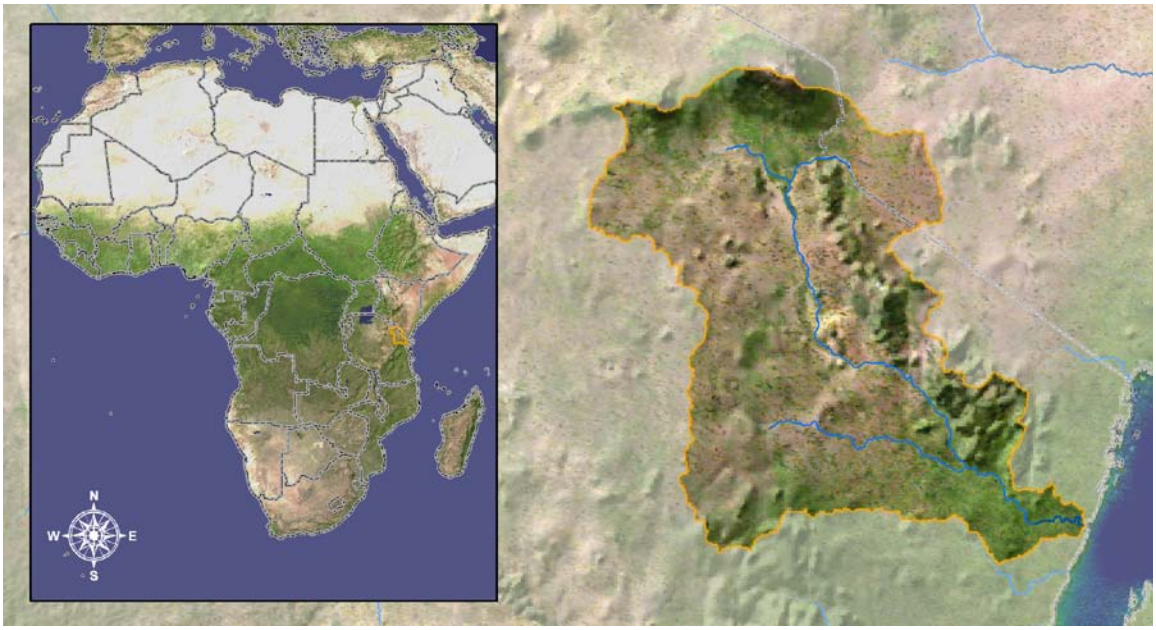

Pangani Basin Water Board, Tanzania

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Context

The Pangani River Basin in East Africa covers 44,000 square kilometers and is home to about 2.6 million people. The Pangani River begins as a series of small streams on the southern sides of Mt. Kilimanjaro and Mt. Meru and passes through the arid Masai Steppe before reaching its estuary and the Indian Ocean at the coastal town of Pangani. Along its 500 km course the Pangani River is a lifeline for biodiversity, people, and industry, and is fundamental to the economic development of the region.

The Pangani Basin is one of the most productive areas of Tanzania, and is very important to the national agriculture (both commercial and subsistence). The river is a source of drinking water for people and livestock and supports irrigated agriculture, which represents the largest water use in the basin. The Nyumba ya Mungu Reservoir is used for the generation of hydropower (8 MW), and as a fish nursery is also an important source of employment. At the coast, the Pangani Hydropower Station (68 MW) is vital to industry and the economy in the town of Pangani and along the coast. Irrigation and hydropower generation use almost 90% of the Pangani’s surface flow.

Population growth, urban growth, and the intensification of land use for agriculture have led to an overexploitation of water resources and increased the demand and competition for water among

land users, industry, and ecosystems. The increasing water stress (<1,200 m^3 per person per year) is thus a source of conflict. Small-scale users in villages often compete against larger and more powerful claims by industry. Downstream users, such as cities, industry, and hydropower companies, are negatively affected by upstream land users, such as farmers and pastoralists, who reduce the availability and quality of water.

Protected areas in the upper basin play an important role in conserving globally important biodiversity resources and help provide water to downstream users. But those areas are not enough to maintain water flow and multiple ecosystem services for the entire basin. Ecosystems such as wetlands, riverine forests, and mangroves need a minimum flow of water to provide wildlife products—including fish, plants for medicinal use, reed, timber, and fruits—and other products that are of great importance for the livelihoods of rural populations. The ecosystem services that are considered most important in the Pangani Basin are water treatment by wetlands and the estuary function as a nursery area for fish.

