Rainwater harvesting is becoming a critical life-support system for rural dwellers in Ethiopia. Photo: RAIN

Addressing Climate Risks to Communities

While many large dam projects purport to enhance climate resilience, in reality, many of them threaten to decrease climate resilience, especially for the rural poor. In the case of large multipurpose dams, for instance, there are often built-in incompatibilities between generation of electricity and provision of water supply during the dry season, when water delivery is most needed. When dam operators must choose one over the other, electricity generation is almost always prioritized over water supply. Hydropower dams, if poorly operated, can also diminish or eliminate seasonal flood pulses downstream, reducing the productivity and extent of floodplain and riverbank agricultural systems, an important alternative to drought-prone rain-fed cropping practices throughout the world. Evaporation from large reservoirs further decreases water availability for downstream use.

In order to avoid undermining climate adaptation activities and a community's ability to respond to climate change, integrated river basin management should be practiced, and projects that will help vulnerable groups prepare for, withstand and recover from negative climate change impacts should be prioritized. Resilience strategies should be an integral part of research, development, planning, training, capacity building, and operation of major river development projects.

This chapter describes some of the methods of avoiding maladaptation projects, and how to address existing or future climate risks.

KEY RECOMMENDATIONS FOR CIVIL SOCIETY GROUPS

Conduct or Participate in an Options Assessment

In most cases, good alternatives to large water infrastructure projects exist. The World Commission on Dams (WCD) recommended a process to ensure development projects meet local needs while doing the least harm. To explore these alternatives, needs for water, food and energy must be assessed and objectives clearly defined. Selection of the most appropriate development response is based on a comprehensive and participatory assessment of the full range of policy, institutional and technical options. In the assessment process, social and environmental aspects are given the same significance as economic and financial factors. The options assessment process continues through all stages of planning, project development and operations.

Evaluation of options for regional energy strategies should incorporate climate assessments that measure the potential of each option to produce negative outcomes, and should rigorously address the potential for projects to lead to maladaptation or will undermine existing adaptation efforts. For regions that are both slated for new dam projects and home to existing projects, exploring opportunities for retrofitting existing dams as an alternative to constructing new infrastructure should be considered in the project selection stage.

Prioritize Integrated Planning and Policy

Civil society groups can develop small-scale integrated river-basin projects that help promote climate resilience by helping vulnerable groups prepare for, withstand and recover from the negative effects of climate change. An integrated project, for instance, could be a micro-hydro project whose water is augmented by extensive watershed protection, and which recycles water coming out from the turbines to be used on croplands.

Since climate change also adds additional risk to electricity resources planning, Integrated Resource Plans (IRP) should be used to evaluate and rank all options for delivering utility services, including all end-use efficiency and distributed generation approaches, and according to comprehensive cost-benefit analyses.

At the national level, civil society groups can push for more integrated policies that help with accomplishing multiple objectives, such as climate change adaptation and rural development and poverty alleviation. For example, the Mahatma Gandhi Rural Employment Guarantee Act (MGNREGA) in India links traditional development projects with climate adaptation work through the development of decentralized renewable energy projects. Many community members participate because they receive wages, while also growing their climate awareness.

Promote the Precautionary Principle

Civil society groups should encourage decision-makers to explicitly adopt the precautionary principle when planning new projects that might have a large environmental and/or social impact. The precautionary principle is defined as: "Where an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically. In this context, the proponent of an activity, rather than the public, should bear the burden of proof."[23] Four key components of this principle can be summarized as:

- Taking preventive action in the face of uncertainty.
- Shifting the burden of proof to the proponents of an activity. In other words, the burden of proof should rest with those who *propose* rather than those who *oppose* a particular project.
- Exploring a wide range of alternatives to possibly harmful actions.
- Increasing public participation in decision-making.

Due to the high uncertainty of climate change, this means decision-makers should move away from making projections based on best-case historical data. While moving towards a risk-based analysis framework is a positive first step, a precautionary approach moves beyond this because it accounts for more uncertainty in a changing climate.

