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RIOS: Resource Investment Optimization System

A tool for water funds design

Questions Answered with RIOS

- What set of investments will give the greatest returns towards multiple objectives?
- How much improvement in objectives can we expect from making the set of investments identified through a scientific analysis?
- How much better are the estimated returns than what we would have achieved under 'business as usual' investments?

Water is one of the scarcest resources on the planet, and pressures will only grow as the human population expands and climate changes. Latin America is making a major effort to address this issue through development of a new conservation financing mechanism known as water funds. The goal of these funds is to improve the management of watersheds, the green infrastructure that supplies, regulates, and cleans water.

There has been a lot of experience in developing and investing in water funds in Latin America. These exciting developments have opened up many new possibilities for investments in ecosystem services, but are also presenting new challenges for providing guidance, using resources efficiently, and ensuring that investment decisions are based on a unified, science-driven approach.

The rapid expansion of water funds in Latin America has presented some challenges for The Nature Conservancy and its partners who are trying to make the most of a potentially great tool for bringing nature's value into the real economy. These challenges hinge around four tough questions: How can water funds get the biggest return on investment for both ecosystems and people? What science can be brought into play fast enough and with small enough data and capacity requirements to be useful? Can one scientific approach work for all funds, or do we have to start over each time? And above all else, do water funds actually work?

Luckily, there has been a lot of experience in developing and investing in water funds in Latin America. In a recent workshop in the Dominican Republic, a group of practitioners and scientists found that their experiences aligned around the need to be able to answer these investment questions with a rigorous, yet flexible, return on investment approach. The Natural Capital Project (NatCap) and the Latin America Water Funds Platform (a partnership among TNC, the Inter-American Development Bank, GEF and FEMSA) are collecting lessons learned and best practices from across the region to answer these questions and turn that experience into a standardized, science-based approach to designing water fund investments.

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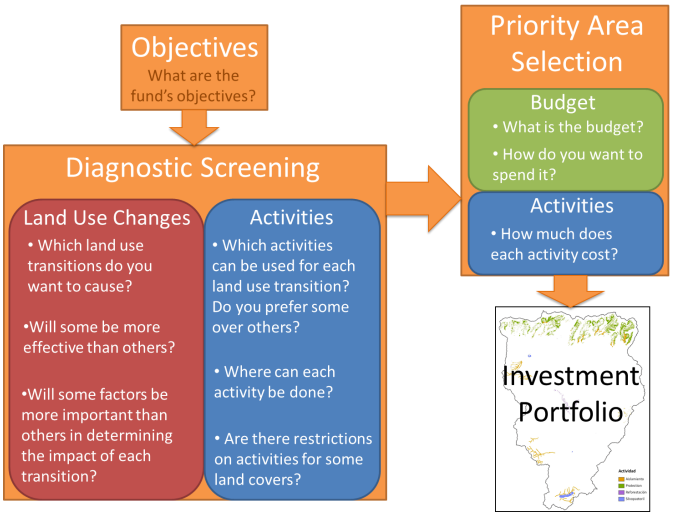
LATIN AMERICAN WATER FUNDS PARTNERSHIP

The Nature Conservancy Protecting nature. Preserving life.

FUNDACIÓN FEMSA

IDB Water and Sanitation Initiative

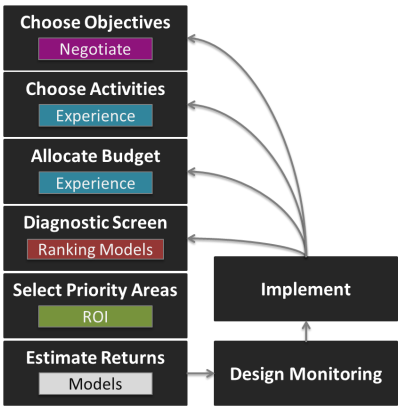


User's view of RIOS. The tool connects 5 core components to create investment portfolios. Each question in the diagram is answered through a data input

Tentatively named RIOS (Resource Investment Optimization System), this tool will standardize water fund investment design and provide water fund managers with answers to three core questions: (1) What set of investments will give the greatest returns towards multiple objectives? (2) How much improvement in objectives can we expect from making the set of investments identified through a scientific analysis? and (3) How much better are the estimated returns than what we would have achieved under 'business as usual' investments?

The tool has been designed by a team of scientists, practitioners and managers through an iterative, field -tested process. The core basis of RIOS is a multi-objective return on investment analysis. Sounds fancy, but it actually works with pretty minimal data that we've been able to find so far at water funds in Mexico, Guatemala, Panama, Colombia, Ecuador, Brazil, and Peru.

How does it work?



A generalized approach for water fund design and implementation. Many different tools can be used to inform each step. RIOS aids with the Diagnostic Screen, Select Priority Areas, and Estimate Returns steps of the process.

RIOS uses biophysical data (i.e. topography, soils, and land uses) and simple representations of demand (i.e. where are the people that depend on the resource?) to identify places where activities like protection or restoration are likely to give the biggest returns for water fund objectives. Water funds are usually trying to get *a lot* for their money including improvements in terrestrial and/or freshwater biodiversity as well as a long list of water-related benefits. RIOS can't do all of this now, but it can identify the best places to invest for some of the most desired water benefits: water quality purification (nutrients and sediments), reservoir maintenance, flood mitigation and groundwater recharge.

RIOS uses a relative ranking approach to identify the areas of high potential impact. Users can add other information about stakeholder preferences, legal limitations on where activities can occur, locations of security concerns and so on. Together, these give a view of where investments will be both beneficial and feasible.