Climate Change

A detailed climate change modeling study for the Pangani River Basin[47] shows that climate change impacts are expected to include: 1) decrease in rainfall during the dry season (May–October); 2) increase in evapotranspiration, mostly in October, by approximately 10 mm; 3) increase in rainfall during the wet season (November–March); 4) minimum temperature increase by approximately 2°C (range of 1° to 3°C) during all months; and 5) maximum temperature increase by 1° to 3°C in July–November. The seasonality of stream flows in the Pangani is therefore likely to change because of hotter and drier periods (especially toward the end of the dry season). The magnitude of this change will vary across the sub-catchments, and its impact will depend on water extraction and the characteristics of each sub-catchment.

In addition, the previously mentioned water use conflicts are expected to increase in the future as climate change aggravates water stress.[48]

Institutional Description and Response to Climate Change

The Pangani Basin Water Board (PBWB or the Board) was established in 1991 and works in accordance with Tanzania's Water Resources Management Act of 2009. The Board is comprised of ten members drawn from public institutions, sub-catchment water committees, and private-sector water users, and it is served by a technical secretariat. Its goal is to develop a comprehensive, integrated, and holistic approach to water resources management. The PBWB

47 PWBO/IUCN. 2010. Climate change modelling for the Pangani Basin to support the IWRM planning process. Pangani River Basin Flow Assessment. Pangani Basin Water Board, Moshi and IUCN Eastern and Southern Africa Regional Programme. V+36 pp. Available at: http://cmsdata.iucn.org/downloads/climate_change_modelling_by_uct.pdf.

48 When the flows for the basin are adjusted to account for the projected changes in rainfall, the water development scenarios predict a reduction in the water available for urban demands, irrigation, and hydropower generation. They also predict reductions in flooding of the ecologically important midland swamps and fish catches and river health in general [PBWB/IUCN (2011). Pangani River System - Future of the Basin Report. Moshi, Tanzania: PBWB and Nairobi, Kenya: IUCN Eastern and Southern Africa Regional Programme. 39 pp.].

must ensure that the Pangani River is managed sustainably while economic and social welfare is improved through better water governance and integrated water resources management (IWRM) principles.

In 2002 the Ministry of Water launched a new National Water Policy (NAWAPO) that recognized the important link between a healthy environment and productive livelihoods. Water for basic human needs is given the highest priority for water allocation, followed by water for maintenance of ecosystems. Determining water requirements for the environment thus became a priority for the government.

Both NAWAPO and the 2009 Water Resources Management Act were formulated in response to the emerging situations of water stress and subsequent conflicts among water-user groups such as we have seen in the Pangani Basin. To tackle uncoordinated abstractions and climate-jeopardized water supplies, the latter amendment also provides for the establishment of water user associations (WUAs) and sub-basin and catchment water committees. Under the umbrella of the PBWB, these groups provide stakeholder participation in water resources management within the same institutional structure that governs the river basin.

Through dialogue and decentralized governance, water users have been empowered to participate in IWRM and climate change adaptation processes. Participatory forums and technical information have equipped the PBWB with the tools, knowledge, and capacity to devise an adaptive water management plan to equitably provide freshwater for the livelihoods of current and future generations as well as for the environment.

In order to implement the National Water Policy, the government has promoted environmental flow assessments that integrate how climate change might affect Tanzanian rivers over time. The Pangani River Basin Management Project (PRBMP) has been assisting the PBWB with such e-flow assessments (studies) and scenario development. Since 2005, the PBWB has undertaken a series of studies to understand water flows in the Basin through the PRBMP. Technical support has been provided by IUCN (the International Union for Conservation of Nature), SNV – Netherlands Development Organization, and a local NGO, PAMOJA, with financial assistance from the Government of Tanzania, the United Nations Development Programme/ Global Environment Facility (UNDP/GEF), the European Union, and the IUCN Water and Nature Initiative (WANI), Through this initiative the PBWB has also identified a number of scenarios (possible future development pathways for the Pangani Basin) to assess different allocation choices and how each would change the river flows from the headwaters all the way to the estuary, as well as assess how the livelihoods of the people who depend on those waters would be affected.

