

## COST Exploratory Workshop Series

# The Energy-Water Nexus: Managing the Links between Energy and Water for a Sustainable Future

### Overview

A better understanding of the nature and possible effects of the links between climate, energy and water is essential in any attempt to formulate energy and water policies for more resilient and adaptable societies. This has been recognised by some very high profile events in the past years, including the G8 Environment Ministers meeting in Gleneagles, March 2007, the UNFCCC meeting in Bali, October 2007, and at the World Economic Forum in Davos, January 2008.

A number of research teams around the world are analysing the links and feedbacks in the energy-water nexus although there is little coordination between them and therefore little opportunity to 'put the pieces of the puzzle' together. There is almost no research undertaken into how even the most dominant relationships between climate, energy and water can be accounted for, and *incorporated into*, international, national and regional policy development. In existing policy frameworks, climate, energy and water policies are developed largely in isolation from one another.

The COST initiative, known as the CEW Links Project, is an integrative endeavour with a policy and management focus. In support of the most outstanding, comprehensive and up-to-the-minute science, and utilising the extensive networking and coordination competencies of COST, the CEW Links Project will provide an international platform for scholars and policymakers already working in this area and/or with technical expertise to contribute to the project. To this end, COST will convene a series of events in 2008-2009 involving both high-level scientists and policy- and decision-makers.

The project has four primary objectives:

1. To identify and understand the links between climate, energy and water, and of the global capacity for accounting for these links
2. To identify and understand the gaps in existing policy frameworks that inhibit the necessary integration across sectors and jurisdictions
3. To produce a comprehensive list of recommendations for the integration of these links into policy and decision-making, to be presented at a number of key international fora, culminating in a submission to the 2009 UNFCCC COP15 in Copenhagen, Denmark.
4. To identify a long term research and development agenda for the continued collaboration of researchers and policy makers in the climate-energy-water domain.

### Rationale

Water and energy are both indispensable inputs to modern economies, and thus present systemic challenges to research and policy. Energy is the basic currency of the biosphere and, defined as the ability to



do work, embedded in all systems of production and consumption. Water is similarly embedded in production and consumption, and essential for all life. Taken together, especially in the context of a dynamically changing climate which will affect supply and demand of both, close attention to water and energy attends to a large part of the challenge of achieving sustainable development.

It is not possible to optimise the operation of energy- and water-supply utilities in isolation from each other or from considerations of climatic conditions. Many large-scale energy-conversion processes consume water, and most bulk water-supply processes require the expenditure of significant amounts of energy. Climate affects both the supply of, and demand for, energy and water—and energy-conversion and water-extraction processes have the potential to contribute to climate change.

Preliminary, early research has been undertaken to identify and understand these links, but none are comprehensive in approach or policy-relevant in outcome.

The main R&D challenges, and objectives of the COST CEW Links initiative, include:

1. The generation of an initial map of the *dominant* causal links in the CEW complex. A staged process will be followed: (a) generate discipline- and sector-focused influence diagrams in consultation with a range of experts internationally (b) assemble focused influence diagrams into a global overview diagram and explanation that summarises the causal structure of the CEW complex, and (c) refine and simplify the overview diagram, emphasising the most influential causal links. The process will be iterative, utilising three workshops, one international conference and two conference panels to exploit the potential for dialogue and debate from the international community of scientists and policy makers.
2. The use of the overview map to guide an initial identification of possible feedback systems embedded in the CEW complex. The aim of this exercise is to identify (a) possible cross-sectorial feedback effects (amplification, policy resistance) that can confound management and policy-making efforts, (b) possible dangers and barriers to effective management caused by feedback (critical thresholds or tipping points, system inertia), and (c) possible opportunities to improve management outcomes by simplifying the causal structure of the CEW complex (decoupling) and by identifying changes that utilise the embedded feedback systems to advantage (leverage points).
3. The production of written discussions of the project findings in forms useful for researchers, policy makers, and managers. Outputs will include detailed descriptions of selected case studies and higher-level discussions of generic insights. The discussion papers and recommendations will be presented at specific international fora, culminating at the UNFCCC COP15 meeting in Copenhagen, Denmark.
4. The drafting of an R&D agenda designed to examine and extend the project findings, focusing on what have been defined as the most critical knowledge needs from the perspectives of both research and policy. In particular, the causal-link mapping endeavour (as outlined in 1, above) will provide the basis for (a) new focused research projects that tackle the most important causal links, (b) research on the most significant feedback loops, and (c) a study of the system as a whole, exploring the use of complex system theory/modelling and network theory/modelling.

