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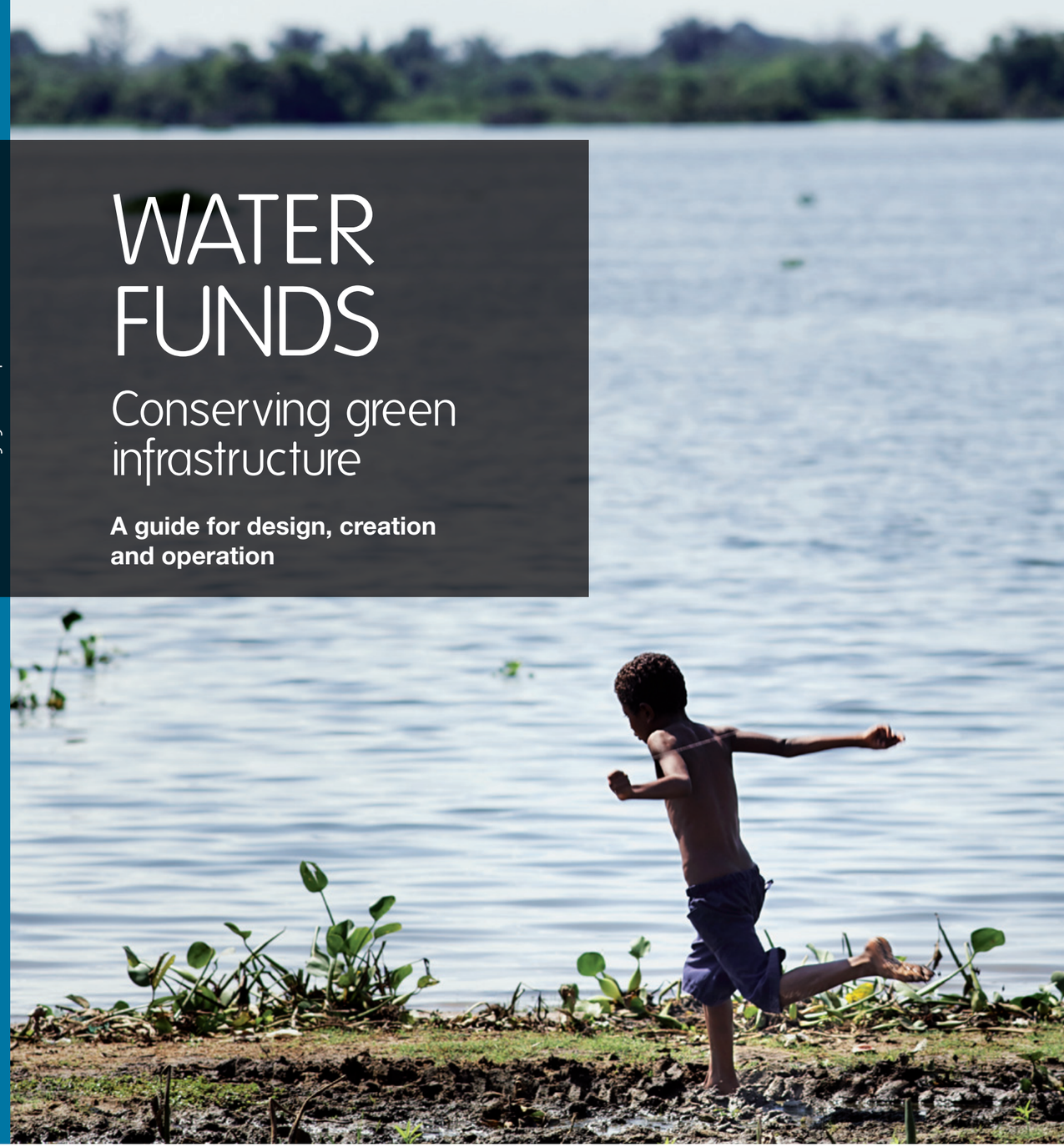
Conserving green infrastructure

A guide for design, creation and operation



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A GUİDE FOR DESİGN, CREATİON AND OPERATİON

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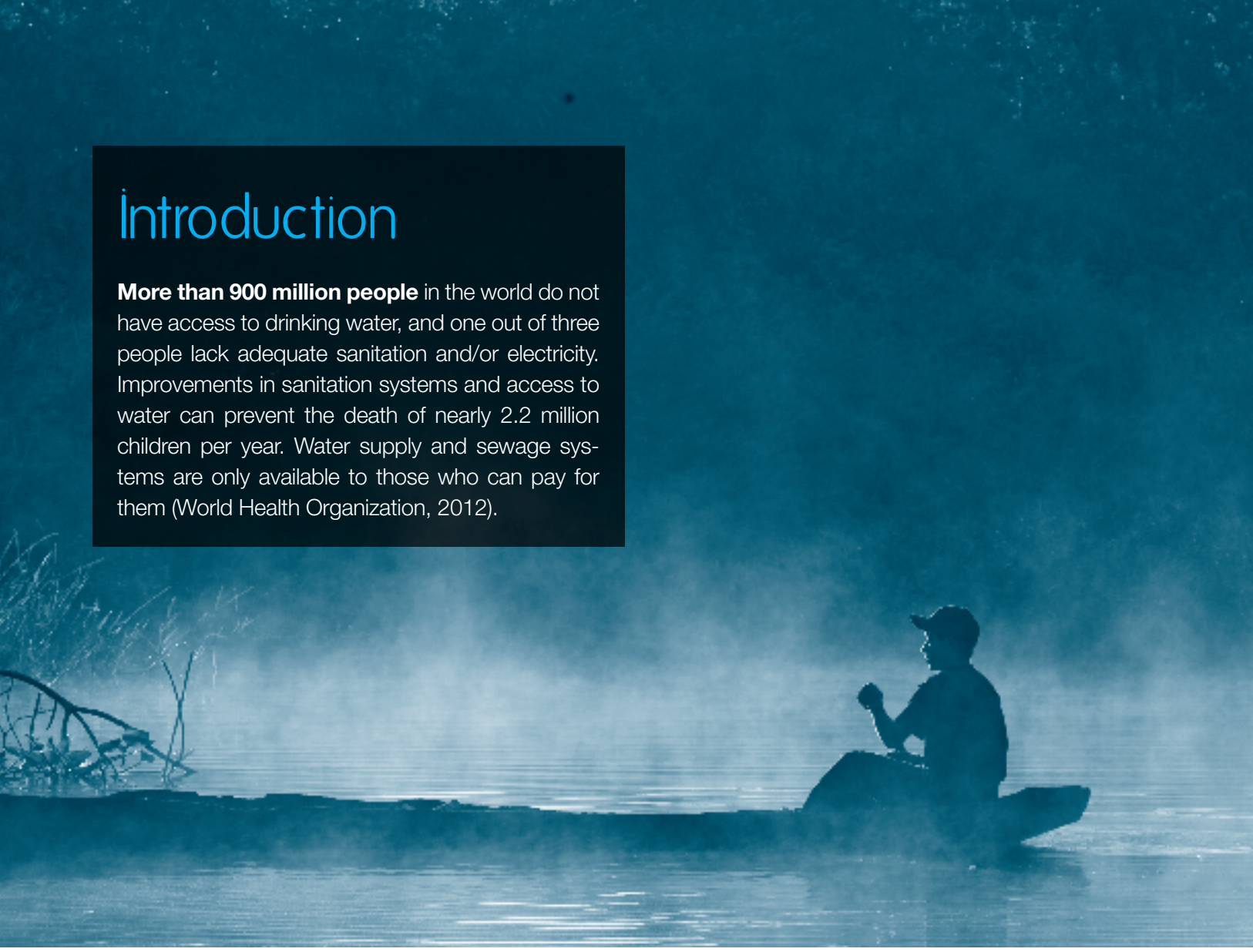
Introduction

More than 900 million people in the world do not have access to drinking water, and one out of three people lack adequate sanitation and/or electricity. Improvements in sanitation systems and access to water can prevent the death of nearly 2.2 million children per year. Water supply and sewage systems are only available to those who can pay for them (World Health Organization, 2012).



Development and climate change are causing stress on all natural ecosystems. The most threatened are freshwater ecosystems, which consist of the diverse communities of species found in lakes, rivers and wetlands. Although these cover a small portion of the planet's surface, when viewed from an acre-by-acre perspective, they are richer in species than the most expansive terrestrial and marine ecosystems (Revenga and Mock, 1999). These freshwater ecosystems, however, have lost a greater number of species than terrestrial or marine ecosystems. This is due mainly to an increase in threats from construction of dams, water extraction, overfishing, and extraction of materials, pollution, deforestation and the presence of invasive species (millennium Ecosystem Assessment, 2005). Climate change brings greater challenges with the associated alterations in annual precipitation patterns, which result not only in natural disasters but also in human and economic losses that many developed and developing countries have had to face in the last few years.

The increase in degradation and changes in land use are causing irreversible transformations in our green infrastructure and the environmental, or ecosystem services linked to these ecosystems. Wetlands store runoff, recharge aquifers and digest organic residues, while forests provide shade to rivers and streams and prevent erosion. In the absence of this green infrastructure, businesses and large water users in lower areas, such as water utilities, hydropower plants and irrigation districts, may incur significant increases of expenses in water treatment, dredging costs and other investments to replace the water catchment infrastructure.

While the evidence suggests that it is more cost effective to protect than to mitigate, watershed management costs have not been taken into consideration when calculating the costs of water supply. This is a phenomenon that occurs repeatedly all over the world. Even more surprising, these costs have not been compared to the operational expenses of water treatment or the costs of investing in new infrastructure. In light of recent evidence of a diminishing water supply and its associated risks, companies and aqueduct managers now understand the issue and view water in a different way — as a high-value good that is produced, sold and consumed and therefore requires investment.

There is an urgent need to be able to replicate these experiences and create financial mechanisms that offer users, in the lower areas of a watershed, the opportunity to become proactively involved in conserving the high and medium altitude zones of the watershed. Although there have been many watershed investment and management efforts, few of them create a direct link with the protected areas and private properties that generate water environmental services. In the case of Colombia, 50% of its citizens receive water from public protected areas, but due to market and institutional gaps, these areas do not receive enough funding for their effective conservation [3].

Cities like New York have decided to make large investments in watershed management to protect water quality instead of investing in water treatment plants [1]. In a similar manner, the city of Bogota is receiving the benefits of the investments it has started to make in watershed conservation. Experts at The Nature Conservancy - TNC- and CIAT estimate that in four years the city could save approximately approximately $4.5 million that it currently spends in sediment removal [2].

Similarly, the communities and private land owners that ensure water supply are not compensated by consumers in the lower basin.

Because it is more cost effective to compensate farmers to improve agriculture and livestock practices, to set aside areas for regeneration and restoration for conservation and to guarantee the effective management of public protected areas-, TNC and its local partners have established financial mechanisms for more than a decade that protect biodiversity while conserving the supply of drinking water.

Water Funds are an innovative way of paying and compensating for the services that nature provides to humans. They attract capital contributions from large water users such as water supply companies, hydropower plants, irrigation districts and agricultural associations, among others, in an organized and transparent manner, adequately investing these resources to maximize their return on investment. The funds are invested in the financial market through trust funds, and the financial returns are invested to leverage public and private funds to conserve the watershed, to create or strengthen public protected areas, to pay for conservation easements, to obtain financial and technical support to promote more eco-friendly agriculture and livestock systems that improve productivity, and to develop community initiatives.

1. Information provided by Al Appleton, Former Environment Commissioner in the city of New York.
2. CIAT, Análisis de oportunidades de inversión en conservación por ahorros en tratamiento de aguas. Bogota, 2007. Hired by EAAB, TNC, Patrimonio Natural, Parques Nacionales.
3 Fedesarrollo and Universidad de Los Andes, Valoración de los Beneficios Económicos Provistos por el Sistema de Parques Nacionales Naturales: Una Aplicación del Análisis de Transferencia de Beneficios, 2005.

These projects must be aimed at directly improving environmental services for the watershed, such as sediment retention, water quality and flow, to which water users have assigned a high priority. The aggregated environmental impacts of water funds can help conserve biological diversity at a landscape or ecosystem scale, and they can also contribute to preventing or reducing the negative impacts of natural disasters caused by intense rain or prolonged droughts.

Water funds are part of TNC's major strategy to conserve large rivers around the world, specially seeking to protect high mountain headwaters. However, new initiatives are also being tested to promote water funds for the conservation of marine coastal lagoons.

One of the most successful and well-known examples is the Fund for Water Protection, FONAG, also known as the Quito Water Fund. This public-private mechanism was established in 2000 with a modest investment of $21,000 and now has capital of more than $9 million that pays for watershed conservation projects and programs that provide water to Quito. Resources are invested in supporting four protected areas (Cayambe-Coca, Antisana, Cotopaxi, and Ilinizas), co-funding park rangers from local adjacent communities, improving agricultural practices and developing community projects. FONAG publishes annual public reports and carries out permanent audits to guarantee the mechanism's professionalism, efficacy and transparency. This builds trust and pride among investors, beneficiaries and contributors to the Fund.

Based on this experience, TNC and its local partners are replicating and improving the model in other regions within Latin America, including Bolivia, Brazil, Colombia, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Peru and the Dominican Republic. There are currently 12 water funds, eight of them already operating with a technical secretariat, trust fund, seed fund, and investments in the watersheds. The other four are in the feasibility analysis phase and negotiating seed funds with partners.

In addition, TNC is exporting the model to other locations with examples that have made great progress in the United States, Africa and Australia. The strategy is being adapted to different geographic features such as dry forests, tropical forests and coastal lagoons, and involve multiple stakeholders from hydropower plants to agricultural and livestock associations, and from large corporations to small farmers.

This manual is an effort by TNC to compile, analyze and synthesize its own experience, together with that of the water funds already in existence and under creation, in order to provide operational guidelines to people and organizations interested in establishing a water fund or similar mechanism. Each location has different ecological, social, economic, legal and institutional features and, therefore, each water fund will have its own characteristics, phases and projections. This manual presents general guidelines and logical steps that must be followed to boost the opportunities and benefits of a water fund and to minimize possible obstacles for its creation. It is not intended to be an in-depth look at every aspect of water funds. Although TNC participates in several other initiatives and similar approaches to watershed management, such as the water producers program in Brazil, this document will not address those initiatives and will only focus on the water funds scheme, placing greater emphasis on experiences in the Andean region.

1. This manual has been organized in the same way a water fund would be structured and created. Chapter 1 explains how to get started and how to identify if a water fund is a good mechanism to solve a watershed management issue. Are there any environmental services related to a user's group with a current or potential use conflict?

2. Chapter 2 covers the research necessary to analyze the viability of creating a water fund and identify the most sensitive variables that influence any decisions.

3. Chapter 3 elaborates on the design phase and provides guidelines for the negotiation and legal establishment of a water fund.

4-6. Finally, Chapters 4, 5 and 6 cover how to initiate activities, develop investment plans, implement projects, and evaluate and monitor the funds.

We hope this manual will be useful to people interested in creating water funds or similar watershed management and protection mechanisms and that it will help conserve environmental services vital for human development and preserving life on our planet.

Background

The adequate management of water resources has become a global priority. It is generally acknowledged that the quality and flow of water are being affected by land use changes, urban expansion and climate change.

Natural ecosystems provide direct benefits to humans such as water quality control, hydrologic regulation and sediments retention. High-Andean forests and páramos, for example, help maintain a constant, good quality water supply. For many people, the loss of these ecosystems results in phenomena that range from flooding to desertification and soil aridity, causing a dramatic loss of water quality (Dudley and Stolton, 2005). Forests and páramos conserved in high Andean watersheds generally supply better quality water compared to alternative land uses such as agriculture, industry and human settlements, since these produce more pollutants that enter the headwaters of rivers. Forests and other vegetation also help control soil erosion and reduce the sediments load. Thus, the influence of forests on water quality and their cost effectiveness is clear and generally accepted. Treatment costs to produce drinking water depend on the conservation status of watersheds. As a result, natural forests are being protected by environmental authorities, local governments and private or community stakeholders in order to maintain a high-quality water supply.

There is not enough investment, however, to ensure the conservation of natural ecosystems that provide these important services to humans under current conditions. Protected areas are good examples, since most of them do not have enough funds to cover their management and conservation costs. Only a few protected areas are financially self-sufficient, while the majority of them still face large financial deficits. Low levels of investment in conservation, insufficient capacity of technical personnel to prepare funding strategies and the lack of participation of key public and private stakeholders are increasingly undermining conservation efforts. In addition, many countries lack adequate legal frameworks to guarantee investment resources for protected areas.

