Climate Change and Water Planning in the Pacific Northwest: A New Application of Shared Vision Planning

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Introduction

There is general consensus in the scientific community that global climate is changing (IPCC 2007). The precise impact of climate change on water resources and the urban environment is less certain. Although paradigms exist that outline approaches to evaluate the potential impacts of climate change on water resource systems (Gleick 1999), no single approach has been generally accepted and the uncertainties associated with the application of any approach are large. The greatest source of uncertainty associated with climate change impacts arises from the range of future scenarios utilized by GCMs. Applying an evolving science to real decisions concerning water resources thus requires gaining the support and trust of those responsible for decision making. However, since climate is, in fact changing, evaluating its impacts is important when investigating the future viability of water resource systems.

This paper investigates the use of a "shared vision planning" approach in a regional water study with the goal of institutionalizing the incorporation of climate impacts into forecasts of water supply and water demand. This is accomplished by the creation of a technical advising committee that strived to identify the potential impacts of climate change in their region through a consensus process and then incorporated these impacts into a series of water system simulation that estimated the likely impacts. This paper begins by defining the conflict that was to be resolved by the shared vision planning approach. It then describes the institutional approach that was taken in response to this perceived conflict. Next, the paper describes a consensus process in which a group of engaged stakeholders devoted six months to defining likely impacts to the region. The paper concludes with a discussion of the challenges of this approach and the lessons learned.

The Conflict to be Resolved and the Institutional Setting

As few as five years ago, some still suggested that global climate change was not a significant problem, that the extreme events that were occurring were part of the natural variability of climate, and that man's activity had little or nothing to do with climate or climate change. Given these perspectives, it is not surprising that water planning agencies in many areas of the country faced significant resistance when they sought to incorporate the potential impacts of climate change into their long range planning. This inability to acknowledge that climate change was occurring and that it was having significant impacts made it difficult to implement action at a local level. The Fourth IPCC Assessment Report has essentially removed any doubt about the need to address climate change. Fortunately, prior to the publication of that report many parts of the US were already attempting to address climate change.

The Puget Sound Region (the Puget Sound Region here is defined as that portion of Washington State that is in the three county region of King, Snohomish, and Pierce County, and other nearby areas) has been a leader in environmental awareness. Water resource planning performed in this area, whether performed by a federal agency like the Corps of Engineers or by a utility, like Tacoma Public Utilities, has long been performed in a "fish-bowl" atmosphere in which planners have been expected to engage resource agencies, Indian nations, regulators, stakeholders and others in an inclusive planning process. Several of the most visible local elected officials (including the Mayor of Seattle and the King County Executive, to name just two) have been recognized nationally as leaders in advocating the need to address issues associated with climate change.

Despite the "fish bowl" environment, or perhaps partially because of it, points of conflict have developed between resource agencies, water providers, and wastewater providers in the region. Two major points of conflict revolve around water supply sources in the region and long-term water demands. For over 30 years, Seattle Public Utilities, Tacoma Water, and the Corps of Engineers sought to interconnect the Seattle and Tacoma water supply systems. This was seen as an excellent alternative in addressing long-term water needs in the region. This interconnection appeared to be imminent, until an existing hydropower project in the region became available as a potential public water supply source, and purveyors sought to include this source in the intertie. An agreement could not be reached on whether to include this source, leading to a number of the purveyors that had been served by Seattle to seek to develop the hydropower power project on their own. The purveyors, when renewing their existing contract, signed a long-term agreement to decrease the amount of water they received from Seattle, and instead develop this new supply source and obtain water from Tacoma in the interim. In addition, King County, sought to expand its recycling efforts to include waste water reuse, which would make available more water regionally for special purposes. The potential impacts of climate change have played into this regional debate, as climate change might place more strain on the region's water resources. In addition, utility water demands projections in the past have over estimated water demands, adding uncertainty to the need to provide more water for the region. In addition, no forecasts have adequately addressed climate change impacts.

