Planning for Climate Change Locally – Summary

The first week of topical discussion was about *Planning for Climate Change, Locally*. We asked participants to tell us about climate change in their mountain regions and describe promising methods of planning for those changes at a local level. We also wanted to know if participants felt it was possible to plan for climate change impacts at a local level, given their unpredictability on the small scale.

We received accounts of the effects of climate change on mountain places from participants around the globe, received several excellent resources and case studies, a collection of general guidelines for water policy planning in light of climate change, and a list of questions for further research.

Effects

As Ralf Ludwig pointed out, mountain people around the world share similar challenges with regard to climate change. The feedback of participants supports this view. Some of the climate effects noted by participants in their own mountain homes include:

Biophysical Effects

Temperature
- more variable but with a distinct warming trend
- more growing-degree and frost-free days
- more hot days and heat waves
- more freeze/defreeze events

Precipitation
- more variable precipitation but with a distinct decreasing trend, especially in the alpine
- later and less frequent winter snowcover, shallower snowpack
- more frequent drought and increasing desertification
- more rain in winter, rather than snow

Streamflows
- problems maintaining flow conditions and water levels throughout summer months
- earlier snowmelt and peak flows
- lower flows at the end of summer

Water Contamination
- increased rain events leading to increased erosion, on agricultural lands especially
- increased contamination of water from sediment, synthetic nutrients, pesticides and bacteria
- higher nutrient concentrations in the water

Biodiversity
- plant and animal species moving to higher elevations, possible future extirpations
- fish populations dropping due to lower stream flows
- more invasive plant species

Economic Effects

Forestry
- more disease
- more frequent and intense fires

Agriculture
- more irrigation
- more expensive food production
- declining agricultural productivity

Tourism
- shorter winter seasons impacting mountain resort towns
- more water required for snowmaking
- lower streamflows for rafting and fishing

Energy
- less hydro energy production

Community Effects

Hazards
- more intense, lengthy and frequent storms
- larger and more intense wildfires
- glacial lake outburst flooding (GLOF)

Drinking Water
- increasing scarcity of potable drinking water
- increasing freshwater exploration, some falling water tables
- increasing demand due to growing populations and industry

Land Use Change
- land use changes in response to changing weather and climate patterns

Conflict
- conflict between stakeholders (e.g. tourism and agriculture)

Looking into the future, Robert Halliday appealed to participants to consider more than the hydrological effects of climate change, but also the way it will change land use patterns in both highlands and lowlands. For example, rising average temperatures may permit higher valued but more water consuming crops in the lowlands, which may require more or less upland water at different times of the season. In this way, land use change may create feedback mechanisms that will amplify or counter the hydrological effects of climate change.

Guidelines for Planning

We asked about managing water resources in the face of climate change and received several case studies, as well as some suggestions about planning for watersheds effectively. We have compiled the most popular suggestions below into a list of guidelines as iterated by discussion participants.

Continue to mitigate the effects of climate change

There was general agreement that climate change is the greatest contemporary challenge to water policy and planning. Brenda Lucas and Babina Kharel urged local communities to respond to the challenge by reducing greenhouse gas emissions. Kharel also advocated for the ratification of the Kyoto Protocol, and suggested that communities urge their national governments to develop strategies to meet Kyoto targets. She also suggested that communities press for more standards and mechanisms for carbon trading nationally, and for local incentives for bio-fuels and solar energy. Finally, Kharel noted that in some parts of the world, communities are protecting – or even growing – local wetlands and forests to help manage unpredictable runoff and prevent flooding downstream. Brenda Lucas cited a report which called for a suite of agricultural incentives encouraging farmers to reduce sediments and pollutants, sequester greenhouse gasses, protect soil and water quality, reduce irrigation, and minimize the use of synthetic nutrients and pesticides.

Collect baseline data about water resources

In addition to mitigating climate change, many participants argued for the continued collection of baseline data about watersheds – including aquifers. Don Weir noted that only 20% of the aquifers in Canada have been characterized for vulnerability, and that it is difficult to plan effectively when planners do not know how large their reserves are, or how quickly they recharge. Brenda Lucas argued for a scientific methodology for identifying and mapping watersheds.

Monitor trends, indicators and possible hazards

Participants were also clear that ongoing monitoring – of trends, indicators, and possible hazards – is also important. Babina Kharel advocated for the use of GIS, RS and satellite imagery in efforts to monitor climate change impacts. She also argued that water, soil and air monitoring should be augmented by monitoring of indicator species including frogs, insects, lichens and rice. Finally Kharel noted that climate change can increase objective hazards in mountain areas and that local mountain communities who are at risk from hazards such as glacial lake outflow flooding should be monitored as well.

Strengthen information-sharing and collaboration

Participants also supported the creation or strengthening of global partnerships for climate change advocacy and technological exchange, as well as learning and information-sharing about water resource planning, management, and policy-making. Some participants also advocated for greater technical and financial support from the North for countries in the South - particularly for energy-efficiency projects.

But in the end, make decisions

It was generally agreed that more knowledge of watersheds, including aquifers, would make planning much easier – particularly in regions where the dearth of knowledge is so great that planning is

impossible. However, Ralf Ludwig pointed out that the "no, or little, data" problem is persistent and should not prevent action. Similarly, watershed processes are complex and therefore difficult to model. What data there is may be formalized and presented differently by different disciplines, and sometimes it seems unlikely that solutions will be found that appease all parties – but participants suggested that none of these factors should prevent communities, individuals or organizations from engaging in watershed policy and planning.