Although there are several resource and watershed protection initiatives, thanks to some national policies, support from technical and economic international assistance or internationally funded infrastructure projects, these efforts are not directly linked to protected areas, which are the source of a large number of environmental services for the region. A significant volume of drinking water consumed in cities comes from protected areas.

According to a study carried out by the UNDP and TNC, in 2008, Ecuador's national protected areas system showed a deficit of $2.7 million, while Colombia's deficit for the same year reached $4.9 million (PNUD and TNC, 2008).

A study funded by the Universidad de los Andes and Fedesarrollo (Carriazo & Ibáñez, 2003) shows that 31% of the Colombian population obtains water directly from protected areas and more than 50% does so indirectly. This study also mentions that Colombian protected areas contain close to 20% of water resources that supply the country's electricity. In the case of Venezuela, a similar study shows that water originating in 18 national parks supplies 83% of the country's population living in large urban centers (Cartaya, 2007). Other sectors, such as hydropower, also greatly depend on protected areas. In Peru, 60.81% of water used to generate electricity is sourced from protected areas (Leon Morales, 2007). The paradox is that in most countries the level of investment in conserving water sources is minimal and does not guarantee the supply of the resource (Echavarría, 2007).

Areas with a good conservation status have a positive impact on environmental services, and the opposite is true for those areas that are not well conserved. A study carried out for the watersheds that supply Bogota (CIAT, 2007) revealed that in Chingaza National Park, which pro-

vides more than 80% of water for human consumption to the city, there are significant differences with regards to sediment, depending on how well the area where water is obtained is conserved. According to the data from these studies, for a similar level of water production, sediment loads can vary between 4 and 46 cubic meters per hectare per year depending on the conservation measures applied. For example, sediment loads vary greatly between an area within the park where conservation measures are in place and an area outside the park, such as some of the buffer zones, where agriculture and cattle grazing activities occur.

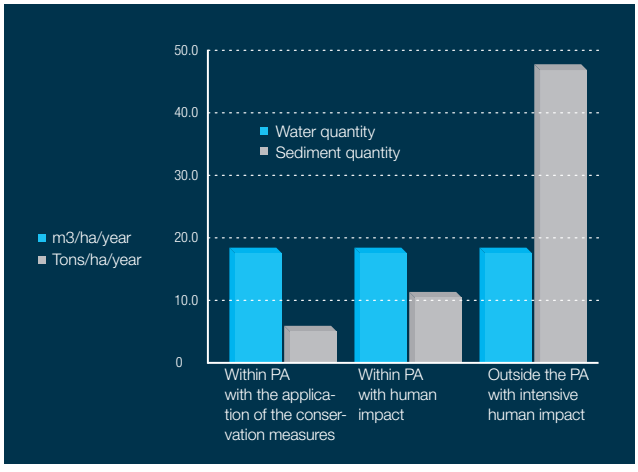


Figure 1. Water and sediments produced in Chingaza, Colombia. Bogota Water Fund. • *Source: CIAT, 2007, Study hired by TNC, Bogota Water Company (EAAB) Patrimonio Natural & Parques Nacionales.*

Similarly, the pollution of water sources results in additional costs linked to health problems of people living in the area. Water sources in bad condition are generally associated with pollutants generated by agriculture, industry, residual water and activities such as mining that cause serious health problems. These could be avoided with adequate watershed management that guarantees good quality water.

For large water users, such as urban water supply companies, this is an advantage reflected in cost structure: improving water quality would result in a reduction in treatment costs to supply cities. In large urban centers, these costs can represent huge amounts of money that exceed the conservation investments necessary to keep watershed ecosystems in good condition. Instead of incurring annual expenses for filters, energy to remove sediments, chemicals to purify water or new treatment plants (gray infrastructure), it is more efficient and beneficial to invest in watershed management (green infrastructure). Similarly, hydropower plants suffer the reduction of the useful life of their turbines and the need to spend money on new investments and recurring costs as a result of sediment accumulation and silting of dams, a situation that could be avoided if adequate investments in green infrastructure were made in the watersheds.

Today, local authorities and governments in many places are looking for ways to improve water sources by changing watershed management practices instead of investing large amounts of money in water treatment. Cities like New York have decided to make large-scale investments in ecosystem management in the Catskills Mountains to ensure a high quality water supply in the city, as opposed to investing in treatment plants and sewage systems. The reason behind this decision is the great cost difference between both alternatives. Thanks to an adequate management of the supplying watershed, efficient conservation investments, adaptive planning processes, clear objectives and vertical integration among different public agencies, the city has saved nearly $1 billion by delaying the construction of a filtering plant and increasing sewage system capacity at peak times (Appleton, 2000).

Likewise, in Andean urban and rural areas, increasing concern over water availability has brought about public and private interest in the sustainable management of water resources. İn some Latin-American cities, innovative tools for the integrated management of hydrologic resources have been designed and implemented. Among these long term tools, water funds are financial mechanisms constituted with contributions from the public and private sector and international cooperation, with financial and administrative autonomy and specific objectives to conserve water and protect ecosystems the ensure the water provision. These tools have proven advantages in comparison to other watershed management mechanisms. Most significant strengths are:

İntegrated Watershed Management Approach

These mechanisms allow meet several consumers under an integrated management vision. Water funds are formed by a diversity of resource users such a water supply companies, hydropower producers, water bottling companies, conservation organizations and international cooperation. This mechanism breaks with traditional water sector management schemes by promoting the participation of different consumers with an integrated vision and management. The common link is the intention to ensure the supply of environmental services from a healthy watershed.

Long-Term Conservation

In order to achieve an impact on water conservation and watershed management, it is necessary to establish a long-term work plan. Water funds are created to sustain investment in watersheds into the future. The capitalization funds created have the principal objective of providing sustained funds through returns on capital. These funds, such as the FONAG, can be in operation for as long as 80 years, allowing long-term conservation agreements with land owners within the watershed.

Transparent Financial Mechanism

One of the great strengths of water funds is that they are managed through secure and transparent financial mechanisms that can be sustained in the long term. The resources generated by the funds can only be used for the purposes for which they were created. The institution managing the funds, such as a Trust Fund, is responsible for overseeing the adequate use of the money. This builds trust among contributors to the fund and makes transparent bookkeeping easier.

Linkage to Public Policies

These financial tools allow the fund to complement efforts carried out by different governments to protect natural resources in order to guarantee sustainable development through coordinated action by the state, the community, non-governmental organizations and private companies.

New Resources

Water funds make easier to leverage new resources that can contribute significantly to the development of new projects and to the financial sustainability of protected areas. Many of the problems faced by watersheds stem from a lack of funds by the public institutions that manage them.

Participatory Involvement of Civil Society and the Business Sector

Water funds can become a communication tool within the municipalities between the urban and rural zones. They allow people in the city to understand the concerns about the water source´s health and their protection. They must work with environmental authorities to ensure that the watershed is managed to guarantee the supply of ecosystem services.

Chapter 1

Water Fund Idea and Concept

Natural ecosystems provide services to humans that are known as environmental or ecosystem services. These services are ecosystem functions that offer social and/or economic benefits to the local, national or international population.

Natural processes such as hydrologic regulation, sediment control, carbon sequestration and pollination, among others, generate benefits to humans that are often not quantified or recognized. According to this logic, a specific area can be crucial for a group of individuals because certain types of natural processes that provide environmental services which are essential for life occur within this area.

Such is the case of an area that is strategic to controlling sediments and reducing erosion within a watershed for a hydropower plant, which needs water with the least possible amount of sediments to operate turbines and ensure an adequate long-term maintenance of equipment. Similarly, a specific area within a watershed may be crucial to guarantee the necessary flow of water to provide reliable irrigation, even in intense dry periods, as well as good quality water for large extensions of crops. Thus, there is an implicit relationship between a specific area, the environmental services it generates, and the stakeholders involved not only as suppliers of environmental services, but also as consumers.

The first step in creating a water fund is to identify the ecosystem services that will be the structural basis for the water fund and will determine many aspects of the following steps for its operation. This will help clarify the issues and needs of the specific area where the fund will operate.

In general terms, these elements answer three initial questions:

1. Which strategic environmental services will the water fund protect, conserve, restore, fund and/or compensate? In other words, where is the opportunity to fund long-term conservation that benefits all parties involved?

2. What will be the area of influence of these ecosystem services?

3. Who are the key stakeholders – in other words, large water users – that have a particular interest in the preservation of those ecosystem services? How can we demonstrate the value of these environmental services so that it can be internalized as a cost-benefit function?

The answers to these questions will determine the activities of the water fund to achieve its goals and objectives. This chapter presents a general description of these three aspects.

1.1

Environmental Services Analysis: Natural Ecosystems and Hydrologic Services

Environmental services are flows of materials, energy and information from nature that combine with industrial and human capital to provide human well-being.

The global capital stock takes different shapes, most of them in physical form, including natural capital such as trees, the atmosphere, and minerals, among others, industrial capital such as machines and buildings, and human capital such as physical bodies that provide labor (Constanza et al, 1997).

The Millennium Ecosystem Assessment 2005, classifies ecosystem services into provisioning or production services, regulating services, supporting services and cultural services. Provisioning services refer to products that can be obtained from ecosystems, such as wood, food and fresh water, among others.

Supporting services relate to ecosystem processes, such as nutrient cycling and soil formation. Regulating services are those linked to the regulation of climate, water purification, or regulation of floods. Finally, cultural services are those linked to recreation, spirituality and aesthetic appreciation.

Among environmental services, hydrologic services are one of the most important to humans. Maintaining ecosystems in their natural state helps keep hydrologic services in balance (Célleri, 2000). A large number of cities, towns and communities depend on water originating in natural ecosystems, many of which are located within public or private protected areas. In the Andean Region, for example, páramos and cloud forests provide water to large cities such as Bogota and Quito, which depend on the páramo and forest ecosystems within protected areas for their water supply. Likewise, coastal cities such as Cartagena de Indias depend on coastal lagoons that must be conserved in order to pro-

tect the environmental services obtained from them. In Chile, high Andean marshes have an essential regulating role. These protected areas are not only important for supplying drinking water, but they also contribute to irrigation and hydropower generation.

Water funds focus on maintaining and conserving hydrologic services through the conservation and restoration of natural ecosystems. However, they can also support other services such as carbon sequestration or biodiversity. Going back to the example of the Andean Region, protected areas that help conserve water sources for large cities are also, in many cases, global priority zones for biodiversity conservation.

The following are the main hydrologic services (Cordero et al, 2008; Célleri and Feyen, 2009) that can benefit from conservation and restoration activities in natural ecosystems in a specific area:

• Regulating the water cycle, maintaining base water flows, regulating high flows (peaks).

• Maintaining or improving water quality (i.e. water without pollutants).

• Maintaining and controlling sediment loads.

• Maintaining or improving aquifer recharge.

• Hydrologic performance (such as fog capture by vegetation).

• Infrastructure development.

The loss or degradation of natural ecosystems can impact hydrologic services. Once a change in land use has occurred, the biophysical processes that control the hydrologic regime also change and, therefore, the hydrologic services provided by the ecosystem are degraded (Célleri and Feyen, 2009).

Some drivers of ecosystem loss or degradation are:

- **Conversion of natural ecosystems for livestock or agricultural activities.**
- **Burning of natural ecosystems.**
- **Mining or other natural resource extraction.**

The identification of hydrologic services that must be conserved or recovered is a very important step that helps set clear goals and objectives for the fund, identify key stakeholders that should be involved and develop strategies for achieving the goals set. The following are some examples of hydrologic services that can be identified as goals for a water fund:

Regulation of the Water Cycle

Natural ecosystems help regulate the water cycle. They store water during the rainy season and slowly release water during the dry season, ensuring water availability when there is no rain. (Célleri and Feyen, 2009). They are also essential to help control overflows or flooding at certain times of the year. It is very common to find areas with water availability problems in the dry season. Natural ecosystems, such as the páramo, help maintain a base water flow during the dry season due to their great capacity to capture water. The capacity of natural ecosystems to retain water also helps regulate water flow during peak precipitation periods. A change in land use of the natural páramo to agriculture may reduce the base water flow in times of drought to 50% and increase its peak flows up to 20% (Buytaert et al, 2005; 2007).

Sediment Control

Natural ecosystems protect the soil from erosion effects such as wind and runoff. The roots of natural vegetation help keep soil compact and firm so that it will not be carried away by rain or water and wind currents. Maintaining a low sediment concentration in the water benefits the operation of drinking water dams and hydropower plants and keeps irrigation canals in optimum conditions. Changes in land use — for example, from natural vegetation to agriculture, pasture or burnings — often cause an increase in the production of sediments. Studies and models in land use alterations have found significant increases in sediment that vary between two to 10 times the initial amount of sediments before the land use was altered (White et al, 2008; Poulenard et al, 2001). This is the case of Bogota with the previously mentioned study carried out by CIAT.

Water Quality

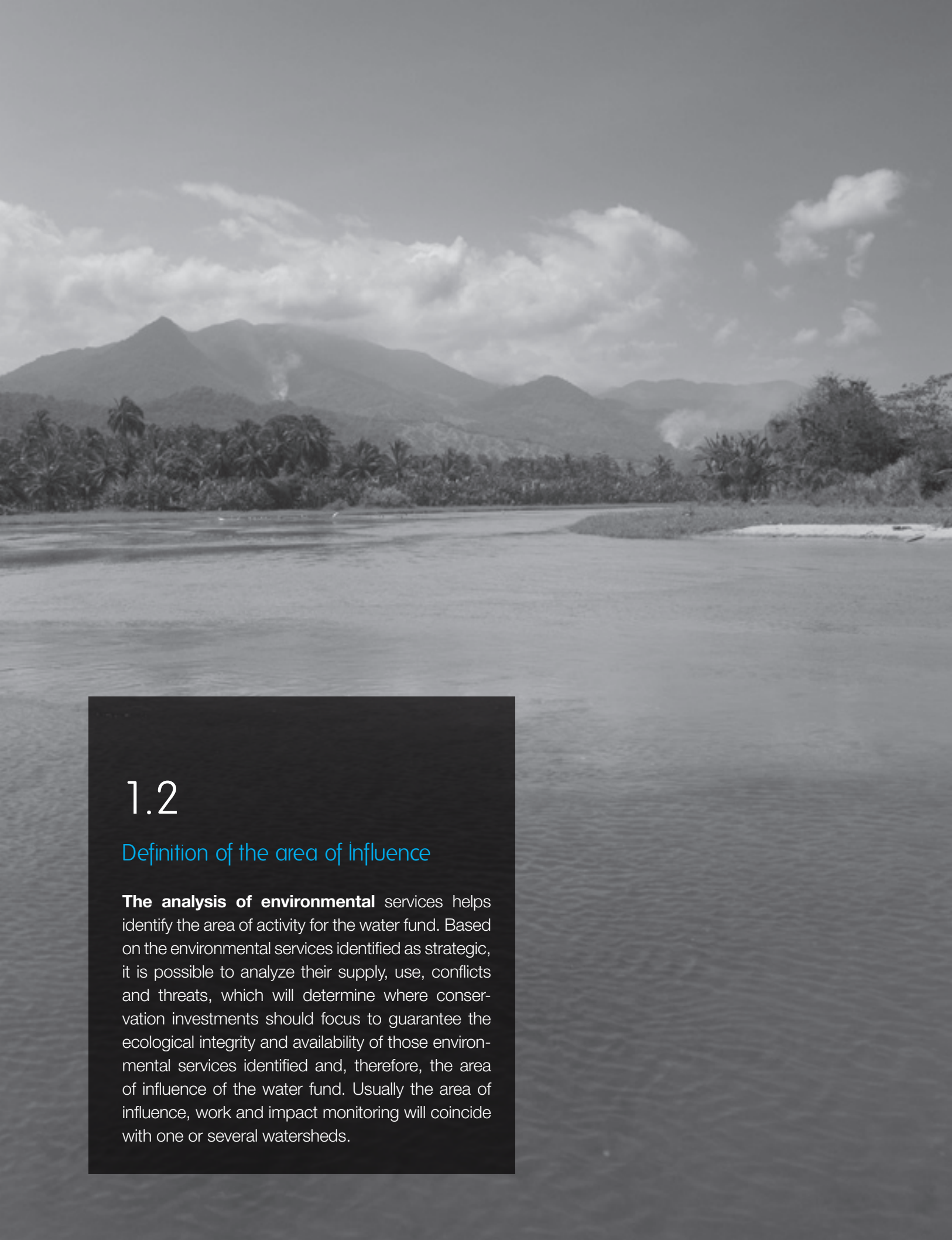
Natural vegetation has a filtering and barrier effect against water pollution from pesticides, fertilizers and other pollutants derived from poorly managed agriculture or cattle ranching. Vegetation can absorb several pollutants and store them in its tissues or transform them into less dangerous substances. It can also capture suspended solids that can have pollutants attached to them. Riparian vegetation is of great importance because it acts as the last protective barrier that prevents pollutants from entering streams or rivers (Tallis et al, 2008). The presence of natural vegetation in a watershed, particularly that of riparian forests and wetlands, helps maintain water quality, which in turn results in savings in water

treatment costs and a lower likelihood that human populations will contract diseases linked to poor quality water.