Protect Ecosystem Services and Environmental Flows

Measures to protect ecosystem services and implement environmental flows allow river ecosystems to have enough capacity to absorb climate stressors. Comprehensive basin-wide planning should thus consider a full accounting of the values of ecosystem services supported by river flows. Community- and ecosystem-based adaptation approaches that link

Populations of freshwater species declined by 50% between 1970 and 2000.

biodiversity and ecosystem services with poverty alleviation and building community resilience to climate change must be central to any comprehensive planning efforts.[24]

Below are some examples of incorporating ecosystem service management in climate adaptation (adapted from a UNEP study):[25]

- *Recognize the multiple functions and services provided by ecosystems at all levels.* In the context of rivers, this could mean identifying all the key benefits and services that the river provides across different sectors and at both the localized, basin-wide, and – for transboundary rivers – international levels.

260 river basins are shared by two or more countries.

- *Reduce pressures on ecosystems.* For rivers, this could include reducing extractive water demands from surface and groundwater, restoring more natural river flows so that freshwater ecosystems are not vulnerable to small, climate-induced changes in runoff, and reducing other pressures such as pollution and overfishing.
- *Link ecosystems-based risk reduction with sustainable livelihoods and development.* For rivers, this could mean, for example, making the connection between income generation from fisheries and regional food security, and how an economically thriving fishery protects the region from the climate-related threats to other food sources.
- *Address risks associated with climate change and extreme events and reduce their impact on ecosystem services.* Climate change will affect the ecosystem services of rivers, for instance by reducing rainfall and thus diminishing river flow. Adaptation solutions that allow communities and local governments to address this risk while also protecting river resources, such as building small check dams to restore groundwater or restoring floodplains, can offer a more sustainable and secure approach to maintaining livelihoods.
- *Involve local stakeholders in decision-making.* This recommendation is a common theme and an underlying principle for any successful climate adaptation project.

Develop Ecosystem, Livelihood and Disaster Monitoring Systems

Accurate and timely monitoring and detection of shifts in key variables in water quality, quantity and timing are not perfect means to capture emerging trends, but they can track gradual shifts and, ideally, help anticipate tipping points.[28] Such systems need not be expensive and can be decentralized and community-led through the practice of citizen science. However, they should be standardized across the region as much as possible. Civil society groups should also affiliate themselves with an academic and/or government institution that is capable of analyzing the trends and explaining those trends to the community.

Community-level early disaster warning and evacuation plans can help river basin communities become more resilient to extreme climate variability. They can also reduce costs to governments that would otherwise have to provide relief support for the devastation brought about by extreme droughts and floods.

Opening the sluice gate on a small hydro project in Africa. Photo: Wim Klunne

Environmental Flows for Climate Adaptation

California's dammed Trinity River is now flowing more naturally, thanks to an agreement to restore environmental flows. Photo: © Conservation Lands Foundation

The most obvious change in a dammed river is the change to its flow. "Environmental flows" is a system for managing the quantity, timing and quality of water flows below a dam, with the goal of sustaining ecosystems and the human livelihoods that depend on them.[26] Environmental flows are now seen as a critical means of alleviating poverty and creating a more sustainable development path in the developing world. The scale of environmental flows is shifting, from single dams being operated in isolation to networks and portfolios of water infrastructure, managing flow regime at the basin or sub-basin levels.

Having an environmental flows plan for existing and proposed dams is especially important in a changing climate. Many dams around the world presently lack the institutional support and mechanisms needed to control water discharge for environmental flows. Pressing for national laws and regulations to require planning and implementation of environmental flows for all dams would be a good first step.

