly organized by:
The Building and Construction Authority
and
The Tropical Marine Science Institute of NUS

Building and Construction Authority

NUS National University of Singapore

Seminar on Coastal Protection and Adaptation to Climate Change

Grand Copthorne Waterfront Hotel

Riverfront Ballroom

16 Jan 2013 (Wednesday)

Time	Programme	Speaker
0845 – 0900	Registration	
0900 – 0915	Opening Address	Mr Ong See Ho (Deputy CEO of BCA and Commissioner of Building Control) Prof Peter Ng (Director of TMSI)
Morning Session		
0915 – 1005	Sea-level rise scenarios for impact and adaptation assessment *Faculty of Engineering and the Environment, University of Southampton, United Kingdom*	Prof. R. Nicholls
1005 – 1035	Tea Break	
1035 – 1125	Describing, assessing and envisaging changing coastal hazards *Institute of Coastal Research (HZG) & University of Hamburg, Germany*	Prof. H. von Storch
1125 – 1215	The availability, generation and use of climate information in an African context *United Nations Development Programme, University of Cape Town, South Africa*	Dr M.Tadross
1215 – 1330	Lunch	
Afternoon Session		
1330 – 1405	Design of Adaptive Policy Pathways under Deep Uncertainties *SDWA, NUSDeltares and Department of Civil & Environmental Engineering, National University of Singapore*	Assoc. Prof. V. Babovic

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1405 – 1440	Coastal zone management and climate change *DHI-NTU Centre, Nanyang Technological University, Singapore*	Dr. Ole Larsen
1440 – 1510	Tea Break	
1510 – 1545	Wave climate, and wave-coupled processes in the large-scale circulation *Centre for Ocean Engineering, Science and Technology Swinburne University of Technology, Australia*	Prof. Alexander V Babanin
1545 – 1620	An idealized study of the impacts of sea-level rise on salinity intrusion in estuarine environments. *Department of Civil & Environmental Engineering, National University of Singapore*	Asst. Prof. Vivien P. Chua
1620 – 1730	Panel Discussion	
	End of Event	

Speaker 1: Professor Robert Nicholls

Faculty of Engineering and the Environment, University of Southampton, United Kingdom
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Prof. Robert's research concerns long-term coastal engineering and management, especially the issues of coastal impacts and adaptation to climate change, with an emphasis on sea-level rise. He has been involved in methodology developments and assessments from the local to global scale. For example, he led development of the Tyndall Coastal Simulator in Norfolk and the global DIVA model developed within the EU DINAS-COAST Project.

He has also been involved in many policy assessments including lead authorship of chapters in five reports of the Intergovernmental Panel for Climate Change (IPCC), contributions to the Stern Review on the Economics of Climate Change, the EU Green and White Papers on Adaptation, and OECD papers on climate change.

He is interested in developing realistic integrated assessments of coastal areas, including vulnerable areas such as deltas and small islands. He has been an Associate Editor of the Journal of Coastal Research since 1994, and a member of the Editorial Board of Maritime Engineering since 2009. He was awarded the Roger Revelle Medal by the Intergovernmental Oceanographic Commission in 2008.

Abstract of Paper

Sea-level Rise Scenarios for Impact and Adaptation Assessment

Global-mean sea-level rise is one of the more certain impacts of human-induced global warming and it will drive local impacts and adaptation needs around the world's coasts. A key element in assessing these issues is the development of sea-level rise scenarios (or plausible futures). This paper summarises key relevant material concerning sea-level rise scenario development for the 21st Century from previous Working Group I and Working Group II assessments of the IPCC. The paper will describe the mechanisms which contribute to sea-level change and a methodology for combining available data on these mechanisms to create suitable sea-level rise scenarios for impact and adaptation assessments.

Each component of the sea-level rise scenario, including the global volume of the ocean, regional effects due to differential thermal expansion of the ocean and dynamic effects and vertical land movements due to various natural and anthropogenic causes, are reviewed and methods to estimate these changes are considered that are consistent with the IPCC SRES emission scenarios. Procedures for developing relevant scenarios are illustrated, including the minimum requirements, and example sea-level scenarios are also included. This includes consideration of sea-level rise during the 21st Century, which may be of high consequence, though of low or unquantifiable probability, that exceeds the projections of the quantifiable portions of sea-level budget reported in the AR4. The application of these scenarios is considered.

Speaker 2: Professor Hans von Storch

Institute of Coastal Research (HZG) & University of Hamburg, Germany
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Prof. Hans von Storch is director of Institute of Coastal Research of the Helmholtz Zentrum Geesthacht (HZG) and Professor at the Meteorological Institute of the University of Hamburg. From 1987 - 1995, he was Senior Scientist and leader of the "Statistical Analysis and Modelling" group at the Max Planck-Institute for Meteorology.

His research interests are climate diagnostics and statistical climatology, regional climate change and its transdisciplinary context. He has published twenty books, and numerous articles. He is member of the advisory boards of, among others, Journal of Climate, Environmental Science and Policy, and Meteorologische Zeitschrift, and organizer of the HZG School on Environmental Research.