Other Hydrologic Services

Natural vegetation provides a series of additional benefits that can be important in certain areas. For example, in cloud forests vegetation intercepts fog, producing an increase in the amount of water that goes into the hydrologic system. This effect can be particularly important to areas where water availability is seasonal and a water deficit exists during the dry season. In other cases, natural vegetation can help water infiltrate into aquifers. Generally, these services must be analyzed on a case-by-case basis and it is necessary to research existing data or generate new data that will support the creation of water funds based on these services.

Determining one or more strategic environmental services to create a water fund will help establish conservation priorities that will improve the health of one or more ecosystems and, at the same time, support the availability of other services such as biodiversity, carbon sequestration and recreation. It is crucial identify conservation goals for the condition of the environmental services at stake.



1.2

Definition of the area of influence

The analysis of environmental services helps identify the area of activity for the water fund. Based on the environmental services identified as strategic, it is possible to analyze their supply, use, conflicts and threats, which will determine where conservation investments should focus to guarantee the ecological integrity and availability of those environmental services identified and, therefore, the area of influence of the water fund. Usually the area of influence, work and impact monitoring will coincide with one or several watersheds.

1.3

Analysis of the Stakeholders İnvolved

The identified ecosystem services are linked to a series of stakeholders for which the availability of these services is very important.

As a next step in setting up a water fund, it is necessary to analyze the stakeholders present in the area that eventually will have a direct or indirect relationship with the mechanism. This exercise is of the utmost importance as it will help identify who are, or could be, the most interested in maintaining or recovering ecosystem services and, therefore, become partners and contribute financial resources to the fund.

An interesting concept that can help to better understand the group of stakeholders involved is the social basin. It refers to an area that encompasses the headwaters of rivers and the high zones that protect and nurture them to the lands where water "naturally" flows or where water is conducted through canals. It is a complex combination of the geographic watershed and its areas of influence determined by water users. Occasionally, a social basin implies an overlap of several geographic watersheds (Yáñez and Poats, 2007).

The key stakeholders in a water fund are essentially the largest consumers of the water resources. Participation of consumers is key whether for reducing treatment costs or n the interest of guaranteeing the availability and quality of water for a specific use, such as industry, energy, agriculture or human consumption. These major consumers, who can be either from the public or private sector, form the basis of the fund in terms of providing the main financial resources for its establishment.

Likewise, the private sector must complement the public sector's responsibility in conserving the watershed, as generally established in integrated watershed management schemes. The private sector and organized civil society must ensure through legal channels that the public sector fulfills its obligations.

İt is very important for a water fund to have the participation of the public sector, including local governments, environmental authorities, protected area agencies, price and rate regulation institutions and public water companies, among others. These are key stakeholders when making decisions on watershed conservation, and their participation can be active or passive.

In many cases, academic institutions are also very interested in actively participating in water funds. Universities, research centers and governmental environment institutes may see water funds as a good opportunity to carry out research, conservation or monitoring activities and to develop projects using new technologies. This is another advantage of the funds, because it may contribute to improving the way decisions are made regarding water management. In Brazil, the University of Sao Paulo has developed very efficient reforestation systems. Likewise, other public and private universities and research institutes have actively contributed to the development of water funds. Some examples include Stanford University, the Politécnico de Monterrey, the International Center for Tropical Agriculture (CIAT, in Spanish) and the Sugar Cane Research Center, among many others.

The participation of local communities is also important. People living within protected areas and in their buffer zones will be directly affected by conservation projects and should be involved in order to express their needs and serve as links between the fund and the local community.

Finally, it is worthwhile to highlight the increasing interest of cooperation for development agencies to contribute to this type of mechanisms. Their rationale is to facilitate the creation of effective conservation instruments that will bring about human well-being and eradicate poverty. Because of this, water funds are regarded in a positive light, and participation of these types of institutions is on the rise.

In order to carry out a stakeholder analysis, information must be gathered on a case-by-case basis, with a table that summarizes each organization's interest in participating in the water fund. The following figure shows an example in which some actors that may be involved in water funds are grouped according to the sector they represent:

Sector	Stakeholder	Interest in participating in the fund
Public	Water companies, local governments	Water quality, water regulation, avoided sediment costs.
	Hydropower generation companies	Water regulation, avoided sediment costs.
	National environmental authority	Strengthening, financing and fulfilling protected area management plans, resource conservation.
	Local environmental authorities	Strengthening, financing and fulfilling protected area management plans, resource conservation.
	Water authorities	Management of watersheds, resource conservation.
	Irrigation zones	Water regulation, avoided sediment costs.
Private	Water companies	Water quality, water quantity, water regulation.
	Hydropower generation companies	Water regulation, avoided sediment costs.
	Bottled water and soft-drink companies	Water quality, water regulation, avoided sediment costs.
	Agricultural associations	Water regulation, avoided sediment costs.
	Industries	Water regulation and water quality.
Academic	Research centers	Research Development /conservation.
	Universities	Research Development /conservation.
Local Communities	River associations, water boards, irrigation boards	Participation and investment decision-making resource conservation.
	Indigenous communities	Participation and investment decision-making.
International Cooperation	Multilateral cooperation organizations (World Bank, IDB, CAF, CAN)	Cooperation and poverty eradication/conservation.
	Governmental cooperation agencies GTZ, COSUDE, SPANISH COOPERATION, USAID	Cooperation and poverty eradication/conservation.
	Non-Governmental Organizations	Conservation, development.

Figure 2. Stakeholders involved in a water fund. • *Source: TNC, 2011.*

Definition of key stakeholders is the starting point in efforts to create a water fund. Choosing and motivating those actors at the right time is part of the art of creating this type of mechanism. Sometimes, it may be more strategic to have key stakeholders participating from the beginning of the design process. At other times, it may be more efficient to include stakeholders progressively. The creation process may vary significantly depending on the stakeholders that participate. In some cases, this process may unfold very quickly, while in others it may take longer, mostly due to lengthy administrative approval processes.

One of the lessons learned from setting up water funds is the importance of first consulting with large water users to see if they really have a need and the willingness to invest additional resources in the watershed. This helps to avoid creating false expectations among other stakeholders and ensure the demand for the environmental service.

One way to adequately view the group of water fund stakeholders is a matrix that identifies each stakeholder's level of interest in participating and the impact or degree of influence expected from them. A sample matrix is shown below:

Level of interest in the water fund's area	Private sector: Soft-drink company Livestock Multilateral ccooperation agencies International NGOs	Water company Hydropower plant Agricultural sector with intensive water use Local NGOs Protected areas agency Community-based organizations
	Private sector not related to water (chemicals, food) Financial sector Others	Local government Regional government Land owners Environmental authorities Indigenous communities and communities of African descent
Level of influence in the water fund area		

Figure 3. Outline of a stakeholder analysis for the initial design of a water fund.

• *Source: TNC, 2011.*

As shown in the figure above, a stakeholder located in the upper right-hand box represents a stakeholder with a high interest in the water fund and also with a high degree of influence on it. This combination justifies these stakeholders' participation in the fund from the beginning. A stakeholder in the lower left-hand box with a low interest in the water fund and a low level of influence (even if it is considered an important potential participant in the fund) is not crucial at the beginning of the water fund creation process. That stakeholder's involvement can be negotiated in the medium term.

Whatever the reason for their interest, potential stakeholders will need to agree on a strategy for the design of the water fund. As shown above, it is important that water funds gather participants from both the public and private sector to combine efforts that to contribute to the integrated management of water resources.

Fondo para la Protección del Agua –FONAG-, a model for replication

FONAG — the Quito Water Fund — was the first water fund created in Latin America with the support of TNC. The successful results of this model have led to its replication in the region and have generated interest on other continents. The idea for this mechanism was devised in 1997 as a response to concern for Quito's water supply and for the scarce funding for protected areas where water sources are located. The Water and Sewage Metropolitan Enterprise of Quito (EMAAP-Q, today EPMAPS) and TNC boosted the creation of the fund that was established in 2000 as the Fondo para la Protección del Agua, FONAG, a private endowment fund with a planned life of 80 years. The fund began with seed funding of $21,000. Other participants progressively joined as constituents, such as the Quito Power Company (EEQ-2001), the Andean Brewery (now known as the National Brewery-2003), COSUDE (the Swiss Development Cooperation Agency-2005) and Tesalia Springs Co. (a bottled water company-2007). In 2010, the CAMAREN Consortium (Training System for the Management of Natural Renewable Resources) also became a member of the trust fund.

FONAG has a Board of Directors formed by representatives of its constituents. This is the highest decision-making body of the fund in charge of defining policies and strategies to guide the development and fulfillment of the fund's

objectives. All members have the same power when making decisions, notwithstanding the amount of the financial contribution they have made. The technical secretariat is in charge of FONAG's operation and management, serving as the operational body of the fund and reporting to the Board. Financial resources are managed by the trust fund (Enlace Fondos), which also has is the legal representative of the fund and is in charge of expenses, contracts, etc. This mechanism guarantees transparency in the decision-making process and in the use of resources.

FONAG works to guarantee that there is sufficient good quality water through co-financing actions aimed at protecting watersheds to achieve the natural regeneration of the resource. Its mission, vision and objectives are:

Mission:

FONAG restores, cares for and protects watersheds that supply water to the Metropolitan District of Quito and surrounding areas.

Vision:

To be the mobilizing agent that involves all actors in exercising their civic responsibility on behalf of nature, especially water resources.

Objectives:

To lead processes and consensus through dialogue, proper decision-making, strengthening research and the appropriate use of technology to achieve integrated management of water resources in which active, responsible participation based on solidarity leads to sustainable water management. (More information can be found in www.fonag.org.ec)

FONAG carries out activities in the upper basins of the Guayllabamba, Oyacachi, Papallacta and Antisana rivers, covering a total area of 5,420 km2 (2,092.6 square miles). It invests 80% of its resources in long-term programs or activities and 20% in specific projects or activities. FONAG's programs are the following: Recovery of Vegetation Cover Program, Environmental Education Program, Surveillance and Monitoring Program, Water Management Program, Communication Program and Training Program. During its existence, FONAG's programs have achieved the following successes:

- Development of strategies and actions for the protection of water resources within protected areas, in agreement with the Ministry of Environment. Eleven community park rangers support Cayambe Coca and Cotopaxi National Parks, Antisana Ecological Reserve and their buffer zones.

- Recovery of more than 2,100 hectares (5,189 acres) with native species in critical areas of the higher Guayllabamba River basin.

- More than 28,000 children benefitting from the "Guardians of Water" environmental education program.

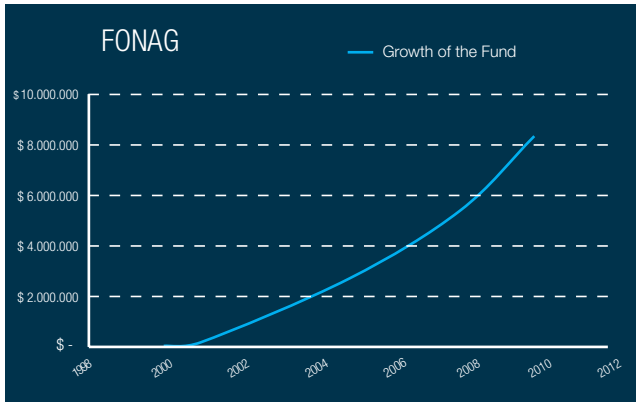
- More than 20 community production projects with 400 families participating in areas such as agroecology, integral farms, processing medicinal plants and grassland improvement.

- Production of the bi-monthly "Water to the Core" periodical with a distribution of 1,000, one monthly electronic newsletter, and at least three public events per year.

- Training workshops on integrated water management and climate change.

- Creation of the water resources information system that gathers data on the Guayllabamba Watershed (www.infoagua-guayllabamba.ec).

FONAG has had a significant financial growth. It started out with $21,000 in 2000, and by December, 2010 it had $8,356,291. The graph below shows the fund's growth.



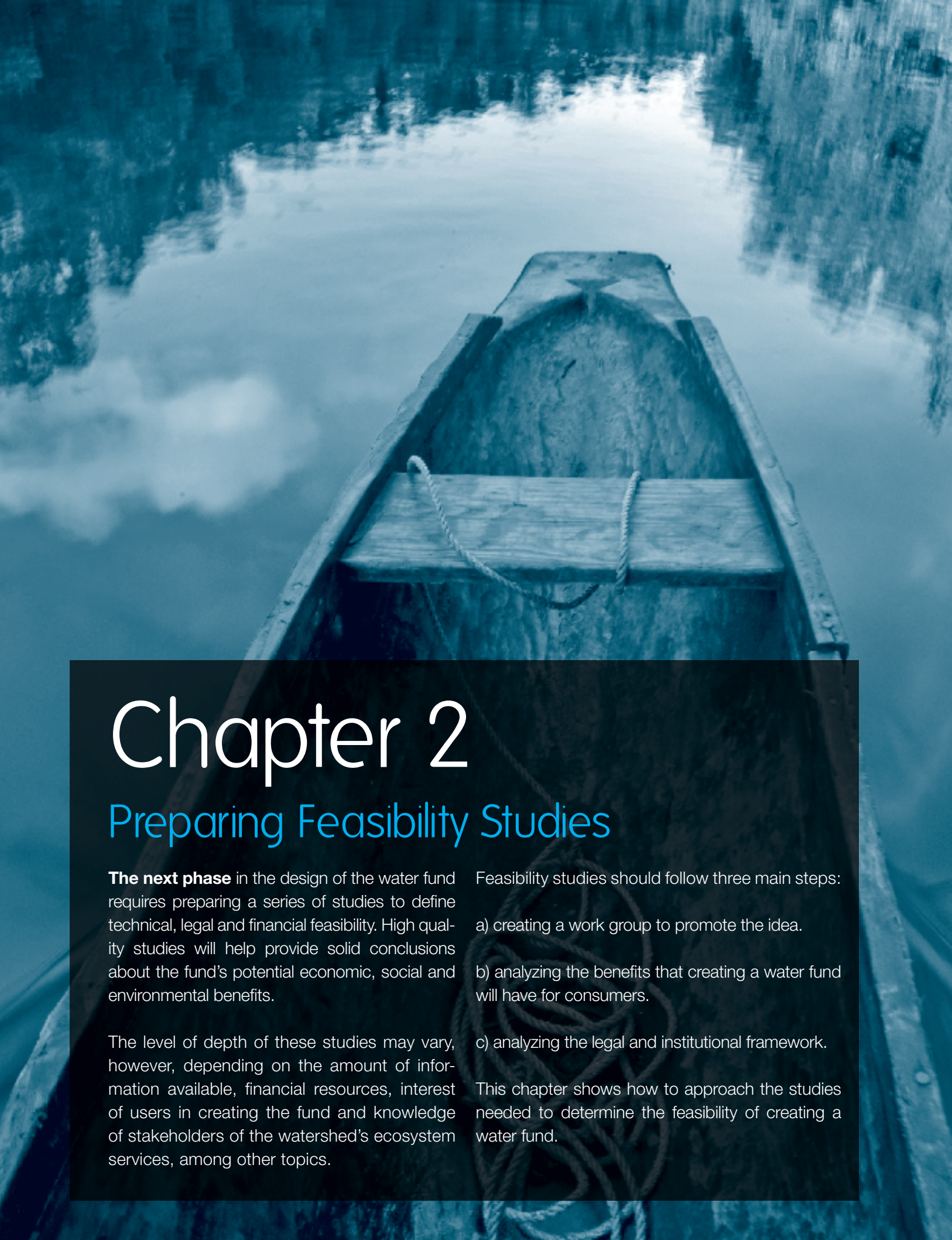
Source: FONAG, 2011. Graph by TNC.