The most ecologically important aspects of a river's flow are extreme low flows, low flows, high flow pulses, small floods, and large floods. Environmental flows can be designed to restore any of these, with the goal of improving water quality, restoring sediment deposition, addressing the life-cycle needs of fish and wildlife, and restoring the livelihoods of river-based communities.[27]

Before developing an environmental flows plan, it is important to consider what the goal of these flows will be. A variety of objectives can be addressed through environmental flow management, including:

- Dam safety: Manage releases to avoid the reservoir reaching unsafe levels
- Health impacts: Manage releases to reduce the incidence of waterborne diseases
- Flood management: Avoid loss of life and reduce socio-economic impacts
- Environmental management: Provide quantity and quality of water required to maintain ecosystems and enable them to provide sustainable services and good quality water
- Dry season floodplain agriculture: Accommodate harvest period in release management, and
- Water supply: Set priorities based on economic or social considerations, including poverty alleviation

Future structures should be designed from the beginning to ensure compatibility with environmental flows releases, including adequate outflow capacity to realize a range of target outflows, multi-level intakes to allow for water releases corresponding to a range of reservoir storage levels and to improve downstream water quality, and effective passage to enable movement of sediments around dam walls. Many existing dams should be retrofitted to achieve these outcomes. (Note: fish passages are very difficult to get right, and tropical species do not generally do well with such structures.)

Challenges to Implementation

While environmental flows is an important management tool for restoring river systems and the services they provide, getting it right usually requires strong support from a variety of agencies. Many governments and river-management agencies around the world have developed environmental flows policies, yet implementation of these policies remains weak.

At the highest level, political support for environmental flows policy is essential for setting strategic direction, securing resources, working with stakeholders and enforcing the policy.

Having sufficient capabilities within the managing agencies is equally key to success. Conducting a thorough assessment and developing operational rules for environmental flows at even a single dam requires significant technical and institutional capacity. A comprehensive framework for implementation requires that relevant laws, policies and institutions be in place across a wide range of water resource management functions.

Conflicts of interest can waylay the best plans. Environmental flows may involve agencies that plan and manage hydropower, agriculture, land use, industrial development and natural resources. Conflicts of interest will intensify on transboundary rivers without a participatory water-sharing agreement process.

For more information, read *Towards Restoring Flows into the Earth's Arteries: A Primer on Environmental Flows* by Latha Anantha (River Research Center) and Parineeta Danekar (South Asia Network on Dams Rivers and People): www.internationalrivers.org/node/7508.

An example from Practical Action of an early flood risk warning system to reduce flood impacts includes:[29]

- A watch tower for villagers to scan waters rising to dangerous levels. They are able to sound a siren, which can be heard up to 3.2 km away.
- Rain/flood gauges to monitor potential risk.
- A bridge to create an escape route for the community at risk.
- Emergency shelters with toilets and clean water pumps are built on higher ground. Outside of monsoon season, the shelter can be used as a school, so the facilities can be made good use of all year round.

A depiction of an early warning system for disasters by Practical Action

An example of people-driven flood forecasting comes from River Basin Friends in India. River Basin Friends is a people's network of more than 300 organizations focused on the Ganga-Brahmaputra-Meghna basin. Official flood forecasting from the central government is often insufficient to predict impacts at the local level, and the information cannot usually reach people in vulnerable locations. So River Basin Friends began its own initiative to commence an early flood warning mechanism that reaches people all the way downstream in Bangladesh. It has more than 1,000 members of different disciplines, living in different parts of the basin, who help circulate flood forecasting messages from upstream locations to downstream locations, using phones and email. People in the central hub in Assam collect information from different sources, and the peoples' network in upstream locations process and analyze it. The final flood early-warning messages are then formulated for different vulnerable locations and disseminated.

Ensure Climate Risk Management Throughout the Entire Life Cycle

All phases of the project life cycle should have assessments of climate change risks and impacts, starting from water and energy plans and through to SEAs, SEIAs, and monitoring plans. However, these tools, along with dam-industry-developed tools like the Hydropower Sustainability Assessment Protocol (HSAP), are very stationary as currently formulated and do not give adequate consideration to climate risks. Assessments of climate risks and impacts should occur as early as possible, beginning with the selection of infrastructure alternatives, and such assessments should be done at a regional scale in order to identify trade-offs and plan for a wide range of impacts. See *Appendix 3: Table of Key Questions for Assessing Climate Risks of River Projects* for a list of questions you can ask about different categories and for all stages of the process.