He is a lead author of the Working Group II of the Fifth Assessment of the IPCC. He chairs efforts for a climate change assessment for the Baltic Sea Catchment (BACC II).

Abstract of Paper

Describing, Assessing and Envisaging Changing Coastal Hazards

Coasts are highly variable environments, which are in many cases very intensively used by people for various, sometimes conflicting purposes, and as such are subject to anthropogenic modifications. At the same time, coasts are also places, where hazards – for instance due to storms urges or tsunamis – represent major risks for livelihood of people. The coasts of Singapore are exposed to such human utilization, and also the coasts of the Baltic Sea represent such a contested region. In this contribution, we discuss the multiplicity of possible utilities, conflicting perceptions, and the need for politically guided management of coasts, and which role science can play in such a set-up.

Science cannot decide which utility should be given priority – this is the privilege of the political system – but it is essential in determining the present state and the present change, in deriving the sensitivity to global and local modifications, and in envisaging possible futures.

Examples from Northern Europe, in particular dealing with the Hamburg and its port, demonstrate the provision of scientific underpinning of decisions, while leaving the political process and its balancing of interests, preferences and perceptions intact. The whole process is intimately related to the concept of Regional Climate Service.

Speaker 3: Dr Mark Tadross

United Nations Development Programme, University of Cape Town, South Africa

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Since 2011, Dr Mark Tadross has provided technical advice on climate information and modelling to projects supported by the United Nations Development Programme, as part of the Green-LECRDS (Low Emission Climate Resilient Development Strategies) team.

In addition to technical advice, Dr Tadross helps governments (mostly in Africa and developing world) formulate project proposals to access climate change funds, often administered by the Global Environment Facility (GEF) e.g. the Least Developed Country Fund (LDCF), Special Climate Change Fund (SCCF) and Adaptation Fund (AF).

Before joining UNDP, Dr Tadross worked for the Climate Systems Analysis Group (CSAG) at the University of Cape Town, where he helped develop downscaled (high resolution) climate change scenarios and seasonal forecasts over sub-saharan Africa using a range of climate models (both global and regional).

He was both a contributing author and reviewer to the Intergovernmental Panel on Climate Change (IPCC) 4th assessment report. He is a reviewer for several international journals and managed projects examining and modelling climate, as well as its impacts. As an advisor to both national and international organisations (Including World Bank and United Nations), he has provided advice, data and analytical support to understand climate change and model its impact on a range of sectors including agriculture, water resources and disaster management.

Abstract of Paper

The availability, Generation and Use of Climate Information in an African Context

This talk will present examples of how climate information (historical data, seasonal forecasts and climate change scenarios) have been developed and used in projects across Africa and the limitations placed on the use of this information due to: the paucity of spatial data, poor/incomplete records, inability to translate the information into sector-specific information (and the communication thereof) and insufficient quantification of risks/probabilities. For short-term planning and disaster management, the availability of historical observations and short- and medium-term (seasonal) forecasts are critical, whereas for long-term (decadal and multi-decadal) planning, both historical observations and downscaled climate simulations are desired (e.g. CORDEX). The availability of these data is limited in many countries and understanding which information may feasibly be generated (or sourced), given data availability, is often a crucial step when planning for many projects.

Recognizing the need to improve the availability of climate data for planning and early warning systems for disaster response, many countries are currently seeking to improve their climate-observing infrastructure and data gathering capabilities. Such capabilities will never be perfect and using less accurate available information e.g. from satellites, may be one way to improve spatial coverage when it is accurate enough for the intended purpose.

It is additionally recognized that the ability to combine these data with other socio-economic factors (access to markets, pricing etc.) and communicate warnings to those in danger, is crucial if climate information is to be used effectively. However, building such systems in developing countries is difficult and often hampered by a lack of human and institutional capacity, as well as both technical skills and suitable budgets to maintain and operate equipment. These issues and potential solutions will be discussed.

Speaker 4: Assoc Professor Vladan Babovic

Department of Civil and Environmental Engineering, SDWA, National University of Singapore

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Assoc Prof. Vladan Babovic is Director of Singapore Delft Water Alliance (SDWA). Concurrently he leads NUSDeltares, a platform for integration of capabilities of National University of Singapore and Deltares for the purpose of innovative applied research in South East Asia.

Vladan holds PhD. degrees from both UNESCO-IHE and Delft University of Technology, as well as a business degree from IMD (Lausanne, Switzerland). Prior to joining NUS, he was Head of Emerging Technologies at the Danish Hydraulic Institute (1995-2002), Chief Technology Officer at Tetrasys, Switzerland (2002-2004) and Senior Research Scientist at WL | Delft Hydraulics (2003-2005

His research interests include hydroinformatics, real options and systems architecting. In 1998, he was awarded Talent Award by Danish Academy of Technical Sciences, and in 1996, Dr Arthur Ippen Award by International Association for Hydro-Environmental Research. In 2012 he was bestowed upon a rank of Fellow by International Water Association.