Start with a vision

Ralf Ludwig argued that the first step of the planning process is to develop a vision for what a watershed wants for its future. Without a shared vision, the work of watershed planning will not be as coordinated or as meaningful.

Use participatory approaches

Many participants argued for participatory approaches when developing a vision or plan. Including multiple stakeholders ensures that the many roles of the watershed are represented in a meaningful way, but Ralf Ludwig suggested that the participatory process also equips stakeholders with an understanding of how their actions affect others in the watershed. The relationships that are created during a participatory planning process are as important as the plan that is developed. Other participants suggested drawing on experiences from community forestry, water user groups, clean energy, and community disaster preparedness planning.

Plan and enforce on a watershed scale

Participants were also generally in agreement that watershed planning must take place at the watershed level – that is cross-jurisdictionally, even trans-nationally. Some participants also argued that watershed planning groups, or their multiple jurisdictions, should be able to restrict activities within designated well-head protection areas. Don Weir noted a recent Energy and Utilities Board decision in Alberta that imposed stricter regulations on commingled oil and gas production which can sometimes lead to groundwater contamination.

Account for changing land use patterns

As mentioned earlier, Robert Halliday suggested that changing climate and watersheds could change land use patterns, particularly in agriculture. For example, drier and warmer weather may be conducive to growing new or different crops with different water requirements. Participants agreed that it is important to take into account not only climate change, but how industry and individuals are likely to adapt.

Account for differences between highlands and lowlands

Halliday also noted that the hydrological effects of climate change and changing watersheds will be different in mountainous areas as opposed to lowland areas. He urged participants to consider carefully what these differences may be and how they may manifest themselves.

Embrace interdisciplinarity and integration

Many participants advocated for interdisciplinary or integrated science in the management of upland watersheds, and watersheds in general. Ralf Ludwig argued that solitary sciences cannot provide solutions to the complex challenges of global change. Futhermore, he argued that while different disciplines have different ways of formalizing and describing their knowledge, these differences should not stand in the way of collaboration.

It is about more than biophysical science

Participants agreed that watershed management must take into account the human dimension as well as biophysical science. Luc Vescovi suggested that governance and the cultural dimensions of watershed change are equally important, especially the conflicts of value and interest that will take place between stakeholders. This view was seconded by Subrata Mandal. Mandal argued that although climate change is influenced by energy and land use, in the South, land and energy cannot be addressed without talking about livelihoods and food security. The importance of this human dimension was raised again in the third week of discussion when Lorne Taylor argued for the fundamental importance of the political process to policy-making.

Questions to Consider

- How will scientific uncertainty affect local water policies?
- What kind of research would be most helpful to support effective adaptation?
- Who should the participants in participatory approaches be? What kind of approaches will bring these participants together?
- Are there any studies that take into account changing land use patterns while examining changing hydrological patterns at the same time?
- Will alpine regions be compelled to assume "ecosystem services" if seasonal water shortages become more serious? Should they? Can and should there be mechanisms to charge for this service? (e.g. Would agricultural areas then charge for soil fertility?) What would charging and payment mechanisms look like? Who would be in charge? Who will quantify? Who will regulate?

Case Studies & Resources

Ouranos: Consortium on Regional Climatology and Adaptation to Climate Change
http://www.ouranos.ca/

GLOWA: Global Change in the Hydrological Cycle
http://www.glowa.org/

GLOWA-Danube
http://www.glowa-danube.de/

Bruce, Jim. "Planning for Extremes: Adapting to impacts on soil and water from higher intensity rains with climate change in the Great Lakes basin," Ontario Chapter of the Soil & Water Conservation Society & The Walter & Duncan Gordon Foundation. 2006.
http://www.banffcentre.ca/mountainculture/mtnforum/econferences/rosenberg/week2.asp

Mandal, Subrata. “Planning for Climate Change, Locally: Case Study from the Nepal Himalaya,” unpublished paper. 2006.
http://www.banffcentre.ca/mountainculture/mtnforum/econferences/rosenberg/week2.asp

Himachal Pradesh Forest Sector Strategy and Policy
http://hpforest.gov.in/HP_Forest_Sector_Policy_byPAPU.pdf)

Himachal Pradesh Water Policy
http://www.hpiph.org/w.polocy/swp.pdf.

European Water Framework Directive
http://ec.europa.eu/environment/water/water-framework/index_en.html

Buried Treasure: groundwater permitting and pricing in Canada. Walter & Duncan Gordon Foundation
http://www.buriedtreasurecanada.ca

POLIS Project on Ecological Governance: Water Sustainability Project
http://www.waterdsm.org/

At a Watershed: Ecological Governance and Sustainable Water Management in Canada
http://www.waterdsm.org/PDF/AtaWatershed.pdf

Soft Path for Water in a Nutshell: a practical guide to water security in Canada
http://www.foecanada.org/PDF/nutshell_lowres_final.pdf

Keeping Water On the Land Longer
http://www.nv.blm.gov/elko/pdf/03KWoLL3b.pdf#search=%22%22Keeping%20Water%20on%20the%20Land%20Longer%22%22

Canadian Water Network
http://www.cwn-rce.ca/

Aspen Climate Change Study
http://www.agci.org/aspenStudy.html

Rough Guide to Climate Change
http://www.roughguides.com/climatechange