



## **AWI-CMAS**

### **Climate Change Mitigation and Adaptation Strategies for Pacific Rim Cities (June 2009 Update)**

The APRU World Institute research program on Climate Change Mitigation and Adaptation Strategies (AWI-CMAS) has developed with strong and increasing momentum since its first meeting of the representatives of the founding universities in October 2007 at Tsinghua University. Following the Tsinghua meeting, the theme was focused and the work divided into projects which have already commenced with teams created around these in the growing number of participating universities. (The founding universities are: University of Melbourne, University of California at San Diego, Tsinghua University, National University of Singapore, University of Malaya, Chulalongkorn University, and Kyoto University.)

At its March 2009 meeting in Melbourne, the CMAS Program participants had expanded beyond the founding universities to include Australian National University, University of Indonesia, the United Nations University, and a written contribution also from the Asian Institute of Technology. The meeting also included representatives from the World Bank, CSIRO/AUSAID Alliance, UNESCAP, NAHRIM and through them, the Asian Development Bank. Interest in the work of CMAS continues to grow rapidly with other universities actively interested in joining its work.

Over the period since its establishment, AWI-CMAS has focused its work around examining, on a comparative basis, key issues associated with integrated water management systems, in major Pacific Rim coastal cities, that need to live with the stresses of economic and population growth and climate change.

In the last six months, the APEC Business Advisory Council (ABAC) has agreed to collaborate with the work of the AWI CMAS project; AWI CMAS has been invited to participate in the work of the Mekong River Commission. The National Hydraulics Research Institute of Malaysia (NAHRIM) has identified AWI-CMAS to become its partner for Regional Cooperation and Knowledge Hub Services, placing it in a good position to be funded by the Asian Development Bank. AWI-CMAS has also played an important role in helping catalyse developments for its member universities, including the UCSD-Cambridge partnership focusing on snow melt (which is the upstream counterpart of CMAS), and a developing relationship with the UN University in the area of climate change and innovation.

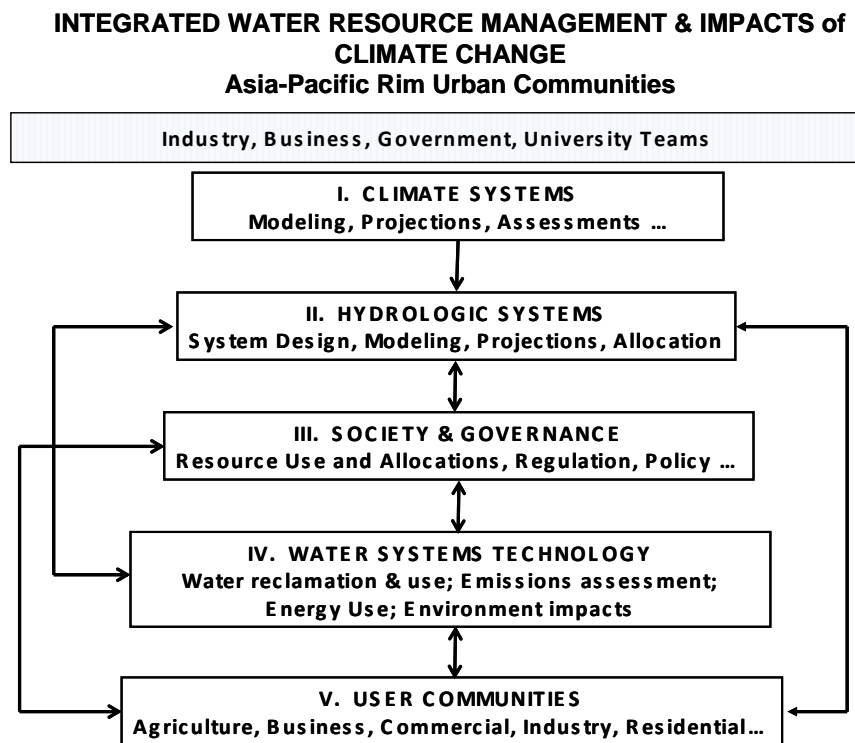
#### **Rationale**

Water is central to human life, and human social organization. Current climate change projections make it clear that precipitation intensity and seasonality will change, with many locations being threatened by water deluges and many others by regional droughts, both as increasingly normal occurrences. These projected changes over the coming decades will exacerbate (i) current water shortages in many urban areas of Asia, US, Australia and Europe and (ii) extensive flooding from cyclone-, monsoon-, hurricane- & tsunami-events in many areas of Asia, US and Australia.

For this reason, and in addition to current needs for understanding how to effectively manage water systems in urban communities, anticipating and adapting effectively to the effects of climate change will require developing an enhanced understanding of urban climate and precipitation projections and water systems in urban communities, and the ways they interact as integrated systems. The CMAS program has a strong emphasis on developing its work as a multi-university initiative with business, industry and government partners to assess climate change impacts on the whole integrated water systems of urban communities.

At its recent Melbourne meeting, CMAS researchers agreed to focus on the city using the following model.

### CMAS Model



### Program Thematic Thrust Areas

Consistent with the above overall design, the CMAS project is addressing urban communities in North America (San Diego), Asia (Bangkok, Singapore, Kuala Lumpur, Danang) and Australia (Melbourne with a comparison case study in Canberra) using a series of connected thematic thrust areas. The thrust areas currently are:

- I. Climate Systems
- II. Hydrologic Systems
- III. Society and Governance
- IV. Water Use: Reclamation, Energy, Emissions & Environment
- V. User Community Reference Process

The roles and tasks for each of the thrust areas is evolving as the research develops. A brief description of each is presented in **APPENDIX A**.