Regarding its investment in activities, FONAG has been very successful in attracting leverage funds. For each dollar spent by FONAG, at least three dollars have been obtained from counterparts. In 2008, for example, FONAG's budget was $4.1 million, of which $700,000 was provided by the endowment yields and $3.4 million came from contributions by donors and partners. For example, USAID has been a very important supporter of FONAG.

A summary of activities for 2010 is presented below, providing a good example of the types of investments the fund makes.

Programs and proyects	FONAG Performance	Donations	Other contributions	Total
Water management	$45,000	$26,000	$555,000	$620,000
Surveillance and control	$88,000	$139,000	$155,000	$374,000
Vegetation coverage	$85,000	$9,000	$99,000	$173,000
Environmental education	$22,000	$209,000	$81,000	$306,000
Training	$16,000	$3,000	$10,000	$28,000
Communication	$35,000	$44,000	$15,000	$91,000
Monitoring	$18,000	$40,000		$51,000
Operational management	$40,000	$6,000	$21,000	$69,000
Management of the fiduciary	$94,000	$7,000		$57,000
Support to programs	$52,000	$203,000		$243,000
TOTALS	$496,000	$686,000	$936,000	$2,012,000

Source: FONAG – Institutional folders



Chapter 2

Preparing Feasibility Studies

The next phase in the design of the water fund requires preparing a series of studies to define technical, legal and financial feasibility. High quality studies will help provide solid conclusions about the fund's potential economic, social and environmental benefits.

The level of depth of these studies may vary, however, depending on the amount of information available, financial resources, interest of users in creating the fund and knowledge of stakeholders of the watershed's ecosystem services, among other topics.

Feasibility studies should follow three main steps:

a) creating a work group to promote the idea.

b) analyzing the benefits that creating a water fund will have for consumers.

c) analyzing the legal and institutional framework.

This chapter shows how to approach the studies needed to determine the feasibility of creating a water fund.

2.1

Creating a Working Group

Once the stakeholders and the ecosystem services for the fund have been defined, the next step is inviting strategic stakeholders to form a working group and begin assigning specific tasks that will help advance the development of technical studies and facilitate and promote the water fund.

The main functions of this working group may be the following:

- Preparing a work plan that includes a detailed timeline with the legal establishment of the fund as its final activity.
- Conducting meetings to coordinate strategies and define next steps.
- Analyzing alternatives for the preparation of initial studies.
- Informing stakeholder institutions about the status of the fund's establishment.
- Analyzing and facilitating the incorporation of new members to the working group.

The working group's composition should be duly formalized, for example, through a Memorandum of Understanding.

The following table presents some of the commitments acquired through a Memorandum of Understanding in two water funds in which TNC has been involved.

Water Fund	Members of the Work Group	Functions of the working group
Bogota (Colombia)	Bogota's Water Company, National Parks Service, Patrimonio Natural Foundation, TNC	1. Defining the work plan for the fund's creation and the schedule of meetings 2. Contracting feasibility studies 3. Contracting legal studies
Paute (Ecuador)	Comunications, drinking water, sewerage, and sanitation company, ETAPA, Cuenca.	1. Developing strategies to design and implement the mechanism to reinvest in watersheds. 2. Preparing and developing a plan to make the reinvestment mechanism operational. 3. Identifying possible strategic partners interested in participating in the proposed mechanism, and when and how to link them to the process. 4. Exchanging national and international experiences to strengthen the actions that the mechanism is expected to develop.

Figure 4. Tasks of the working group. • *Source: TNC, 2011.*

2.2

Developing Technical Studies

There are several technical tools that can contribute to the design and operation of water funds. It is important to use tools that will aid in understanding how hydrologic services operate in a watershed and how these can be affected by land use alterations, development of infrastructure or climate change.

The depth and sophistication of the analysis will depend on existing watershed data, the budget available, and the interest of consumers, among other variables. These studies may be simple, such as a rapid assessment of the information available on the hydrologic supply and demand of the watershed, or they may be more in-depth studies that require field data collection or the development of hydrologic models. In many cases it may be possible to start with a simple analysis, but good data on the key hydrologic services identified for the fund are essential. These technical aspects should be approached as an ongoing process that starts with design and continually improves during the fund's operation. Obtaining more and better data at the beginning will help define more precise conservation goals for the environmental services provided.

The main questions to be answered are:

- **What is the condition of hydrologic services in terms of supply and demand? For example, how much water does the watershed produce, what is the demand for drinking water, and what is the natural versus entropic sediment level in the watershed?**

- **What are the environmental, technical and socioeconomic benefits or impacts of the fund? For example, in terms of avoided sediment, do the fund's investments improve or maintain water quality, or do they improve the regulation of water flow? İn socioeconomic terms, does the fund create more employment?**

- **Where should the fund invest to maintain or improve hydrologic services and obtain the greatest possible return on investment?**

- **What is the cost of maintaining or improving hydrologic services in the watershed?**

- **How do hydrologic services vary under different management schemes in terms of land use and climate change scenarios?**

- **What other services (for example, biodiversity, carbon sequestration, recreation) besides the hydrologic ones can the fund help maintain?**

Some useful tools for an environmental feasibility analysis are presented below:

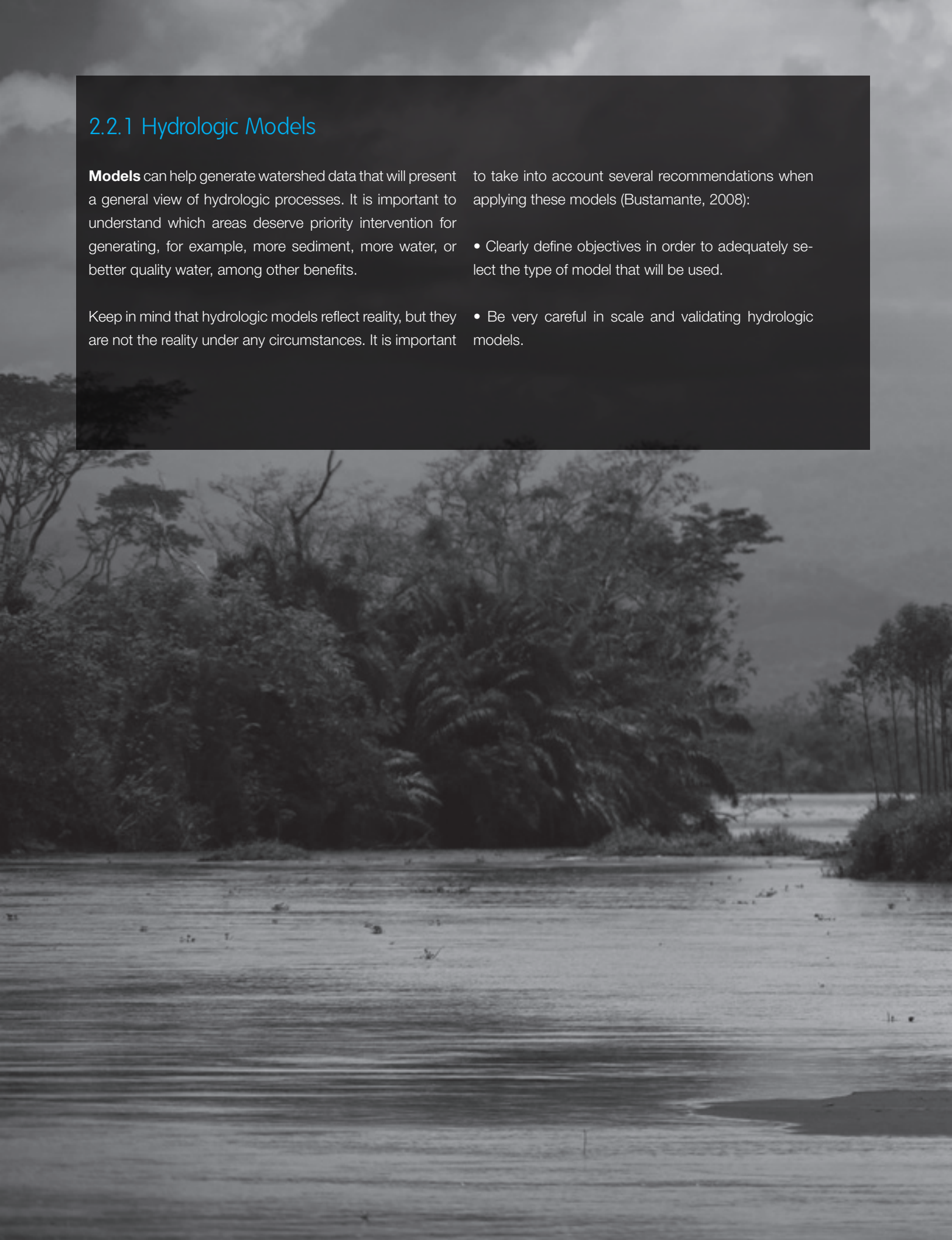
2.2.1 Hydrologic Models

Models can help generate watershed data that will present a general view of hydrologic processes. It is important to understand which areas deserve priority intervention for generating, for example, more sediment, more water, or better quality water, among other benefits.

Keep in mind that hydrologic models reflect reality, but they are not the reality under any circumstances. It is important to take into account several recommendations when applying these models (Bustamante, 2008):

- Clearly define objectives in order to adequately select the type of model that will be used.

- Be very careful in scale and validating hydrologic models.

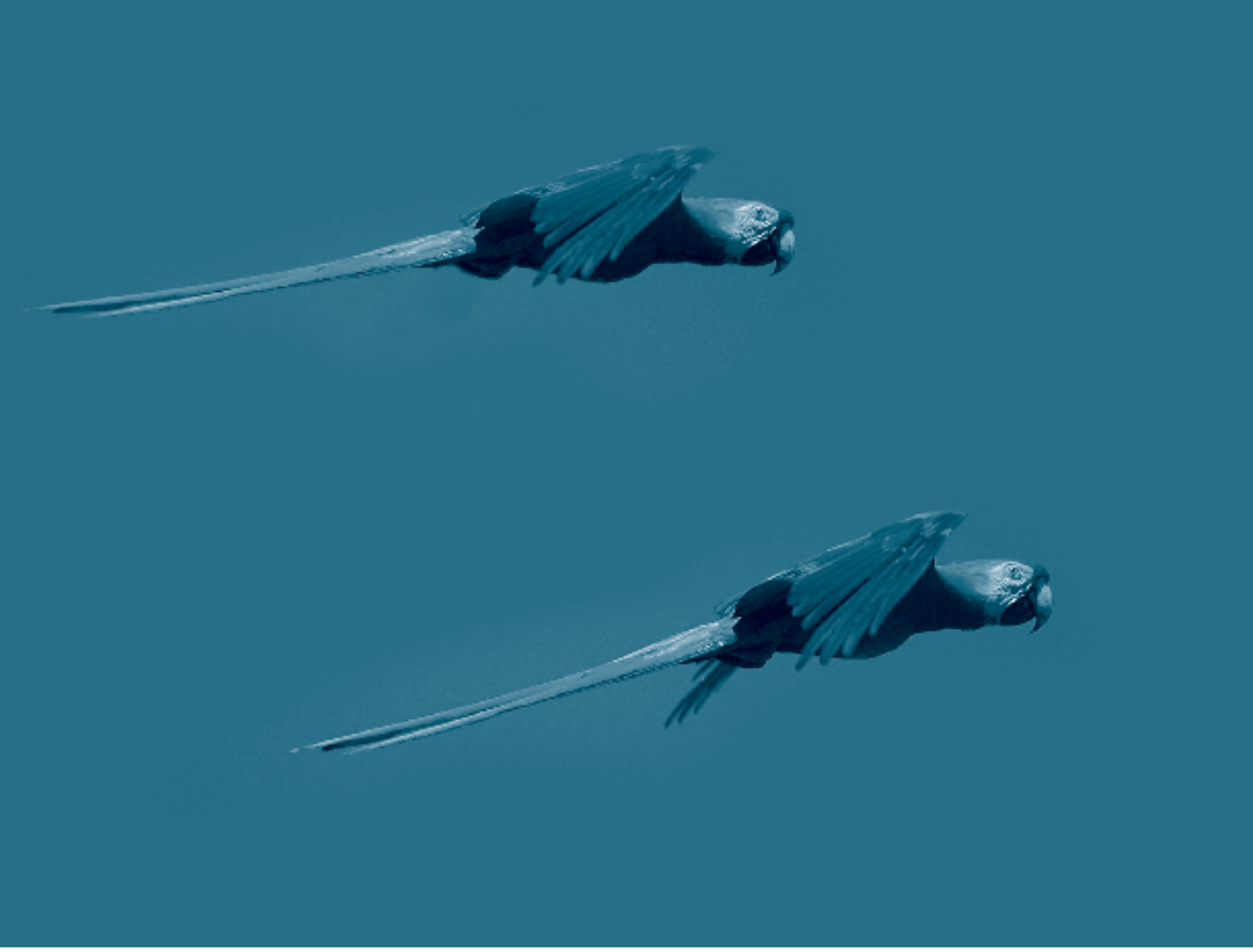


Make efforts to develop hydrologic models, or at least adapt and resize the parameters and coefficients to the conditions of the ecosystems under evaluation, so that they consider their particular ecological features and hydrologic processes (such as morphology and dynamics of leaves, forest structure, simulation of forest interaction, excess saturation).

Consider in the models both the mean annual water flow and the minimum water flow in summer in order to include the preferences of consumers (for example, irrigation and drinking water) for whom this criterion is more important.

In addition, make systematic efforts to obtain baseline information that will provide inputs to the hydrologic models with reliable data. This may be a future investment for the fund.

Some of the free access models available that have been used in the design of water funds are presented below:



Integrated Valuation of Ecosystem Services and Trade-offs -InVEST-

This is a tool developed by the Natural Capital Project, a partnership between Stanford University's Woods Institute for the Environment, the University of Minnesota's, Institute on the Environment, TNC, and World Wildlife Fund. One of the objectives of this partnership is to create practical science-based tools for the analysis of environmental services so they may be considered in decision-making. InVEST is a series of models to map and value nature's goods and services that are essential for sustaining and fulfilling human life. InVEST provides a landscape vision that considers multiple dimensions related to environmental functions of natural ecosystems. This input helps identify potential coincidences and conflicts linked to different land uses and present them in a spatially explicit way. InVEST has been developed with a practical approach that allows working with several environmental services at the same time and with different degrees of complexity according to the data available and the needs of the project. The first level (Tier 1) model has already been developed and can be applied with little data. Model levels 2 and 3 (Tier 2 and Tier 3) are currently being developed and in the future will allow the inclusion of economic analysis and valuation of environmental services. It is best to review

the project website to access the more advanced versions of these models [4]. InVEST has a group of tools that analyze different ecosystem services, including hydrologic services. It also has models to analyze biodiversity, carbon sequestration and pollination, among others. Within the hydrologic models, the following tools are currently available:

Water purification

This model evaluates landscapes in terms of their capacity to regulate pollution from non-punctual pollutants, such as from agriculture and cattle ranching. The model performs this analysis based on a calculation of the superficial flows, the potential pollutants in the landscape, and the value of the different types of vegetation in filtering pollutants.

Reservoir Sedimentation

This model is based on the universal soil loss equation (Wiscmeier and Smith, 1978) to evaluate landscape units according to annual expected erosion. This equation links soil loss to variables such as land use, soil management, soil erosion capacity, slope and rainfall. InVEST focuses on changes in the production of sediments due to alterations in land use and soil management.

Water Yield

This model in Tier 1 uses both basic climate and geomorphology relations as well as the impact of land use on the watershed to estimate the magnitude of water flows within the basin. Water yield in a parcel of land depends on the balance between rainfall and evapotranspiration. This water balance is determined by a variety of meteorological factors and the types of vegetation present in each area.

4. More information on Natural Capital and the InVest Model is available at the official website: www.naturalcapitalproject.org.

Hydropower

This model operates on an annual basis and provides a spatial analysis of the relative impact of water contributions in different parts of the landscape. It offers a vision of how alterations in land use may affect annual water yields. The model's purpose is to operate in situations in which little data are available.