In the Winter of 2005, King County initiated a planning process designed to improve the quality and access to information used in planning for regional water resources and regional water demands. The County was quickly joined by a number of other entities, including the Muckleshoot Indian Tribe, Washington Department of Ecology, Washington Department of Fish and Wildlife, Washington Department of Health, King County Department of Public Health, Seattle Department of Public Health, Pierce County, City of Auburn, Suburban Cities Association, Cascade Water Alliance, Cedar River Water and Sewer District, Lakehaven Utility District, Seattle Public Utilities, Tacoma Public Utilities, Woodinville Water District, Shared Strategy for Puget Sound, Center for Environmental Law & Policy, and Washington Environmental Council. The planning framework that is in place:

> *"outlines a multi-year schedule for studying water resource conditions and management approaches related to meeting the combined needs of water for people and fish from all available sources, including reclaimed water and conservation. In*

addition, the planning process is exploring the potential impact of climate change on water planning, as well as small water system issues and problems. Efforts of this planning process will produce analyses, information and potential projects which may be used in future water planning activities…this planning process is expected to produce information and recommendations in seven topic areas: water demand forecast, water supply assessment, climate change impacts, reclaimed water, tributary stream flows, source exchange strategies, and small water systems." (http://www.govlink.org/regional-water-planning/index.htm)

In this process, a number of technical committees were established to provide information on pressing issues. One of these is the Climate Change Technical Committee. It has approximately 25 members. Its goal is to "assess climate change impacts on water demand, water supplies and instream flows."

Climate Change Technical Committee

The initial tasks in evaluating the potential impacts of climate change on water resources in the Puget Sound Region faced by the Technical Committee was to: 1) develop an acceptable process for organizing and managing the committee, 2) create a common vocabulary and a shared understanding of climate change and its impacts, both on a global and regional scale, and 3) define research tasks that are necessary to quantify the potential impacts of climate change in the region. These goals include the interpretation of existing models and the development of models that are to be incorporated into the decision making process. Throughout the process, efforts were made to seek consensus within the committee, even when this required lengthy debates, review of the published literature, and presentations from experts.

Organization and Management

The committee proved to be "self-selecting" in that all individuals involved in the regional planning process that desired to be on the committee were welcomed. Approximately 25 people, representing some 18 different organizations, now compose the core group. A professional facilitator was used to manage meetings. Researchers from the Department of Civil and Environmental Engineering and from the Climate Impacts Group of the University of Washington provided technical support in creating technical material for individual meetings and for committee reports. King County Department of National Resources and Parks provided the institutional technical lead for the committee. The committee first met in March of 2006 and ground rules for committee procedures were in place by April of 2006.

Common Vocabulary and Shared Understanding

To help create a common vocabulary within the committee and to generate a shared understanding of the potential impacts of climate change, the committee embarked on a joint effort to create a set of "Climate Change Building Blocks." The group concluded that such an effort would result in a document that could be used to crystallize the group's understanding of climate change, to provide information for interested stakeholders outside the committee, and to ensure the engagement of all of the members. The goal of the document was to summarize the major impacts that were likely to occur

due to climate change in the Puget Sound region in a clear and concise manner that could be easily understood by engaged stakeholders and was based on peer-reviewed literature.

An initial draft of the Climate Change Building Blocks was created by the researchers in April of 2006. This document relied on the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change, reports produced by the Climate Impacts Group and peer reviewed publications on climate change. This draft was augmented, modified, edited and discussed for a seven month period. The document was the focal point of monthly committee meetings during this period. By the October meeting, a consensus was reached on the language of each of the thirteen Building Blocks (Table 1). The final document contains extensive documentation from peer reviewed literature to support its thirteen conclusions and is 37 pages in length (http://www.tag.washington.edu/projects/ClimateBuildingBlocks_Final_Oct5.pdf).

The creation of the Climate Change Building Blocks mimicked closely the development of a Shared Vision model. The initial draft of the Building Blocks paralleled the construction of a mock model that is frequently used in shared vision planning. After its construction, each of the major themes of the Building Blocks were debated thoroughly by the Committee until there was consensus that the Building Block was not only scientifically sound, but represented the expressed concerns of the Committee. The seven month period of discussion was typical to the process that occurs in the construction of a shared vision model.

Research Tasks

Once a consensus was reached that climate impacts would be significant and should be included in the evaluation of regional water supply and demand, specific procedures for evaluating these impacts were necessary. The committee entrusted the researchers at the University of Washington to create three items with their guidance: 1) an estimate of the anticipated changes in temperature and precipitation in the region for the decades surrounding the years 2000, 2025, 2050, and 2075, 2) an estimate of the anticipated changes in regional streamflow, and 3) guidelines for using this information in a regional framework to evaluate water supply and demand. Approximately six months later, the committee added three more tasks: an evaluation of the potential impacts of climate change on groundwater, an evaluation of the potential impacts of climate change on cloudy weather during summer months, and the development of a web-based access system to distribute these data.

