FACT SHEET

Building climate adaptation capacity in water resources planning: 'Ríos del páramo al valle, por urbes y campiñas'

Geographical focus:	Colombia, with broader relevance to Latin America
Partners:	Grupo de Investigación en Ecología, Ingeniería y Sociedad (EIS); Grupo de Investigación Desarrollo y Estudio del Recurso Hídrico y Ambiente (CIDERA); Instituto de Investigación y Desarrollo en Abastecimiento de Agua, Saneamiento Ambiental y Conservación del Recurso Hídrico (CINARA); Universidad Tecnológica de Pereira (UTP); Universidad del Quindío (UQ), and Universidad del Valle (UniValle); Grupo de Investigación Aguas y Aguas de Pereira
Funder:	U.S. Agency for International Development (USAID)
Duration:	2012-2015

This project, implemented through a $1.5 million cooperative agreement, aims to support Colombia's national climate change response system by strengthening the capacity for adaptation in water resources management in the country's coffee-growing region and other areas. The subtitle, "Ríos del páramo al valle, por urbes y campiñas" (rivers from the páramo to the valley, through cities and countryside), reflects the special attention to be paid to the role of delicate high-elevation ecosystems in the region's water supplies.

The páramo, alpine moorland found at elevations of 3,000 to 5,000 meters above sea level, is where many of the rivers that feed Colombia's coffee-growing region (Eje Cafetero) originate, and its hydrologic importance is increasingly recognized: it plays a crucial role regulating the timing and supply of water.

Downstream, agriculture is widespread, mainly growing coffee, and mid-size cities are also thriving – and demanding a growing share of the water that flows from the mountains. As climate change alters precipitation and temperatures, affecting both the páramo and the valleys below, it is important for water resources planners to fully understand the climatic, ecological, economic, and social factors at play and to explore adaptation strategies.

Connecting with key actors

Water resources in Colombia are managed by *Corporaciones Autónomas Regionales* (CARs) that are responsible for water allocation, pollution mitigation and ecosystem and watershed management. Their work is challenging and complex, and requires coordinating with multiple actors and constituencies with different degrees of knowledge and influence, operating in different realms: from government and business offices, to small farms, to the highlands. Conditions are also constantly evolving.

This project will provide the CARs with systems and tools that will enable them to effectively manage this complexity while adapting to climate effects. This will allow for more effective and inclusive water resource management, and support better-informed decisions about water allocation, infrastructure investments, and adaptation strategies.

View of Pereira and Dosquebradas © Marisa Escobar, SEI

Specifically, this project involves building applications of SEI's Water Evaluation and Planning (WEAP) for the Río La Vieja and Alto Magdalena watersheds, drawing on water supply and demand data, climate change models, and insights gained through engagement with stakeholders. SEI will also work to strengthen local institutions and build local capacity to use and continue to update the WEAP models.

Project components

Río La Vieja Climate Capacity-Building in CARs

SEI will work with three CARs that share jurisdiction over the Río La Vieja watershed: Corporación Autónoma Regional de Risaralda (CARDER), Corporación Autónoma Regional del Quindío (CRQ), and Corporación Autónoma Regional del Valle del Cauca (CVC), supported by three research centers in the region: EIS, CIDERA and CINARA (see details on p.1).

SEI will lead workshops and guide model development. EIS will be in charge of modeling the hydrology of the upper headwaters of the Río Otún watershed, the water distribution system in the city of Pereira, and wastewater discharge to the Río Consota. CINARA will model water quality from wastewater discharges from the city of Pereira to the city of Cartago, which corresponds to the jurisdiction of CVC. CIDERA will create a model structure for Río La Vieja that integrates the hydrologic and water quality models produced by the other two research centers.

Model contextualization workshops in Armenia © Marisa Escobar, SEI

Huila-Alto Magdalena Climate Action Plan

Through this component SEI will develop and deploy an analytical toolkit to support consideration of adaptation opportunities related to water management in the Huila 2050 Climate Action Plan led by the local CAR, the Corporación Autónoma Regional del Alto Magdalena (CAM). This work will follow a process that SEI has used to support climate-informed water resources decision-making elsewhere in South America, most notably in La Paz and El Alto, Bolivia.

The process includes two phases: preparation and investigation. The preparation phase aims to ensure that all key stakeholder groups and decision-makers have a say in formulating the problem. SEI will apply the RAND Corporation's XLRM framework (eXogenous uncertainties, policy Levers, Relationships and Measures) for robust decision-making to identify key uncertainties, potential water resource management strategies and investments, and metrics by which to judge the success of the approaches chosen.

Then the WEAP model will be built, aiming to incorporate all the factors identified in the first step, including the best available data on projected climate change impacts as well as key non-climate variables such as population growth, per capita water consumption, and regional economic development. These factors are combined with different climate trajectories to produce a set of future scenarios.

The second phase begins with a series of model runs to show the outcomes of each of several potential water resource management strategies under each of the future scenarios. The ensemble of model runs will produce a large database of results across many dimensions of performance (e.g. demand satisfaction, reservoir storage levels, hydropower generation, regional economic output).

The results will then be evaluated using the measures identified in phase one, to find the options that are most robust under different scenarios. Since this is an iterative process, it is expected that the CARs will then take over and continue to use the model indefinitely, with support from the knowledge providers involved.

Magdalena-Cauca Basin Adaptation Planning

A WEAP model is being built for the Magdalena-Cauca watershed, and as part of the project, several enhancements will be made to WEAP to will allow for a more powerful application of the model:

- **Different spatial scale model articulation:** WEAP will be upgraded to allow multiple instances of the software to run simultaneously and dynamically pass information to one another. This would allow, for example, a WEAP model of the Alto Magdalena (Huila), with a high level of temporal and spatial resolution, to pass information on outflows to a larger Magdalena-scale model, and receive management objectives and regulatory drivers from a coarser application of WEAP for the entire Río Magdalena system.

- **Floodplain functionality:** A new functionality in WEAP will allow for floodplain inundation to be characterized as a function of flows through time along a river network, with potentially other explanatory variables.

- **Ecological Limits of Hydrologic Alteration:** We will build a link between WEAP and the Indicators of Hydrologic Alteration (IHA) software developed by the Nature Conservancy as part of its Ecological Limits of Hydrologic Alternation (ELOHA) framework.

The local-scale work in La Vieja and Huila to explore climate adaptation options for water resources management will inform the basin-scale Magdalena-Cauca system. The WEAP enhancements will allow this integration and feedback to understand the cumulative effect of adaptation actions taken locally on basin-scale adaptation to climate change. Participation of key actors in the process will provide knowledge to continue the identification of robust adaptive decisions under future uncertainty.

Measuring the project's impact

The project includes a performance management plan using SEI's internal PMEC (Planning, Monitoring, Evaluation and Communication) system, which is based on outcome mapping. PMEC begins by identifying boundary partners and goals, strategies and communications plans specific to each set of partners. Progress is then regularly monitored and evaluated against agreed-upon milestones and measures of success. In addition, this project will be evaluated through USAID/Colombia's MONITOR system, against two specific goals: to strengthen environmental governance in Colombia, and to improve climate change mitigation and adaptation in Colombia.

For project updates, see:
http://www.sei-international.org/projects?prid=1965

Published by:
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2013
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