Discussion of Most Important Climate-Adaptive Principles

External Regime

The success or failure of mainstreaming climate change into water management often depends on whether climate change has a place in national legislation. The ability of ministries to implement and enforce these laws and to reconcile the interests of traditionally powerful sectors with the interests of the more vulnerable water users is crucial. Tanzania’s National Water Policy

and Water Resources Management Act were thus essential because they provided for the various water requirements and benefits to be equitably considered and periodically reviewed within the frame of what is actually available.

Legal frameworks and institutional mechanisms also need to be flexible and innovative to allow for information sharing on water and climate change-related issues and to build consensus around the different stakeholders’ perspectives and priorities. The PBWB was not a self-organizing institution in its own right. But after more than five years of negotiated steps and social learning, the PRBMP has contributed to a more adaptive PBWB by piloting the formation of WUAs in the Pangani Basin as per the Water Management Act. The pilots were instrumental in creating the new governance arrangements and in allowing water users to further organize in sub-catchment forums and to periodically submit their concerns or recommendations over water decisions to the Water Board. In this way, concerns at the community, WUA, district, and regional levels are all integrated into basin-level planning.

Decentralizing the negotiations over water allocations in river basin planning has proven to be key for better climate-proof water management. A diversity of stakeholders is now legitimately participating in the discovery of options and in joint action. As a result, hydrological models and climate forecasts are complemented by a participatory governance system that can dynamically respond to uncertain futures.

Creativity and Learning

The PBWB was originally not knowledgeable about environmental flows, but after technical advice and financial support from the PRBMP, a team was established, and its capacity was developed by international trainers. The Environmental Flows Assessment (EFA) was one of the most pioneering and resource-intensive components of the PRBMP. Setting out to better understand the hydrology of the river basin, the flow-related nature and functioning of the riverine ecosystem, and the links between the ecosystem and the social and economic values of the river’s resources, the EFA revealed that breaking the link with the natural infrastructure that regulates hydrological cycles would decrease the success of future adaptation to a shifting climate and water demands. The technical information generated by the EFA about the basin was then used to organize the available ecological, social, and economic data into a set of development scenarios — the many possible pathways into the future.

It was certainly a challenge to implement the 2002 National Water Policy requirement that provides for the basins to take into account environmental water allocations. But it also left some degree of autonomy with river basin boards to allow their staffs to experiment and learn by experience. In the Pangani, implementation meant demonstrating environmental flows as a tool for adaptation; this became the pivot around which to test wider IWRM solutions. Environmental flows science provided the evidence for flow management, and the flow management process in turn acted as a catalyst for the required governance reforms and institutional development.

Focus is now switching to stakeholders and the government agreeing on how to best reallocate water. Although this may seem to be a protracted process that yields no prescriptive outcomes, the chosen allocation scenario will be integrated into the basin’s water management plan, which is legally binding. A monitoring program that has been laid out as part of the plan will ensure that

the desired river state is being achieved and maintained irrespective of climate change.

Collaboration and Partnerships

Engagement of relevant stakeholders early in the process of building environmental flows and climate change decision-making tools also resulted in greater buy-in to the decisions made and created new partnerships that helped build stronger water management institutions. The new alliances thus created between water managers, policy makers, community members, and scientists provide a means of jointly solving watershed management challenges at a sufficiently large scale to avoid unintended trade-offs in water benefits.

The PBWB and IUCN are also collaborating with the Climate Change and Development Project and the Global Water Initiative to identify and implement adaptation strategies in the Pangani Basin. Climate change vulnerability assessments have been carried out in eight different villages, from which a list of adaptation actions were identified, ranked by the communities, and implemented. Once again through hands-on learning, the adaptive capacity of the PBWB and other country institutions has been strengthened as technical staff analyzed the vulnerability assessment information gathered during community consultations and knowledge about the basin’s vulnerability was disseminated among water users.

Increasing information about possible future climate change scenarios has brought the water and climate change sectors together. There is now a better understanding of the environmental, economic, and social implications of different river flow scenarios under possible future climatic conditions, along with an increased capacity to collect and analyze such information. The water sector’s vulnerability to climate change is now better understood by those at risk. Pilot actions are bridging the gaps between basin- and national-level processes. And, perhaps most important, the lessons learned from establishing WUAs and the sub-catchment forums in the Pangani are being scaled up to strengthen national support and inform other communities, basins, and countries.