## **Organisation and Forward Development**

The AWI Climate Change Theme is directed by Prof Jim Falk (University of Melbourne) and the AWI-CMAS research program is jointly directed by Prof Falk and Prof Lisa Shaffer (University of California at San Diego), supported by a Program Steering Committee which meets approximately monthly by teleconference.

Each university is developing its own research team around a nominated team leader. The Climate Change Theme Director also is assisting the development of this by visiting a number of the universities for discussions with the teams on site.

Each thematic thrust area is led by a Theme Leader appointed by the Steering Committee. Each of the thrust areas is under development, with some much more advanced than others. The most advanced is the Hydrologic Systems area, led by Prof Azizan Abu Samah (University of Malaya) which is already developing a computer modeling to predict flooding in extreme weather events in situations (such as Danang) where the available data is incomplete.

The first CMAS project workshop, which focuses on its hydraulic modeling work, will be partially funded by UNESCAP, and by the workshop host, the University of Malaya. The next full CMAS meeting will be in Singapore and is hoped to include a dialog meeting with local government officials from the case study cities, funded by the World Bank.

AWI-CMAS has taken the strategic decision that work should not await funding, but rather, if good work is underway through a proved international collaboration around this important set of issues affecting millions of people, then that work will in due course attract major funding. At the same time we are building active collaborative working relations with major funding bodies, and are beginning to prepare funding proposals to assist our work.

Professor Jim Falk  
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Director, Australian Centre for Science, Innovation and Society,  
University of Melbourne

**AWI-CMAS THRUST AREAS**

**Climate systems:** Climate change projections generally depend on global climate models (GCM) used by the IPCC and others to indicate the effects of climate change. While these projections are at global scales, they are being refined and enhanced and will be increasingly used to target climate-change effects on regions through linked regional climate models (RCM). The CMAS project is focused on urban communities and the hydrologic units on which they rely. While these units vary in size, the use of RCMs to make projections for urban integrated-water systems is critical in making water projections for 20- to 30-yr periods of project design and implementation. Hence, this thrust area will focus on enhancing linkages between RCMs and GCMs for the urban communities of CMAS.

**Hydrologic Systems:** With critical inputs for precipitation projections across regions, the hydrologic systems thrust area focuses on linking precipitation inputs and extreme weather events to impacts on the land masses of urban communities. Linking rainfall to surface and groundwater flows, as well as assessing the role of reservoirs, streams, shorelines and urban features, will be the focus of this thrust. Priority is being given to providing hydrologic modeling capabilities and outputs required to develop hydrologic and reclamation systems which protect urban communities from flooding and extreme events and provide energy-efficient, low-climate-change-impact water systems to sustain populations in urban communities.

**Governance and local knowledge:** Approaches to the governance and management of waters systems, and adaption to changes being induced in them, varies enormously across different communities. These approaches are themselves situated in regional, national, and even multinational systems which are rapidly evolving both politically and in terms of cultural and technical understanding and capacities. The approaches to investigating, developing and managing integrated water systems in a climate-change environment must seek to fully integrate inputs of urban societies and governance systems into policy-making and management.

Globally there are a limited number of urban communities where water systems are or can be managed in a fully-integrated approach. Most communities include water systems that reach well beyond the confines of the community reaching across institutional, state and even national borders. This thrust area focuses on tools and approaches to overcoming these barriers to effective integrated water governance.

Whilst much policy is set at broader scales through governance systems, effective adaptation to changes in the water system requires action at local level, which is inevitably mediated by local knowledge and understanding. Sometimes local knowledge will provide strong resources for resilience, whilst in other cases it may hinder utilization of new and more effective responses. This thrust area is developing a clearer picture of how local knowledge may affect effective adaptation responses, and the role that education can play in shaping resilient urban communities in the face of water stress.

**Water Uses: Reclamation, Energy, Emissions, and Environment:** Water-reclamation processes are driven by fundamental physicochemical and biological processes and available technologies range from simple to complex systems. The approach to be taken with this thrust project will be to develop an array of technologies and approaches for water reclamation for integrated use with the overall project. The thrust will be an integration of four (4) sub-areas: Emissions, Energy, Environment, Reclamation and Reuse.

Approaches will be developed for developing-country and developed-country use and will address appropriate-technology systems, ranging from individual users (e.g., community well-tap and surface-water bucket-brigade systems) to urban communities using rainwater-cistern, ground, surface, brackish, and marine water sources. The approach will also address the expanding use of distributed water systems with a focus on minimization (elimination) of extensive subsurface transport networks. The Energy and Emissions portions will serve to provide effective and efficient means to provision of waters with minimal climate-change emissions. The Environment portion will address effects of climate change on disease vectors and public-health concerns in urban communities, as well as the needs of the urban-community environment in addressing quality-of-life issues and biodiversity issues related to water limitations and excesses.

**User Community Reference Process:** In urban communities, water resources are used in many community-based sectors including agricultural, industrial, commercial, home, block and institutional users. Other water resource issues are focused urban storm-water runoff; flood-management systems; surface-reservoir and aquifer management; wastewater reclamation reuse and discharge; potable-water provision; building-block management of water utilities; landscape irrigation; desalination; and fire-protection systems, all driven by water needs and uses and all potentially affected by changes in precipitation intensity and patterns. The final thrust area ensures that User Communities are both examined and participate in the shaping of the research questions. This User Community Reference Process is being developed to integrate user groups into the research in the other four thrust areas through a formal process of delineating the key user groups for each city, and a series of consultations and discussions with government, business, agricultural, water-management and industrial partner. This then will be set within a set of key data describing each city.