Abstract of Paper

Design of Adaptive Policy Pathways under Deep Uncertainties

Water and spatial management in coastal areas is increasingly challenged not only by climate-associated change such as sea level rise, but also pressures due to population growth and increasing variability in river runoffs. Adaptation to such changes is not only determined by what is known or anticipated at present, but also by what will be experienced and learned as the future unfolds, as well as by policy responses to social and water events.

As a result, a pathway emerges. Instead of responding to surprises and making ad hoc decisions, exploring adaptation pathways into the future provide indispensable support to water management decision-making. We have developed a structured approach for designing a dynamic adaptive policy based on the concepts of adaptive policy making and adaptation

Speaker 5: Dr Ole Larsen

DHI-NTU Centre, Singapore.
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Dr Ole Larsen has an MSc from the Royal Veterinary and Agricultural University (Denmark) and PhD from Technical University of Denmark, with a theoretical background covering geochemistry, hydrology and hydraulics. His specialties include: numerical simulations, risk management, environmental management, flooding, biogeochemistry, negotiations. He has practical experience from more than 40 development and consultancy projects within water management and hydraulic engineering, as well as related information technology and decision-support. Today, his work focuses on developing and applying new technologies to improve water and environmental management

Speaker 6: Prof. Alexander V Babanin

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Prof. Alexander V Babanin is the director of the Centre for Ocean Engineering, Science and Technology. Under his management and directions, the Centre was awarded the prestigious 5 star rating in Maritime Engineering in ERA-2012 (Excellence in Research for Australia), the highest recognition in Australia.

In 2005, Alexander received the Editor's Award for the Journal of Physical Oceanography from the Council of the American Meteorological Society.

With his co-authors, Alexander has secured numerous Competitive Grant funding for the last 5 years including the Australian Research Council, Discovery, Linkage and LEIF grants, the US national competitive grants and the CSIRO flagship.

Abstract of Paper

Wave Climate, and Wave-Coupled Processes in the Large-Scale

Until recently, large-scale models did not explicitly take account of ocean surface waves which are a process of a much smaller scale both in space and time. It is, however, becoming obvious that waves mediate a great number of processes both in the atmospheric boundary layer and in the upper ocean. In addition, waves can potentially serve as a climate-change indicator themselves and, together with surface winds have shown increasing trends globally. In short, without accounting for the wave effects directly, the physics of large-scale air-sea interactions appears inaccurate and incomplete.

In the presentation, the ocean waves and their influences will be discussed in the context of large-scale processes in the atmosphere and the ocean. In particular, wave impacts on the large-scale phenomena and features, such as atmospheric sea drag over the ocean interface and wave-induced mixing in the upper ocean will be shown.

In turn, changes and trends in the ocean winds and waves at climate scale will also be highlighted. The wave-induced mixing will be introduced through the turbulence produced by non-breaking waves. Laboratory and field observations of such turbulence, and its numerical simulations will be shown. Its implementation in large-scale models for ocean circulation and climate will be demonstrated.

Speaker 7: Asst. Professor Vivien P. Chua

Department of Civil and Environmental Engineering, National University of Singapore

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Dr. Chua Pei Wen Vivien is an assistant professor in the Department of Civil and Environmental Engineering at the National University of Singapore. She received her Ph.D. and M.S. from Stanford University, USA in 2012 and 2008, respectively, and obtained her B.S. (Highest Honors) from Georgia Institute of Technology, USA in 2005. Dr. Chua's research interests lie in the study of processes that influence the dynamics of the coastal ocean, rivers, lakes and estuaries. Most of her research thus far focuses on the development and application of numerical models and high performance computational techniques to study surface water flows.

Her work strongly relies on combining advanced numerical models with observations, and then analyzing that model both analytically and computationally to understand current conditions and to predict future behavior in the face of climate change.

Abstract of Paper

An Idealized Study of the Impacts of Sea-Level Rise in Estuarine Environments

Estuaries are semi-enclosed areas along the coastal shoreline where freshwater from a river mixes with salt water from the sea. An idealized estuary model is employed to investigate the effects of sea-level rise on salinity intrusion and estuarine circulation in well-mixed and stratified estuarine flows. Intertidal estuarine zones are particularly vulnerable to projected sea-level rise that might lead to inundation and intrusion of high salinity water further upstream. The saltwater intrusion would lead to a loss of estuarine habitats and be potentially harmful to aquatic plants and animals, as well as threaten the water supply of coastal communities.

The sea-level rise scenarios are performed by initializing the model with different mean sea-level heights derived from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) based on the A1F1 (fossil fuel intensive) scenario. The upper-limit (95-percentile) for the five scenarios are namely: 0.00 m (year 1990), 0.10 m (2020), 0.27 m (2050), 0.56 m (2080), 0.81 m (2100). Rising sea levels reduce the impact of bottom-generated turbulence causing less vertical mixing.

This creates stronger gravitational circulation and higher vertical stratification, resulting in enhanced salinity intrusion. The largest amount of salinity intrusion is observed for stratified estuaries with weak tidal mixing and strong freshwater inflows. Our idealized simulations will be valuable for coastal management and planning in response to sea-level rise for a wide range of estuaries, and may be incorporated to improve our understanding of the effects of rising sea levels in estuaries with realistic coastlines and bathymetry.