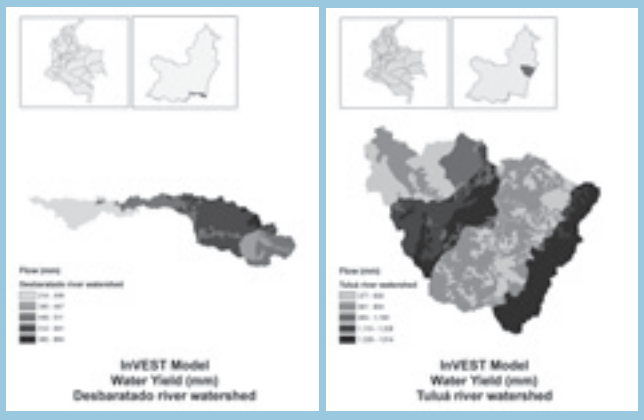


Figure 5. InVEST Model: Estimation of water yield in the watersheds of Desbaratado and Tulua rivers, Cauca Valley, Colombia. Water for Life Water fund. • *Source: TNC, Feasibility studies for Water for Life Water Fund, 2009. Sostenibilidad, 2009.*

Soil and Water Assessment Tool SWAT

The hydrologic analysis of the watershed allows for prioritizing conservation and/or recovery areas where impacts can be reflected in better water flow regulation and sediment reduction. This analysis uses the SWAT model — designed by the U.S. Department of Agriculture and Texas A & M University — that, among other things, helps predict the impact of variations in land use and management as well as climate change on sediment generation and water regulation in watersheds. SWAT is an interface that works on the ArcGIS9.2 software platform and helps organize geographic entry data, which are processed under a hydrologic balance model that outputs data (watershed baseline) for a later analysis of alternative land use scenarios in a watershed. The tool is useful to prepare easily accessible maps and information that would be impossible to integrate through conventional procedures with field measurements or existing databases. It provides reliable and global information to have an integrated vision of the watershed and all of the factors influencing it. It can also be used at any type of scale — that is, where the area under study presents no limitations — and helps combine social aspirations with the boundaries and needs imposed by environmental conservation. More information can be obtained at http://swatmodel.tamu.edu/

Figure 6. SWAT Model: Estimation of sediments in Bogota´s water supply systems, Colombia. Bogota Water Fund. • *Source: CIAT, 2007, Study hired by TNC, Bogota Water Company (EAAB) Patrimonio Natural & Parques Nacionales.*

Figure 7. SWAT Model: Estimation of sediments for the watersheds of the Desbaratado and Tulua rivers, Cauca Valley, Colombia. Water for Life Water Fund. • *Source: CIAT, Feasibility Study. Water for Life Water Fund, 2009.*

Fog Interception for the Enhancement of Streamflow in Tropical Areas FIESTA

This model quantifies hydrologic flows based on data available around the world. Its main strength is that it can quantify the water contributed by fog interception in a watershed. The FIESTA model is a spatially detailed hydrologic model distributed in physical processes that is used to estimate the contribution of fog interception in cloud forests and paramos and to understand its potential impact on land and water resources at the national and regional levels (Mulligan and Burke, 2005). This model uses data freely available on several websites. It does not employ soil parameters, but instead uses land attributes derived from topography.

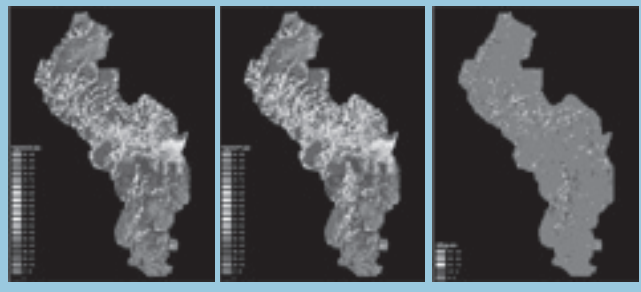


Figure 8. FIESTA Model: Fog Interception (mm year-1). a. Interception 1977. b. Interception 2000. c. Difference between scenarios 1977 and 2000. Bogota Water Fund. • *Source: CIAT, 2007, Study hired by TNC, Bogota Water Company (EAAB) Patrimonio Natural & Parques Nacionales.*

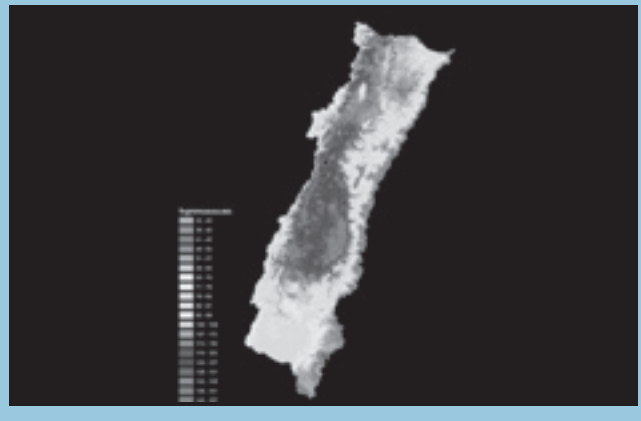


Figure 9. FIESTA Model: Fog Interception (mm year-1). Tulua, Guabas, Sabaletas, Amaime, Nima, Bolo, Desbaratado, Fraile, Palo. Cauca Valley and Cauca, Colombia. Water for Life Water Fund, 2009. • *Source: CIAT, Feasibility Studies. Water for Life Water Fund, 2009.*

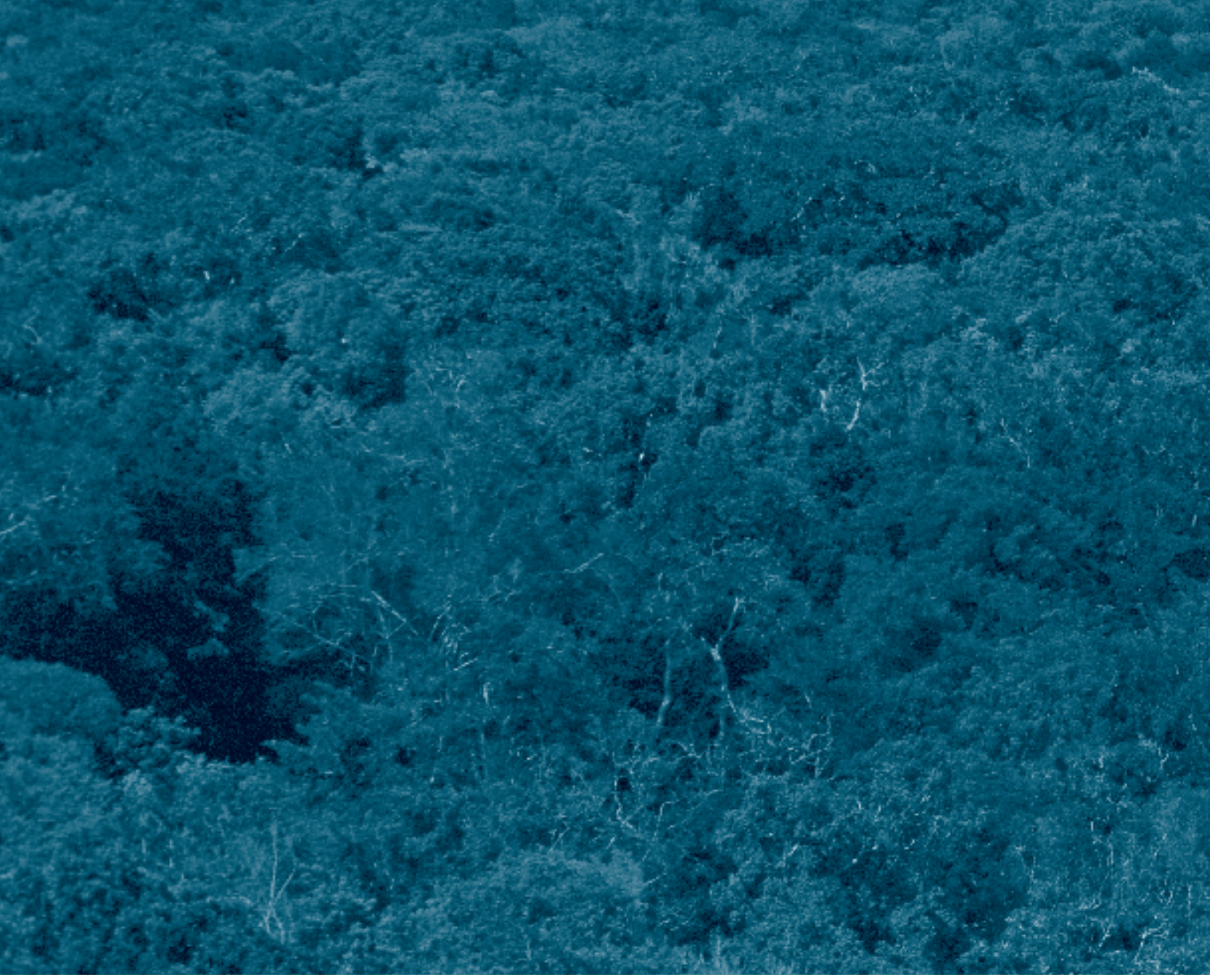
According to the models, a priority area is one in which it is more effective to invest in conservation resources because general conditions make it produce or retain more sediment, because it provides greater water flow, or because it retains and contributes more fog to the water flow, among other factors. In other words, these are areas with a greater return on investment. Once these areas have been defined, the best possible combination of activities for preserving the selected environmental services must be defined. These are the land use alteration and conservation activities that allow the ecosystems to continue supplying the environmental service and sustain it over time for the benefit of larger consumers.

Given that financial resources are limited, it is necessary to analyze the cost of the activities in order to attain a balance between the budget available and the investments the water fund will make to achieve its goals. Designing several scenarios with hydrologic models, estimating the return on investment for different proposed land use alterations and conservation activities will help identify the where and how the fund should focus its efforts. An example of using such scenarios is shown in the following table:

SEDIMENT PRODUCTION	**Scenario 1**	Intensive livestock in areas adjacent to the river	Silvopastoral management in 50% of these areas	2,500US/ha	Reduction of 50 tons of sediments per year
		Uncovered riparian buffer zone	Fencing of the rivers' headwaters and courses in 100% of these areas	500US/ha	
		Crops in high areas with low productivity	Alternative production systems in 10% of these areas	1,500US/ha	
		Reduction of natural vegetation	Restoration / reforestation in 20% of these areas	1,200US/ha	
			Programs for park rangers	50US/ha	
			Incentives for conservation in 50% of these areas	20US/ha	
	Scenario 2	Intensive livestock in areas adjacent to the river	Payments to eliminate livestock (lost opportunity cost)	3,500US/ha	Reduction of 35 tons of sediments per year
		Uncovered riparian buffer zone	Fencing of the rivers' headwaters and courses in 50% of these areas	500US/ha	
		Crops in high areas with low productivity	Purchase of lands for conservation	3,500US/ha	
		Reduction of natural vegetation	Natural regeneration	100US/ha	

Figure 10. Scenarios to build a model to estimate return on investment.

• *Source: TNC, 2011.*



This example shows how a series of activities can have different results in return on investment. In some cases, the differences can be greater in terms of the results of the investment and on the costs of the activities that will be carried out. It will be the fund's responsibility to identify the best option according to its financial resources and the goals it aims to achieve.

Using models to build scenarios helps determine more precisely what the degree of response of an environmental service to the specific changes in the landscape will be, which is the ultimate goal of the water fund's investments. Sometimes the response to land use and conservation activities will be poor, for example, in those areas whose features (slope, climate, geology, etc.) do not make intervention by the fund viable.

The following map provides an example of the proposed activities that will obtain the best results in terms of return on investment given a base budget:

In this map, the highest return on investment is obtained through a series of activities that can be carried out with the given budget. As will be discussed in Chapter 4, the combination of these activities and its cost analysis will provide the basis for establishing the water fund's goals.

Figure 11. Map of the priority areas and activities proposed in the Tulua River watershed, Cauca Valley. Water for Life Water Fund. la Vida.

• *Source: CIAT, TNC, Natural Capital Project, 2011.*

2.2.2 Climate Change Analysis

Water funds can be important mechanisms to address future climate change impacts. Because they are mechanisms with a long-term vision and work plan (i.e., at least 80 years), they are an ideal way to establish actions that will support adaptation to possible climate change impacts. With the increase in CO^2 concentration in the atmosphere, it is expected that a series of changes will affect global climate.

For example, mean global temperatures have increased 0.75°C (1.35°F) between 1991 and 2002, and it is expected that they will rise between 2° and 4°C (3.6 and 7.2°F) before 2100 (IPCC, 2007). These effects will in turn cause changes in rainfall patterns, which — combined with temperature variations — will modify the supply of environmental services. The technical studies for the water fund can analyze the vulnerability of the supply of environmental services to climate change. A good understanding of these potential impacts will help the fund develop future adaptation strategies in order to maintain a good supply of water in terms of quantity and quality. Three main steps for a climate change impact analysis in a water fund are:

Analysis of Possible Climate Changes in the Future

Climate change models and scenarios are used for this type of analysis. These models are available globally (Global Circulation Models, GCM) and use different greenhouse gas emission scenarios. These models have improved their resolution for several regions and countries around the world by downscaling. There are several sources of information to find out more about these models. For example, TNC has developed the ClimateWizard tool (www.climatewizard.org) that offers a simple platform to analyze these models. Meteorological institutes in different countries have worked to improve the resolution of global models and are a good source of information as well. Another useful source for current and future climate data is WorldClim (www.worldclim.org). When analyzing possible future impacts, it is best to use several climate change models in order to have a better understanding of future climate uncertainties.

Analysis of Climate Change Impacts on Hydrologic Services

The previously mentioned models — such as InVEST, SWAT or FIESTA — are useful for this purpose because they include variables that are affected by climate change (such as, temperature and rainfall). These models can be used with current and future climate variables and thus can provide an overview of what the likely differences in the future supply of environmental services might be.

Development of Adaptation Strategies

With the knowledge of possible future impacts, the water fund can develop strategies that will allow it to adapt to possible impacts, such as sediment increase, reduction of base water flow, increased floods, etc. TNC promotes the use of ecosystem-based adaptation, a concept that factors biological diversity and environmental services into a general adaptation strategy that applies a range of actions in sustainable management, conservation and restoration to supply ecosystem services that will help people adapt to climate change impacts (AHTEG, 2009).

At the Water Fund for Life and Sustainability, TNC carried out a joint study with CIAT and the Natural Capital Project to analyze possible future impacts of climate change in the supply of environmental services. These results are used to prioritize areas and strategies that will help the fund adapt to potential future changes.

These results help the fund prioritize intervention strategies to adapt to more sediment. Emphasis is placed on strategies aimed at reducing sediment production, such as reforestation, isolation and conservation of natural ecosystems.