Repaying a Climate Debt: Making Climate Finance Transformational

By Janet Redman, Co-Director of the Institute for Policy Studies, Washington, DC

"Climate finance" is a catch-all phrase for the money and financial services governments need to fund activities that lower their greenhouse gas emissions in order to keep the planet from reaching dangerous temperatures ("mitigation"), and the resources needed to cope with the warming that's already locked in ("adaptation"). In 2008, Nicholas Stern, author of the UK government's study of the economic costs and benefits of climate change, estimated that the cost of averting climate disaster will be 2% of global GDP per year by 2050. But Stern's calculations didn't get to the heart of one of the most contentious issues in the debate around a global climate agreement – who pays.

The UN climate convention, signed by 192 countries, gives clear directions on which countries are responsible for footing most of the bill. It states that developed countries must "provide new and additional financial resources" to developing countries to cover the cost of shifting from business-as-usual, fossil-fueled economic expansion to low-carbon development pathways. It also commits developed countries to help developing nations meet the costs of adapting to the adverse effects of climate change – a problem they did not create.

Developed countries' historical responsibility for the climate crisis is called "climate debt." Climate debt recognizes the fact that while they are home to only 20% of the world's people, wealthy industrialized countries are responsible for releasing more than three-quarters of all greenhouse gas emissions already in the atmosphere. This means that rich nations have used more than their fair share of the global carbon budget. It also means that if we are going to limit global warming, poorer countries cannot follow the same fossil-fuel-intensive development path that industrialized countries took to getting rich. There's just not enough space left in the atmosphere for all that CO_2.

So where does that leave developing countries? A growing number of developing governments and civil society groups are demanding that rich countries repay their climate debt in two ways. First, they must immediately and drastically lower their greenhouse gas emissions so that enough of the shrinking carbon pie remains for poorer nations to meet the basic needs of their people.

Second, developed nations must pay for damages already incurred from climate change, and compensate for the portion of the global carbon budget they consumed that rightfully belonged to the 80% of humanity living in the developing world. The price tag is still up for debate, but the World Bank's World Development Report 2010 pegs the cost of mitigation in developing countries at US$400 billion a year for at least the next 20 years, and adaptation at $100 billion annually in the next four decades. Environment and development NGOs have called for at least $150 billion of that to come from public finance from industrialized nations. The Group of 77 and China, a negotiating bloc currently representing 132 developing countries, is calling for the transfer of 1% of developed countries' GDP each year.

Quality, Not Just Quantity

Development experts, environmentalists and grassroots organizers from across the political spectrum are quick to point out that money alone isn't going to solve the climate crisis. The rules that govern how money flows, and what activities it supports, will in large part determine whether climate finance is truly transformational.

A climate debt approach is useful here, too, for thinking about *how* to provide climate finance. It acknowledges that the way industrialized countries grew wealthy – by exploiting and exporting natural resources out of poorer nations – actively impoverished people in the Global South. Therefore, repaying the climate debt should help undo historical harm by establishing financial rules and mechanisms that uphold developing country governments' sovereign right to determine their own low-carbon development pathways. But even beyond the national level, just and effective climate finance must support the local, democratic control of natural resources, as well as promote poverty eradication and climate-friendly development.

The good news is that lots of people from all over the planet have come up with some common principles to guide the development of fair and effective climate finance. First, any financing scheme must be democratic, transparent and accountable to all, with civil society formally represented in decision-making arrangements. Also, community-based groups (in addition to government agencies) should have direct access to funds. The Global Fund to Fight AIDS, TB and Malaria has successfully shown that when civil society cuts out the middle man (for example, the World Bank and other international financial institutions), they can better and more efficiently meet peoples' needs. In addition, a global climate finance regime must respect and protect the right of all people – particularly indigenous people and local communities – to determine their own development path, decision-making processes, and activities related to climate change.

For the full article, see:
www.internationalrivers.org/node/1731