The details of all of these tasks are beyond the scope of this paper, however, it is informative to note the interplay between the use of computer models, climate forecasts, decision frameworks, and the Committee. Like many current planning processes today that involve stakeholders, the Committee was not willing to simply provide a work statement to the researchers and then accept the researchers' result. Rather, the committee wanted to be informed on the approach that was to be used, understand the model and model assumptions that were to be used, provide evaluations along the course of the research, and to be involved in the final reporting of the research.

The specific steps included in developing the climate impacted streamflows alone involved: 1) selecting appropriate emission scenarios, 2) selecting appropriate GCMs, including the appropriate number of models, determining the "downscaling" technique to be used to translate the GCM data to local, watershed data, 3) the calibration of

watershed models, 4) creating of the climate impacts streamflows, and 5) evaluation of streamflows to ensure quality control. Each step required explaining to the committee the range of potential options and the rationale for the approach chosen.

Conclusions

Shared Vision Planning is a process that integrates public participation, discipline water resources planning, and computer modeling to improve and streamline water resources planning. Since its inception, one tenet of Shared Vision Planning has been to make use of models developed by stakeholders as a means to ensure the proper use of model results in decision making.

Because of the nature of climate change science, complex models that are not well understood by the water planning community are playing a significant role in evaluating climate impacts on water resources. If Shared Vision Planning is to effectively incorporate these models, adjustments must be made. The use of climate models requires further diligence in engaging stakeholders in defining the assumptions of the models to be used and in their interpretation. Unlike shared vision planning and modeling in the past, stakeholders will not be part of the model construction process but their trust still must be garnered. Experience in the Pacific Northwest indicates that stakeholders can gain confidence in such model and incorporate them into their analyses, but that even more time is necessary to gain their acceptance than in using simpler models.

Table 1- Climate Change Building Blocks

Impacts of Climate Change on Temperature

Building Block 1 – The global average temperature has increased during the 20th century and is forecasted to increase in the 21st century.

Building Block 2 – Warming in the Puget Sound Region has increased at a faster rate during the 20th century than the global average and increases in temperature are forecasted to continue.

Building Block 3 – Increased surface temperatures in the Pacific Northwest will increase the rates of evaporation and transpiration (evapotranspiration).

Impacts of Climate Change on Precipitation

Building Block 4 – Global precipitation is projected to increase in the future, although there is less certainty in predicting changes in precipitation than in temperature.

Building Block 5 – The occurrence of heavy precipitation events has increased over the U.S. during the 20th century. This trend is projected to continue during the 21st century.

Impacts of Climate Change on Snowpack and Glaciers

Building Block 6 – The loss of snowpack and glaciers in the Pacific Northwest mountains has been due to increased temperatures in the 20th century.

Building Block 7 – Forecasted increases in temperatures associated with climate change will further reduce snowpack and glaciers in the Pacific Northwest mountains.

Impacts of Climate Change on Streamflows

Building Block 8 – Climate change is projected to increase winter flows and decrease summer flows in snowmelt influenced river systems of the Pacific Northwest, particularly transient watersheds.

Building Block 9 – Climate change is projected to increase the frequency of flood events in most western Washington river basins.

Building Block 10 – Climate change is projected to increase the frequency of drought events in the Pacific Northwest.

Impacts of Climate Change on Sea Level Rise

Building Block 11 – Climate change is forecasted to raise global mean sea level in the 21st century.

Impacts of Climate Change on Salmonid Habitat

Building Block 12 – Climate change is forecasted to increase temperatures of rivers, streams, lakes, and river mouth estuaries in the Puget Sound region.

Building Block 13 –Climate change, as described in Building Blocks 1-12, is forecasted to contribute toward stream flow and temperature conditions that have been shown to negatively impact freshwater and estuarine habitat of most species of salmonids in the Puget Sound watersheds.

NOTES FROM THE PRESENTATION

The above paper was provided as background material for participants in advance of the workshop. Additional detail was provided during the presentation and in through the discussion that followed. Included was the following information:

- When this project started, the purpose of forming the task group was to quickly (over a few meetings) make a list of foundational points everyone could agree on. But, surprise, surprise - it turned into a long ordeal. During the process that ended up closer to 1 year, several people who originally rejected climate change changed their views and accepted the basic principles.