The InVEST and SWAT software programs were used for this analysis with several future climate change models. The results revealed that one of the main future impacts is sediment increase. The following graph shows the results of the analysis, using 20 future climate change models. Of the 20 models, 17 predict future sediment increase:

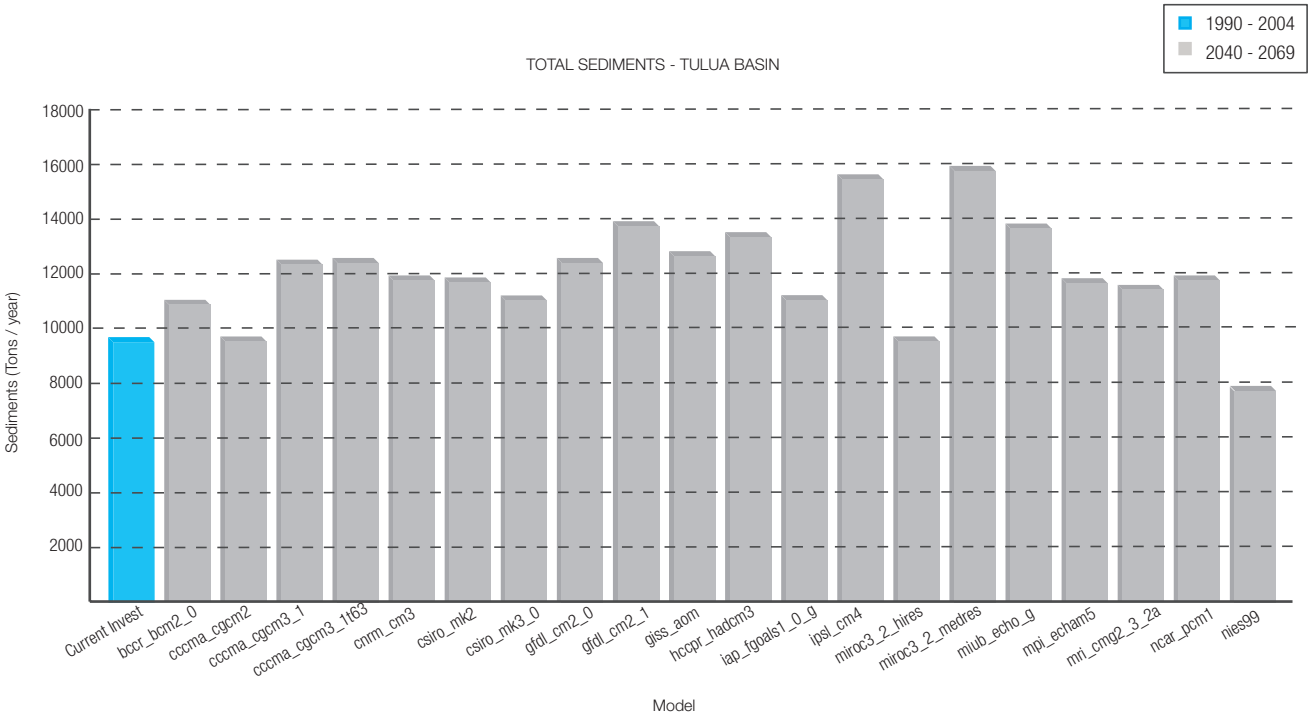


Figure 12. Sediment level estimated with 20 climate change models. Tulua Watershed, Cauca Valley. Water for Life Water Fund.

• *Source: CIAT, TNC, NAT CAP, 2011.*

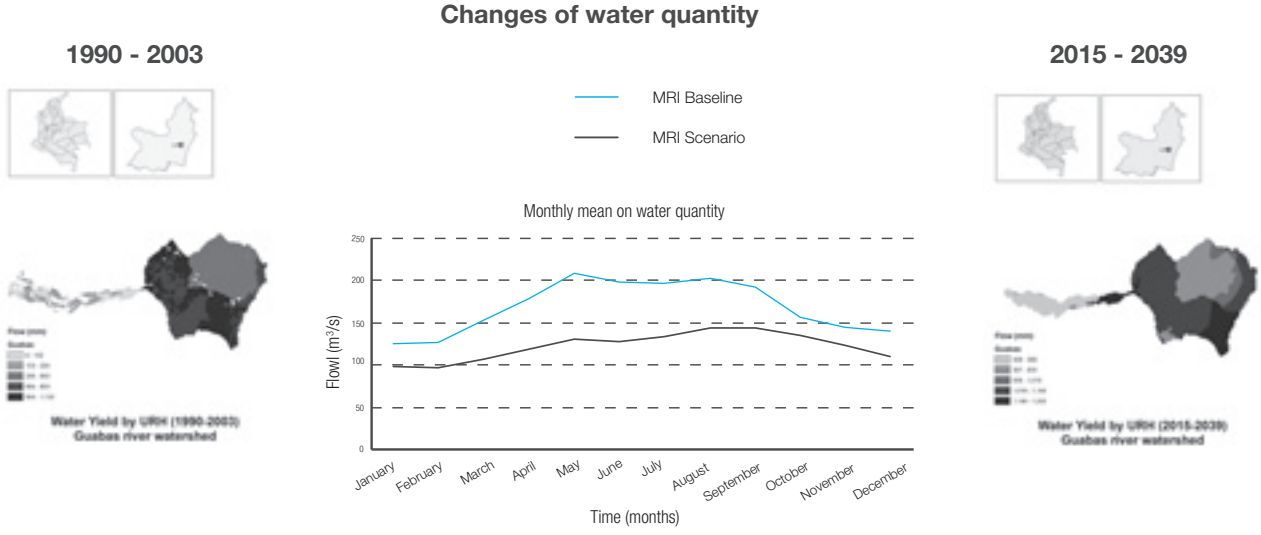


Figure 13. Analysis of water quantity changes in Guabas River, Cauca Valley. Water for Life Water Fund. • *Source: CIAT, TNC, Natural Capital Project, 2011.*

2.2.3 Socioeconomic Analysis

The integrated management of water resources that is intended with the creation of a water fund requires understanding the watershed's operation and internal relationships.

This involves exploring and understanding the activities, relationships and socioeconomic benefits expected as a consequence of the water fund's investments. In general, insufficient knowledge and application of methodologies to value environmental goods and services and the benefits of social inclusion lead stakeholders to make poor decisions, especially when they exclude natural capital preservation and the expansion of human well-being. Thus, the price signals, or the values to prioritize market actions, do not precisely measure the environmental consequences of economic activities and, therefore, create negative incentives that lead to the degradation of renewable natural resources. The clearest example of this dynamic is the price charged for drinking water in cities, because in most cases the price does not include the realistic environmental cost of restocking environmental assets or conserving the health of ecosystems where water is obtained.

Among the technical studies that should be conducted for water fund creation is developing a component that will help value environmental services and promote the inclusion of environmental costs in decision-making by the fund's partners. The water fund should represent an attractive option for its partners in terms of environmental, social and economic benefits. It is important to determine what those benefits are, based on biophysical information, and to include clear indicators of the socioeconomic aspects that should translate into benefits for the partners as well as for the ecosystems in general. This involves identifying the business opportunities that will make a positive difference in the watershed and, who should pay, and how much should be paid for those environmental services.

A water company's treatment costs as a result of sediment load, the current expense of building a dam and its consequences on ecosystems, the risk due to water scarcity in the medium term, and the vulnerability to pollution of an ecosystem that supplies water are only some of the variables that can be quantified, valued and compared to more attractive options from the financial and environmental points of view.

Considering that one of the strengths of a water fund is the possibility of implementing a payment or compensation scheme for environmental services, this valuation is a necessary step that will help quantify the water fund's financial needs for its investment plans. The monetary valuation is the value of the physical and psychological benefits obtained from the assessment of environmental factors. The objective of monetary valuation methods is to estimate the variations in well-being as a result of a change in environmental quality patterns. The valuation is a complement of the assessment of environmental policies, since it is necessary to quantify the physical units in monetary units in order to homogenize and express the calculations in economic terms. These methods can be applied both to the valuation of environmental goods and agents as well as to the effects of certain external agents causing impacts on the environment, mainly pollution (Mandiburu, 2005).

There are several methodologies in the current literature to value environmental services that can be used to quantify the benefits of decisions that a water fund may make. The technical studies discussed in this chapter will provide the fund with the necessary arguments to present to new partners an economically attractive option with clear environmental, social and economic returns, or simply as a profitable business. Some of these methodologies, which are easy to apply, are explained below.

Opportunity Cost Analysis

This method uses the maximum alternative sacrificed value to make an economic decision. The alternative cost of the opportunity of producing a unit of good X is the amount of good Y that must be sacrificed to obtain it. Thus, the opportunity cost will vary depending on the project being considered (be it conservation, sustainable development, industry or other), which projects or activities must be sacrificed (such as fishing, hunting, timber exploitation, agricultural or cattle use) and any other activity that will lead to conservation.

For example, an ecosystem preservation project, which logically implies not using natural resources, will require paying the stakeholders who use those natural resources in order for them to relinquish their rights to the use of those resources. The exercise of calculating the opportunity cost requires having a substitute project or alternative to the current use to be relinquished. This is because, due to the scarcity of the resources, it will be impossible to carry out both alternatives in the same area, unless changes in technology and resource use patterns occur. The opportunity cost calculation is therefore based on the estimate of the net benefits obtained from current productive activities carried out by people living in an area (such as wildlife hunting, fishing, wood extraction). To do this, a traditional financial project evaluation methodology is use, based on the flow of funds from productive activities.

Contingent Valuation Analysis

This direct valuation method is based on surveys regarding the maximum price that citizens are willing to pay for an environmental "improvement" or the minimum price they would accept as compensation to withstand a certain hardship. This method is used in cases where no market information is available on people's preferences. The process consists of taking representative samples of people in a given location and grouping homogeneous participants, taking into account variables such as social class, age, sex, income, education level, area where they live, etc. People are asked how much they are willing to pay for a benefit and/or how much they are willing to accept as compensation for environmental damage.

The aim is to obtain the interviewees' personal valuation of an increase or reduction of the availability of an environmental good, using a hypothetical market (Munasinghe, 1993). The main advantage of this method is in the direct valuation citizens make of their preferences. Credibility may be lost, however, if these preferences are influenced by producers of those goods or by other people who consume those goods.

Avoided Cost Analysis

This methodology is based on the assumption that the costs of preventing environmental damage are assumed by society as a whole and, therefore, it provides a value indicator of the good being analyzed. The method identifies positive or negative effects caused by a change in the quality of the resource (such as air or water) on the elements that directly or indirectly interact with it. In order to use this methodology, it is necessary to evaluate the group of costs that different stakeholders will have as a result of a specific action, such as additional costs for building infrastructure or prevention projects and the costs of restocking assets due to inadequate management and environmental impacts. Likewise, the calculations may include physical damages caused by a specific agent. The translation into monetary terms is carried out by evaluating the cost of the loss of material resources. For example, when floods occur, it would include the cost of the destruction of homes, infrastructure that can no longer be used, damaged furniture and material damage using the market price. Costs produced by diseases (medications and hospital treatments) and inability to work would also be taken into account.

The reliability of this methodology may be affected because the costs of preventing environmental damage depend on individual or social valuations, society's awareness, and the negotiation capacity of certain groups or budgetary issues (Sánchez, 2003).

As an example, the following table shows some results of the models used to determine the socioeconomic component in some of the water funds that TNC has worked on:

Water Fund	Type of Analysis	Result
Bogota	Shadow Price of Water (ECOSAUT)	The study estimates the value of water in US$0.37 per m3. The estimate represents the value from the producer's point of view. It can also be considered as the average cost to encourage conservation. It is estimated that this cost is equivalent to US$ 601 per hectare per year.
		At the same time, the study also shows that the company would save US$4.5 million a year on water treatment due to the reduction of sediments that would result from investments in conservation.
Cartagena	Opportunity cost analysis	The opportunity cost analysis shows that the total amount of compensation for three areas of improvement — Rocha, Boca Cerrada and Puerto Badel — in net present value with a discount rate of 10% is the following: Scenario 1-Conservation: US$55.5 million, if payments for 100% of the costs of the activities developed in the three improvements are recognized. Scenario 2-Sustainable Use: US$28 million, if payments for 50% of the costs of the activities developed in the three improvements are recognized.
Cauca Valley	Avoided costs analysis	Data from ASOCAÑA and TNC show how the possible reduction in water offered in certain times of the year and the increase in the demand by the sugar production sector may be reducing irrigation cycles from 5 to 4. This would generate a reduction in productivity of around 9%, costing the sector US$33 million. Investing in the watershed to ensure the maintenance of the 5 cycles costs US$2 million per year.

Figure 14. Socioeconomic models used for designing water funds.

• *Source: TNC, 2011.*

Some models integrate spatial variables with socioeconomic results. One example is the Modelo de Evaluación Económica, Social y Ambiental de Usos de la Tierra (Model for Economic, Social and Environmental Evaluation of Land Use), ECOSAUT. Developed by CIAT, this model seeks to evaluate the relationships between human populations, agricultural and livestock activities, production costs and environmental impacts. The model was created to help quantify environmental externalities in Andean watersheds. ECOSAUT is an optimization model that allows researchers to identify and design natural resource management strategies that minimize potential environmental and socioeconomic impacts that may be caused by human activities at a parcel, micro-watershed or watershed level. This helps decision-makers to quantitatively demonstrate the impacts that may be caused by different measures related to the promotion of new technological alternatives, the fulfillment of land use policies, etc. The model has been designed to represent an agricultural and ecological system in which activities or processes are linked with environmental and socioeconomic restrictions and, therefore, have an impact on the net incomes of producers as well as on environmental externalities. The model uses lineal programming, which helps examine and compare the socioeconomic and environmental performance of different activities through a trade-off analysis (Quintero et al, 2006). This model was used by CIAT in the feasibility studies for the Bogota Water Fund.

2.3

Legal and Institutional Analysis

Technical studies must also include a legal and institutional analysis. The water fund's transparency, independence and long-term permanence must be justified in a study that analyzes the different legal and institutional alternatives for its structure and operation.

It is very important to comply at all times with the guidelines, laws and procedures of the participating institutions as well as the country or region where the fund will operate. Local ordinances and laws must be carefully analyzed to ensure that all requirements are met and no current policies are violated.

The following are some of the most important topics to be analyzed in legal and institutional studies:

Current Legislation

Some countries have relatively recent environmental legal frameworks or are in the process of establishing them. It is very important to understand these legal frameworks to avoid conflicts in the water fund proposal. On the contrary, the water fund should contribute and complement plans, programs and projects that different governments have established in their environmental policies. The legal feasibility study should analyze the following aspects:

- General national environmental policy, particularly programs dealing with watershed protection and management of water resources.

- Current legislation for financing environmental services. Existing environmental funds for conservation.

- Capacity, feasibility and, in some cases, obligations of different public agencies to provide financial resources for watershed management and conservation projects.

- Current legislation to establish water service rates.

- Existing financial mechanisms for conservation coming from other funding sources such as international cooperation.

Current Management Plans

As mentioned before, water funds are an effective tool to satisfy the financial needs of protected areas. Many of them already have management plans in place, but in most cases they lack the financial resources to update and implement them. Once With key water fund stakeholders identified, it is important to carefully explore existing management plans and how the water fund could partially or fully contribute to financing them.

Likewise, it is important to consider integrated watershed management plans that may have already been prepared or are in preparation. These provide important guidelines for features of the watershed that the water fund will need to take into consideration when implementing its activities.

Legal Nature of Potential Water Fund Partners

With potential water fund partners already identified, it is important to determine the legal nature of each of them in terms of their ability to contribute resources to establish the water fund in the short, medium and long terms. This is particularly the case with public institutions. Each country has different regulations for the administration of public resources, but they are generally subject to a permanent oversight by state audit agencies and, thus, they may present limitations or require additional steps for their execution in a water fund.

Resource Administration

A water fund's success will largely depend on the adequate management of resources, independence, legal and financial guarantees and self-sustainability achieved for financial resources, as these can sometimes be limited. It is essential, then, to choose the best option to administer resources among the many available alternatives based on each country's conditions and the needs of each fund. Alternatives to managing the resources of a conservation fund range from a fully private market financial institution to an environmental trust established in order to finance sustainable development projects. Legal and institutional feasibility studies should explore these alternatives and determine which of them best fits the legal requirements of the institutions that will establish the water fund. Some alternatives that may be considered are presented below:

1. Trust Fund

One of the best options, per TNC's experience in the establishment of water funds, is to manage resources through a trust fund. A trust fund is an agreement by which an individual or a legal body (constituent or trustor) gives a trust organization one or more specific goods, whether or not it relinquishes ownership of them, in order to achieve

a certain goal that will benefit the constituent or a third party expressly identified by it. When the party does not relinquish ownership, it is called a fiduciary assignment. The trust organization commits to making its best effort to achieve the goal determined by its client, managing the received goods to that end. It is a contract of means, not of results, and it is a hybrid between traditional banking and investment banking.

Generally, this type of contract builds more trust among future fund contributors and the general public, given that these independent organizations do not have any relationship with the water fund partners. Its success lies in the fact that it is a long-term resource management tool that can guarantee adequate performance and compliance of the fund's investment objectives for many years, which is a very important element in the operation of water funds.

Likewise, these contracts clearly establish that investments can only be made to achieve the objectives for which the fund was created, and funds may not be siphoned off. Two key elements must be taken into account regarding trust funds:

• Legal Nature of the Trust Fund: It is necessary to determine what type of trust is more suitable to the needs of the water fund: a public trust — which generally facilitates the participation and disbursement of resources from the public sector and avoids lengthy biding processes — or a private trust, which operates in a competitive market and would require searching for an institution that offers the best financial conditions to administer resources, such as high interest rates and low administrative commissions.

• Capital Resources and Investment Resources: It is important to factor in how resources will be financially managed, the percentage of resources that will be left as capital and the percentage to be used in investments. This type of management can be very flexible and will depend on the availability of resources and the needs identified for each fund. In some cases, funds will need to make large investments in order to attract new partners or to carry out technical studies for their operation, so the percentage for capital may be very low or zero. In other cases, if long-term resources are guaranteed, it is best to set aside part of the sources for capital at the beginning, so that financial returns will increase from the time the fund starts operating.