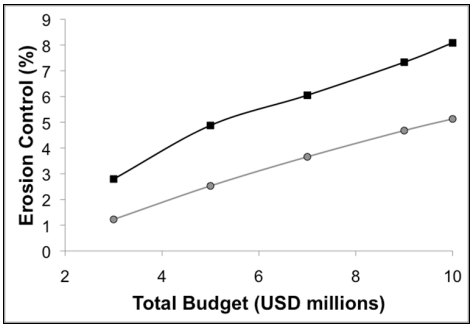
Using data on activity costs and budget levels provided by users, RIOS calculates a relative return on investment (ROI) score for each activity across the water fund area. Investment areas are chosen based on the ROI score until the fund's money runs out. The tool also gives people the flexibility to specify that all or a portion of the budget is pre-allocated to certain activities or priority areas, and to design a sequence of investments across several years.

To answer the next question - how much return can I expect from my investments? - RIOS uses the suite of InVEST models (Integrated Valuation of Environmental Services and Tradeoffs). These models estimate the actual change in ecosystem services and their values if the portfolio were implemented as designed. If the fund has a quantitative goal, like reducing water pollution by 10%, the tool will show whether the budget they are proposing is big enough to meet that goal, and get a sense of the trade-offs between conflicting priorities. These estimates of returns can be tested over time as monitoring data reveal what real returns accrue.

How it works (*continued*)

Finally, the 'business as usual' approach to investments is when water funds are spent in a more ad-hoc way that is driven mostly by logistics, social or political concerns, or other non-biophysical criteria. In its final form, the tool will compare returns on investment for a RIOS-designed portfolio to returns from a more ad-hoc investment approach, giving a sense of how much the science improves investment returns.

Although RIOS and the InVEST models make use of biophysical data, the focus on flexibility and using only widely available data means that the tool has some limitations when it comes to applying the results at very fine scales. Users have expressed an interest in incorporating the results from more complex biophysical models into the RIOS portfolio selection, so that if a water fund has access to highly detailed physical models and the data necessary to run them, the tool could overcome some of the limitations of generalized data. This type of integration is being explored for future releases.



Example of RIOS output showing the investment returns for erosion control using the RIOS approach (black line) versus the business as usual strategy (grey line).

Generalized, flexible tool for a regional approach

From concept to design, RIOS was created with the vision of improving returns from conservation investments, presenting scientific information in a way that is useful for managers, and being flexible enough to be applied in many different environmental, social, and legal contexts. None of this is very helpful if there isn't anyone to use RIOS. Luckily, the enabling conditions being developed by the Water Funds Platform gives us a real opportunity to take what has been one-off, site-based work on water funds to the continental scale.

To date, the RIOS and InVEST tools have been tested in several water funds in Latin America. The goal is to provide a set of tools that can be applied to all funds within the Platform, providing a standardized approach to water fund design and investment prioritization. In addition, NatCap's intent is that these tools will be widely applicable in other contexts throughout the world, and they are currently working with partners in many regions to ensure that the tool will be useful globally.

WF NAME	COUNTRY	STAGE
La Paz	Bolivia	1. Design
Paraiba do Sul Watershed	Brazil	1. Design
Piripitapu Watershed / Brasília	Brazil	1. Design
Taquaruçu Watershed / Palmas	Brazil	1. Design
Camboriú Watershed	Brazil	1. Design
São Paulo State PES Program	Brazil	1. Design
Rio de Janeiro PES State Program	Brazil	1. Design
Parana PES State Program	Brazil	1. Design
Feio Watershed / Patrocinio	Brazil	1. Design
Upper Tietê Watershed / São Paulo	Brazil	1. Design
São Lourenço Watershed / Pantanal	Brazil	1. Design
Santa Catarina State PES Program	Brazil	1. Design
Espirito Santo PES State Program	Brazil	2. Created
Guandu Watershed / Rio de Janeiro	Brazil	2. Created
PCJ Watershed (Cantareira System)/ São Paulo	Brazil	2. Created
Minas Gerais PES State Program	Brazil	2. Created
Santiago/Valparaiso	Chile	1. Design
Sierra Nevada de Santa Marta - Valledupar	Colombia	0. Evaluating Potential
Manizales	Colombia	0. Evaluating Potential
Cali	Colombia	0. Evaluating Potential
Cartagena	Colombia	1. Design
Medellin	Colombia	1. Design
Barranquilla	Colombia	1. Design
Bogota	Colombia	2. Created
Valle del Cauca (APLV)	Colombia	2. Created
Terraba	Costa Rica	0. Evaluating Potential
Santo Domingo	Dominican Republic	0. Evaluating Potential
Yuna	Dominican Republic	0. Evaluating Potential
Rio Yaque del Norte	Dominican Republic	1. Design
Guayas/Guayaquil	Ecuador	0. Evaluating Potential
Expindola Water Fund- Amaluza	Ecuador	0. Evaluating Potential
Ayampe / Puerto Lopez	Ecuador	1. Design
PROCUENCAS- Zamora	Ecuador	2. Created
Tungurahua/ Ambato	Ecuador	2. Created
FONAPA- Cuenca- Azogues	Ecuador	2. Created
FONAG- Quito	Ecuador	3. Mature
Guatemala City	Guatemala	0. Evaluating Potential
Tegucigalpa/ la Tigra	Honduras	0. Evaluating Potential
Rivera Maya	Mexico	0. Evaluating Potential
Monterrey	Mexico	1. Design
Cuencas de la Sierra Madre de Chiapas	Mexico	2. Created
Chagres	Panama	0. Evaluating Potential
Siraola	Panama	1. Design
Arequipa	Peru	1. Design
Piura	Peru	1. Design
Trujillo	Peru	1. Design
AQUAFONDO - Lima	Peru	2. Created
Mérida	Venezuela	0. Evaluating Potential

Development of RIOS and the preparation of this material was financed through grants from the Gordon and Betty Moore Foundation.