In any case, the commercial financial institution (be it public or private, whichever is more convenient) ensures resources in terms of control, supervision and solutions to any potential financial risks, which guarantees the adequate operation of the conservation fund.

2. Existing National Environmental Fund

These funds are highly linked to each country's environmental dynamics and projects. Although some of them also operate under a trust scheme, a subsidiary account can often be created within them to manage the resources of a water fund. Generally these types of funds are created to carry out activities aimed at protecting natural resources and allocating additional funds. National environmental funds have the capacity to manage large budgets contributed by international cooperation for the development of environmental projects and have the advantage of experi-

ence in managing fresh resources and technical capacity. In addition, administration costs may be reduced by negotiating and agreeing on an administrative commission and a contribution of hours worked by the employees of the environmental fund.

3. Creating a New Organization

In some cases it may be faster and more efficient to create a new institution, such as a non-governmental organization, as a new legal body to manage the fund's resources, operation and implementation of activities. Although it is a valid option, it would undoubtedly increase administration costs and not be able to take advantage of the experience and name recognition of another institution better able to manage the funds and leverage new resources. One of the premises in creating a water fund is to optimize resources and avoid bureaucracy, so using an existing institution would be a better option.

4. Opening a Bank Account

Managing a water fund through a bank account helps reduce administration costs, as only bank costs would need to be covered and trust administration commissions would not need to be paid. While this option is valid, it lacks some of the advantages of using an existing environmental fund in terms of the technical and financial capacities already available, and it lacks the financial benefits of using a trust fund.

Some of the alternatives discussed above have been used in funds promoted by TNC in the Andean Region. The following table provides an overview of some of the solutions for managing resources that have been deemed most appropriate in each case.

Although each country and fund has its own specifics, TNC recommends, where possible, the use of commercial trust funds accompanied by a document that regulates and makes transparent the decision-making process in the short and long term.

Water Fund	Organization that administrates the resources	Type of entity
FONAG (Quito)	Private trust fund.	Private financial commercial organization.
FONAPA (Paute)	Public trust fund: National Financial Corporation.	Public financial commercial organization.
Agua Somos (Bogota)	Existing environmental fund: Patrimonio Natural.	Private foundation, created to strengthen the National Protected Areas system.
Water Fund for Life and Sustainability (Cauca Valley)	Private trust fund.	Private financial commercial organization.

Figure 15. Some examples for water fund's financial management.

• *Source: TNC, 2011.*

2.4

Expected Outputs of Feasibility Studies

Feasibility studies can give a clear picture of many fundamental aspects that will indicate whether or not setting up a financial mechanism for conservation is relevant. These studies provide a baseline on which to begin designing a water fund. As discussed in this chapter, the following information should be obtained from these studies:

With the application of hydrologic models or the analysis of hydrologic data used to understand the watershed's dynamic, the expected outputs are:

- Conservation objective proposed for the water fund, according to the key environmental services identified for a specific area.
- Selection of priority areas for conservation, according to these environmental services.
- Goal of the area for which the fund will work to achieve its objective.

With the application of socioeconomic models or the use and analysis of available social and economic information, the expected outputs are:

- Total estimated amount of necessary financial resources to carry out activities and operate the water fund.
- Alternatives of the investments the fund will be able to make from various intervention possibilities to achieve the fund's objective.
- Financial goals to leverage new resources with other institutions and attract potential new partners in order to guarantee the fund's sustainability.
- Social goals and impacts on people that the fund expects to achieve through its investments.
- Type of institutional partnerships to use financial and in-kind resources in the watershed.

With the legal and institutional analysis, the expected outputs are:

- Possible adequate legal structure for the fund's operation in accordance with the country's environmental laws, regulations, plans and policies.
- Possible mechanisms to manage financial resources.

Agua Somos, a water fund for Bogota and its neighboring municipalities

Colombia's capital is a city of more than 8 million people. More than 80% of the water consumed by Bogota's residents is supplied by the Chingaza system, located east of the city. The system comprises the watersheds of the Chuza, Guatiquia and Teusaca rivers, in addition to the Chuza dam that has a capacity of 257 million cubic meters. Both the dam and the rivers' headwaters are located within Chingaza National Park, which was created in 1974. The Park covers 76,600 hectares (189,282 acres) and harbors high-Andean forests and páramos of vital importance. In addition to being the habitat for a large number of species, these forests and páramos regulate water flow, control sediments and guarantee the supply of good quality water for the city of Bogota.

Alterations in land use have significantly modified some parts of the park, particularly its buffer zones, where human settlements have expanded areas used for livestock and agriculture for their livelihood. İn addition, the park's budget is insufficient to meet the needs identified in its management plan. Therefore, ecosystem conservation efforts and the possibility of offering alternative sustainable economic activities to local communities are also insufficient. This has revealed the long-term risk in the supply of good quality water for people living in Bogota. This risk is equally valid for the Tibitoc (north of the city) and La Regadera (south of the city) systems, which supply water to the remaining 20% of Bogota's population.

The Bogota Water and Sewage Company (EAAB) annually spends a considerable amount of resources on water treatment, which could increase in the future if necessary measures are not taken to stop ecosystem transformation and to protect watersheds. Likewise, the National Parks Service, the national government agency in charge of managing national parks, has expressed a permanent interest in participating in innovative schemes that will allow it to leverage resources to implement its programs and projects. The National Parks Unit is supported by the Patrimonio Natural Foundation, a public-private organization whose goal is to make strategic investments to conserve nature and environmental services. Thanks to resources provided by international cooperation, this organization, created as a trust fund, promotes public policies that help finance conservation, designs and establishes financial tools and mechanisms, and manages specific projects.

İn 2006, TNC began contacting public and private institutions to promote the idea of creating a water fund for Bogota and its neighboring municipalities. A year later, a Memorandum of Understanding was signed between EAAB, the National Parks Service, Patrimonio Natural Foundation and TNC to combine technical and financial efforts to determine the feasibility of creating a watershed investment mechanism aimed at conserving ecosystems. That year, feasibility studies were undertaken with two main components:

1. Application of models to determine the hydrologic dynamic of the watersheds of the supplying system, which included quantifying water volume flows and yields, sediment levels and the importance of fog capture in the hydrologic balance for the area. This study was developed by the International Tropical Agriculture Center (Centro Internacional de Agricultura Tropical –CIAT-).

2. Legal alternatives for the establishment and structure of the Bogota Water Fund, as well as analysis of potential funding sources and resource flows. This analysis was carried out by the firm ECONOMETRIA.

The studies were completed in 2009. They determined the viability of creating a mechanism aimed at conserving the watersheds supplying the system, emphasizing the prevention of impacts caused by erosion in rivers and sediment from inadequate livestock practices and human pressure on natural ecosystems, such as deforestation and disturbance of the páramos.

TNC made parallel contact with the private sector to promote the participation of corporations in the Bogota Water Fund. Thanks to these contacts, SabMiller Bavaria brewery, the largest in the region, committed resources

to the fund. Its interest, beyond a simple social and environmental responsibility, coincides with the water fund's objective: To reduce sediment levels and prevent an additional sediment load in the long term, thus saving costs for water treatment to produce beer. The Bogota Water Fund was launched publicly in May 2009. In October of that same year, a two-year Cooperation Agreement was signed in which EAAB, SabMiller Bavaria and TNC committed $1,300 million Colombian pesos (US$ 650,000) as their initial contribution to kick-start the fund's operation.

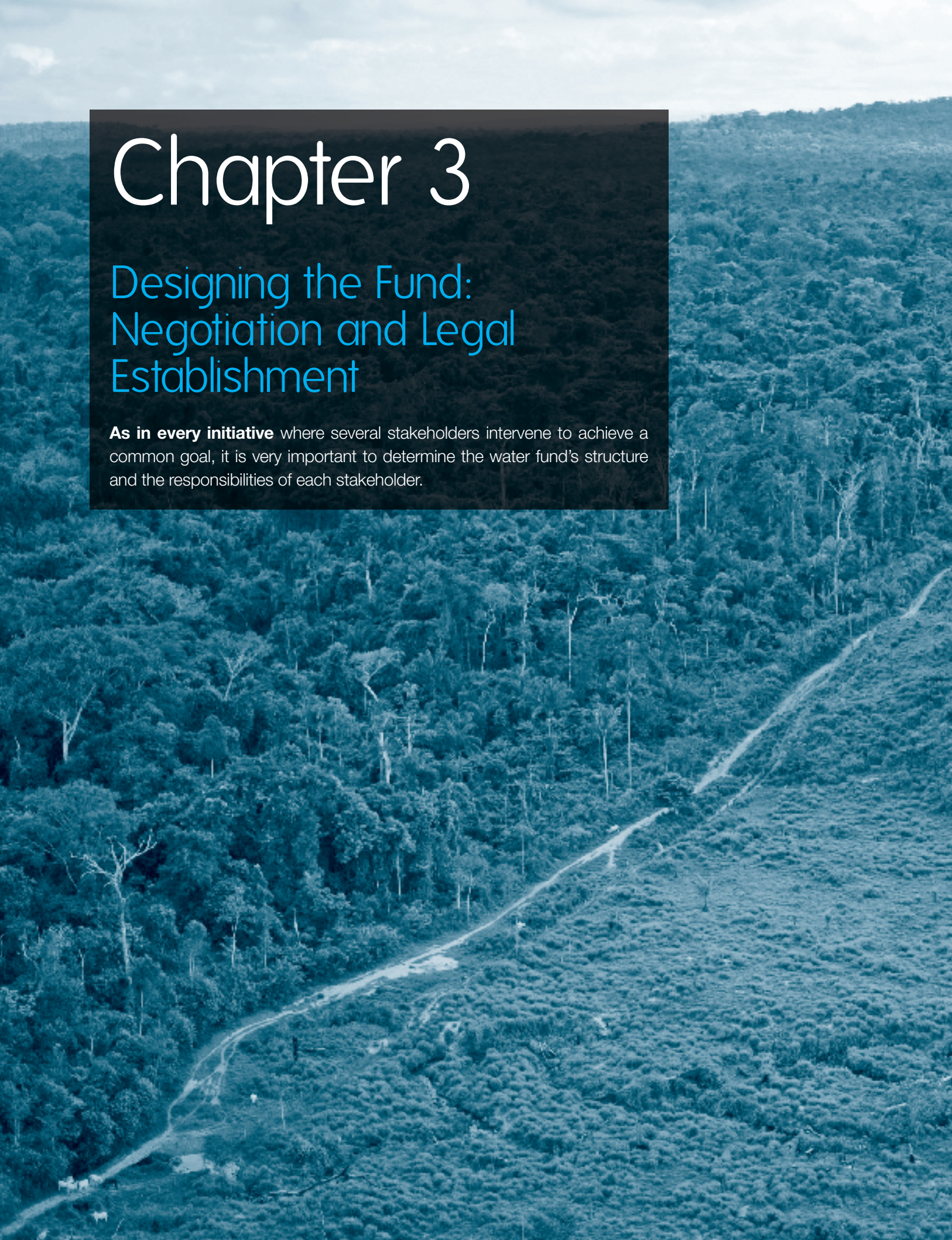
This seed money covered the costs of a full-time technical secretary to lead the water fund, the completion of some necessary legal studies for its operation, an investment in a large marketing campaign to promote the fund and leverage resources from voluntary donations from citizens of Bogota and the private sector in general, and the implementation of some restoration activities in the field. When this Cooperation Agreement expires, it is expected that the fund will have the technical, legal and financial base to operate and achieve its objectives.

In accordance with the feasibility studies, Agua Somos — the commercial name of the Bogota Water Fund — intends to prevent two million tons of sediment from entering the supplying system, which represents approximately US$40 million in savings in treatment costs over the next decade.

Chapter 3

Designing the Fund: Negotiation and Legal Establishment

As in every initiative where several stakeholders intervene to achieve a common goal, it is very important to determine the water fund's structure and the responsibilities of each stakeholder.



This structure will provide the basis on which the water fund will operate harmoniously and efficiently, assigning specific responsibilities to optimize efforts and achieve the goals and objectives set for the long term.

The design of its structure must be formalized in a contract signed by the partners. According to their legal nature and each country's legislation, this contract guarantees the partners' commitment to participate in the fund through an explicit agreement to unite efforts to carry out watershed conservation activities. Likewise, it is a guarantee to third parties that may want to contribute donations or other types of financial resources.

This chapter shows the components of these contracts, emphasizing the most relevant aspects that should be considered in negotiations not only between the fund's partners but also between the partners and the financial institution that will manage the funds.

3.1

Designing the Structure

A conservation fund is a financial mechanism that seeks to assemble different water users who will voluntarily (or compulsorily, depending on each country's legislation) contribute to conservation activities in the watersheds from which they obtain water resources. The best structure, or institutional arrangement, to establish this financial mechanism will depend on the legal nature of each of its members and the regulations defined among its partners.

A good structure for a water fund is illustrated below:

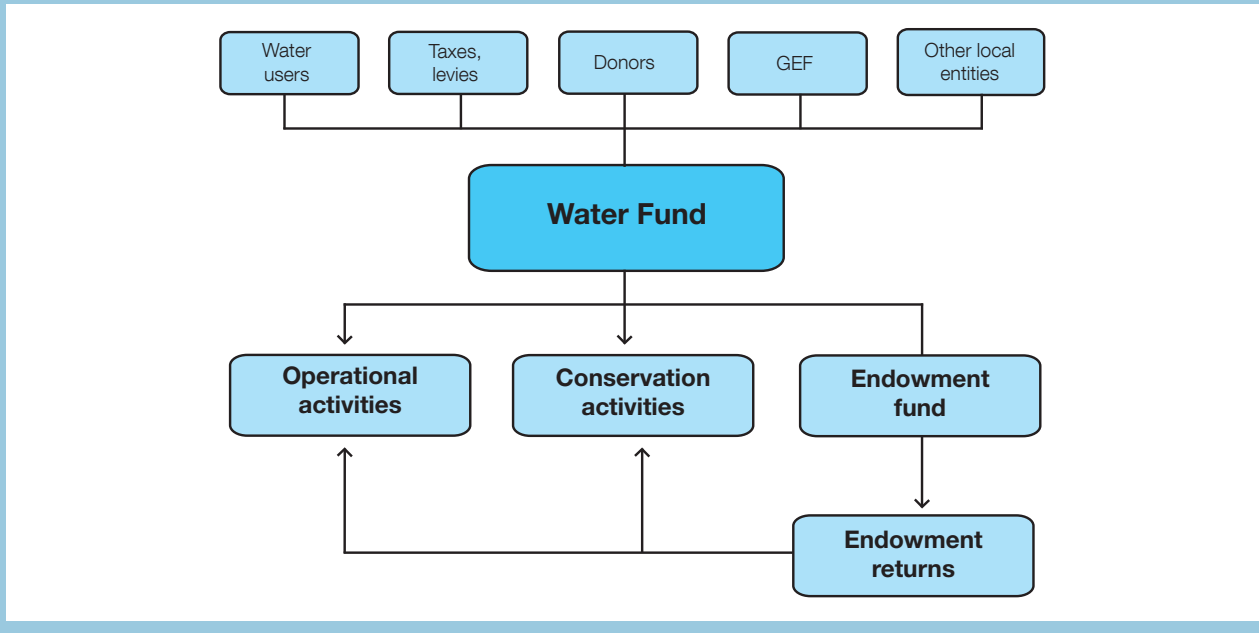


Figure 16. Structure of a water fund. • *Source: TNC, 2011.*

The general guidelines for the fund will be the responsibility of a board of directors, the main executive body of the fund formed by representatives of partner institutions. Although ideally there should be a balance between the public and private sector in this board, in order to guarantee transparency and objectivity when making investment decisions, sometimes this balance is not possible due to strategic, political, institutional or legal restrictions. In any

case, decisions made by the board of directors should be analyzed, discussed and agreed upon in accordance with the previously established regulations in the fund agreement. This institutional arrangement promotes a strategic alliance between the public and private sector that will result in a better integrated water management.

Although the board of directors approves investment decisions in a balanced manner in the fund, it can also rely on a technical committee in charge of providing necessary supporting information and investment alternatives from a technical perspective. This committee should be composed of technical employees from the institutions that make up the fund, or from organizations specifically invited by them, and its main role is to ensure that the conservation fund's investment decisions are in line with the conservation and management plans, programs and conservation projects in the watershed. The technical committee is a permanent advisory body of the technical secretariat that ensures the water fund's investments will be in accordance as much as possible with the interests of all partners.

The technical secretariat, or management of the fund, is a technical body responsible for executing the guidelines provided by the board of directors. It is charged with carrying out specific conservation activities, leveraging additional resources and generally supervising operations. The technical secretariat works under direct supervision of the technical secretary, who is appointed by the board of directors in a democratic and transparent manner. It should be

a person capable of giving the fund its own identity, so that it will not be seen as an extension of any particular member, but as a new, independent and efficient organization that has resulted from the effort of many institutions. Depending on the size and needs of the fund, the technical secretary may be supported by one or more technical employees.

Finally, resources should be managed by a financial institution. As shown in the previous chapter, a detailed analysis should be made to determine the best type of financial institution for the fund: a private trust, a public trust, an environmental fund or a new legal organization. In any case, the management of resources must be supported by a long-term contract with the financial institution that guarantees the necessary timeframe to achieve conservation objectives.

Creating a water fund does not necessarily mean the creation of a new organization. Although this may be a solution to overcome legal obstacles, an important premise in the creation of a water fund is the optimization of resources and the use of its partners' available technical capacity, in order to avoid creating new legal bodies that will require incurring significant additional costs.

The structure of a water fund should not be just a schematic on paper. A contract specifying the fund's members and their roles will be the basis for the entire negotiation process described below.

As in any process in which different stakeholders are involved, the creation of a water fund demands dedicating time to negotiating some aspects of the fund to ensure its adequate operation. The objective of this negotiation process is to balance the interests of each fund partner and formalize agreements reached in the signed contract.

In general terms, a water fund must be based on a contract, agreement, or Memorandum of Understanding that clearly specifies the fund's different components, the relationship between those components and the obligations and commitments of each partner or member. If necessary, according to the type of institution that will manage the funds, this contract must be supported by a commercial agreement with the financial institution that will manage the funds, with a focus on how the fund will operate and the guidelines for its administration.

3.2

Negotiating the Contract between Partners

This contract must comply with fundamental legal requirements and corporate purpose of each partner.

Depending on the degree of complexity of the contract, its improvement should be overseen by a specialized law firm to ensure that all legal guarantees are included, that no legislation is violated, and that nothing will hinder the adequate performance of the fund.

The contract between partners must specify a series of elements, some of them negotiable depending on the interest of each partner. The most common elements to be included in the contract are the following:

- Purpose of the contract.
- Partners or members that sign it.
- Components of the fund.
- Legal capacity to be part of the water fund, given the legal nature and corporate purpose of each partner.
- Activities the fund is expected to carry out.
- Amount of contributions, both in seed money and in other contributions each partner will make.

- Necessary requirements new partners must meet in order to join the water fund.
- Duration of the contract.
- Structure of the water fund according to what was discussed above, specifying the role of each component: board of directors, technical committee, technical secretariat and trust fund.
- Decision-making mechanism.
- Composition of the board of directors, rotation and mechanism to incorporate new members and capital.
- Identified risks and conflict-resolution mechanisms.
- Internal and external audit mechanisms.
- Future dissolution mechanisms.

3.3

Defining a Decision-making Mechanism

The decision-making process within the components of the water fund is a key element for its operation. As mentioned before, the fund's board of directors will be responsible for this and, therefore, internal guidelines should be prepared considering the following topics:

- Members that will participate in the board of directors.

- Timeline and timeframe of meetings.

- Decision-making mechanism within the board of directors, defining the voting process and the participation of each partner in it.

- Decision-making mechanism in case of total disagreement among partners.

- Representation system in case any members are absent.

- Mechanism to include new members.

- Conflict-resolution mechanism within the board of directors.

- Dissolution and resource allocation mechanisms.

The water fund's investment decisions must be made in consensus and with transparency. As a general rule, in one of the decisions made by the board of directors should favor the particular interests of any one of its members. To that end, a voting mechanism should be defined to guarantee the balance between the public and private sector, and special clauses should specify the inability of a member to participate in the decision-making process if necessary. This guarantees that decisions, including the appointment of the technical secretariat, are truly discussed and reached in a consensual, independent and transparent manner.

3.4

Defining Administration Commissions and Salaries

The water fund's administration costs are linked to the total amount of resources available. One of the issues that must be negotiated in this phase is the administration cost that the trust institution will charge for this service. In general terms, resource management costs must be identified according to one of the following alternatives:

- Annual percentage of the resources deposited in the trust fund.

- Annual percentage of the resources executed in investments by the water fund.

- Commission for each financial operation the trust institution must make.

In any case, it is the partners' role to select the best alternative to negotiate rates that are in accordance with the market and the general context of similar funds.

The partners also must negotiate and agree upon salaries and operational costs for the water fund. In general, salaries must be paid to the technical secretary and employees if necessary. The partners also should negotiate and agree upon the maximum amounts assigned to the technical secretariat for its operation, including office equipment, corporate branding, facilities and rent payment, if necessary.

3.5

Contract Signature among Partners

Signing the contract to establish the fund implies accepting the conditions and agreements that have been made regarding all topics covered in previous chapters.

Because of this, each partner should have their legal departments review the final document before signing the contract to establish the fund. All contributions committed, salaries and administrative commissions must be ratified in addition to the decision-making mechanism discussed above (internal board of director regulations), which should be included as an appendix to the contract between partners. The same procedure should be followed for the trust contract.

3.6

Launch Event

It is important that the water fund be known not only by the public in general, but also by sectors that may be key participants in it. Because of this, the contract signing by partners is a good opportunity to promote the water fund to the media and thereby reach new potential partners.

A simple launch event should be organized, with invitations to media, key private sector stakeholders, local governments, important trade associations, environmental authorities, government environmental agencies and non-governmental organizations. An agenda should be prepared for this event, covering all the topics the partners wish to publicize. Among them are:

- Brief history of the water fund.
- Objectives and goals of the water fund.
- Financial resources at the moment of contract signing.
- Financial needs that will encourage new partners to invest in the fund.
- Advantages of participating in the water fund.

The water fund should thus begin to form its own identify. İt should be recognized as a joint initiative of several institutions and not as a specific project of any one of its members. İt is best to create a commercial name for the fund that links to its nature and, if possible, the geographic location where the activities will take place, such as the name of the watershed or the name of the city that will benefit from it.

The water fund must not become a political tool or merely an institutional mechanism. The previously proposed design creates the necessary instances and legal guarantees to ensure that the fund will be a financial mechanism in which several public and private institutions will participate to achieve a common long-term goal. This message must be clear to the audience, hence the importance of the fund having its own identity and being transparent and efficient.

The water fund should also be under permanent public scrutiny. Periodic audit processes should be carried out and information should be disseminated regarding its management and progress in achieving its goals. The fact that the fund may often have public resources involved should be always kept in mind, since this generally implies that a series of additional controls will be carried out by national government authorities. The fund must have well-organized and transparent bookkeeping.

The Water Fund for the Conservation of the Paute River Watershed -FONAPA

The Paute watershed is of great importance because it harbors Ecuador's largest hydropower plants and supplies water to communities, agriculture and industrial users.

The Paute River watershed is located in south-central Ecuador and is part of the Santiago River basin, which is in turn part of the Amazon River basin. It covers an estimated area of 5,000 km^2 (1,930mi^2). Nearly 700,000 people currently live in its human settlements, 45% of which correspond to urban populations concentrated mainly in the cities of Cuenca and Azogues, while the remaining 55% is classified as rural population. The higher zones of the Paute River basin supply drinking water for Cuenca, which is located in Del Azuay Province in the southern area of the Andes Mountain Range at approximately 2,500 meters (8,202 feet) above sea level. It is the third-largest city in Ecuador, with 450,000 residents.

The city of Cuenca obtains water from four rivers — Machangara, Tarqui, Yanuncay and Tomebamba — that feed the Cuenca River, which in turn forms the Paute River. These rivers are located within Cajas National Park, with an area of 28,000 hectares (69,189 acres). The Environmental Management of the Municipal Telecommunications, Drinking Water, Sewage and Environmental Sanitation of Cuenca Public Company (ETAPA) has shown a permanent concern for the protection of these watersheds.

FONAPA
Fondo del agua para la conservación de la cuenca del río Paute

In July 2007 a cooperation agreement was signed between ETAPA and TNC to promote the establishment of a mechanism to reinvest in watersheds with the goal of "collaborating for the conservation, protection and management of the higher Paute River basin that supplies water for different uses, in order to guarantee water quality and flow, protecting its biodiversity."

Under this cooperation agreement, a financial mechanism was created based on the example of the Quito Water Fund, FONAG. ETAPA formally invited several Paute River watershed consumers to participate in the initiative, including the Del Austro S.A. Electricity Generation Company (ElecAustro) and HidroPaute (now CELEC, HidroPaute's business unit). ElecAustro depends on the Machangara River basin (in the higher zones of the Paute River watershed) to generate electricity. This is the largest country's electricity generation company, and water used by HidroPaute to generate electricity comes from the Paute River basin.

The FONAPA mercantile trust was established in Cuenca on September 26, 2008, with the National Financial Corporation (a public trust institution). The trust was created with the following constituents: ETAPA, TNC, ElecAustro, Hidro-Paute (now CELEC), the University of Cuenca, the Tropical Mountain Range Foundation (Fundación Cordillera Tropical) and the Municipal Drinking Water, Sewage and Watershed Management Company of the Azogues Municipality (EMAPAL). The fund started off with initial capital of $490,000 and the aim of collaborating to ensure the conservation, protection, preservation and restoration of water resources and their environments in the Paute River watershed through the investment of returns from the trust's autonomous capital and from external contributions in projects and programs designed to that end.

FONAPA has a trust board formed by all its constituents. The main roles of the board are appointing the board of directors, reviewing and approving annual reports, agreeing upon any contract modifications, and resolving the fusion, dissolution or anticipated liquidation of the trust contract. FONAPA's board of directors is composed of all three major contributors to the trust fund, and the other two members are elected by the remaining constituents of the trust board. All members of the board of directors have the right to vote, and decisions are made by a majority. The board of directors dictates regulations for the trust fund's operation, appoints the technical secretariat, approves work plans and annual budgets, approves the incorporation of new members to the trust, and leverages new contributions from all involved. FONAPA's technical secretariat is the operational branch of the fund and implement what the board of directors decides. In addition, FONAPA has a consulting technical committee that advises the secretariat and is formed by delegates of the constituents.

Since its creation in 2008, FONAPA has financed several of the following activities:

• Community Park Rangers: Strengthening of associated park ranger microenterprises for the conservation of nature. This microenterprise was created to work with local communities to take care of protected areas. The microenterprise has worked in the southern area of Sangay National Park and together with FONAPA other parts of the Paute River. FONAPA's vision is to strengthen this microenterprise to promote the good management of critical conservation areas in the watershed.

• Environmental Education Network: FONAPA coordinated the creation of an integrated network for environmental education in the Paute River watershed.

• Design of a New Tool to Support the Decision-Making Process: Part of the contribution that FONAPA makes is the design of technical tools that may improve decision-making processes to prioritize the region's most vulnerable places. This tool is being designed by Del Azuay University and will be made public and freely available.

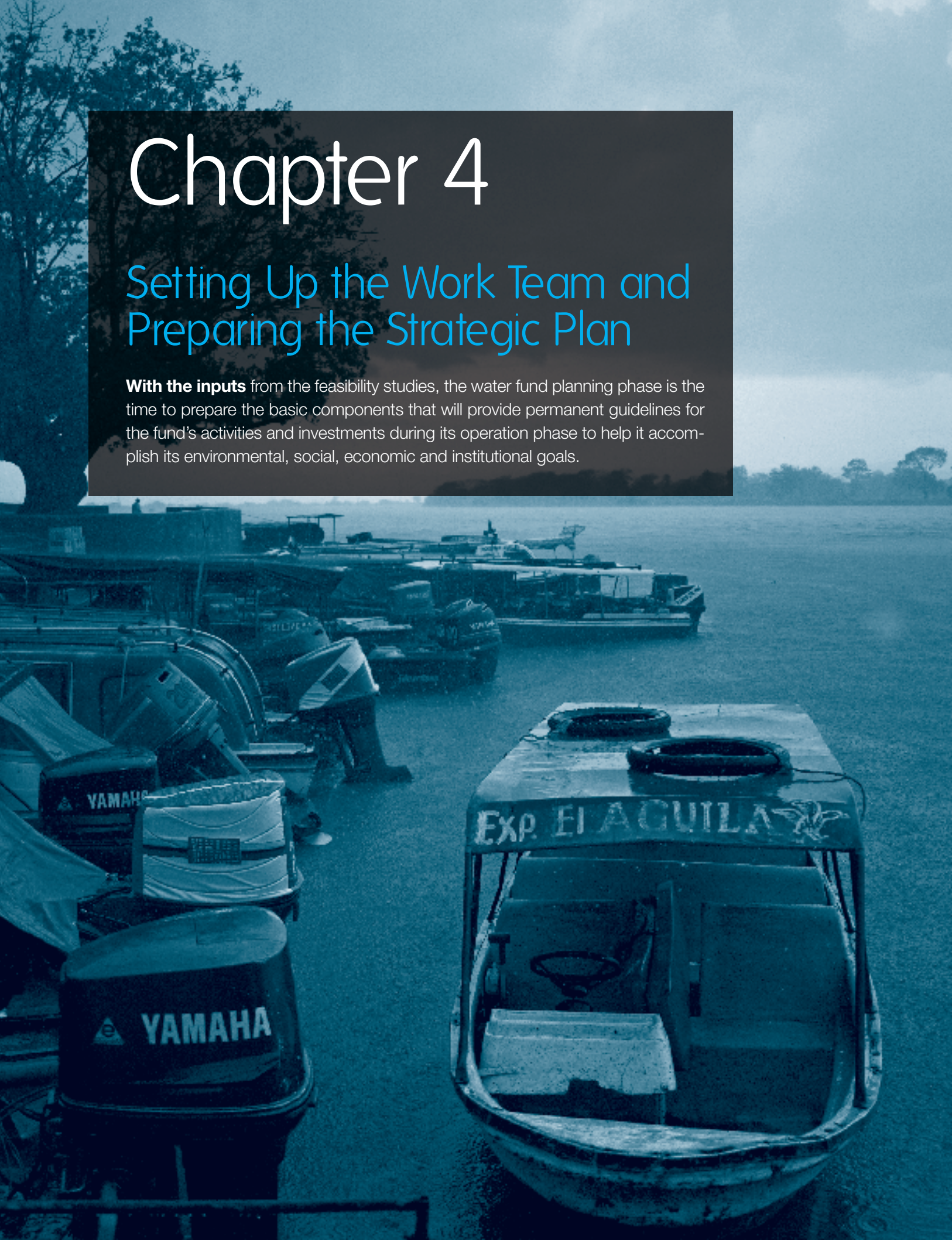
• Sustainable Economic Alternatives: In order to find strategies to conserve water sources in the Paute River sub-watershed, FONAPA launched two pilot projects to determine sustainable economic alternatives. These projects are being co-funded by private companies and are aimed at supporting the production chain to improve product quality and optimize results.

By December 2010, FONAPA had capital of $770,000. In 2010, at least $3.6 was leveraged for each dollar invested by FONAPA. According to its work plan, in 2011 FONAPA plans to invest approximately $540,000 in the Paute River watershed.

Chapter 4

Setting Up the Work Team and Preparing the Strategic Plan

With the inputs from the feasibility studies, the water fund planning phase is the time to prepare the basic components that will provide permanent guidelines for the fund's activities and investments during its operation phase to help it accomplish its environmental, social, economic and institutional goals.



4.1

Appointment and Meeting of the First Board of Directors

This is the time to formalize the components of the fund by holding an initial meeting of the board of directors, publicly recruiting and selecting the fund's technical secretary and appointing the technical committee that will provide input for its investment guidelines. In addition, a detailed strategic plan should be prepared using all of the tools previously mentioned. This chapter shows that the investment plan will be the permanent guideline for the fund and will be an important management tool for its adequate performance. Its components are linked to investments in the watershed's conservation that the fund will implement and to the availability of financial resources.

Because of this, the design of the investment plan must go hand-in-hand with the design of a fundraising strategy, developed in the feasibility studies, that specifies the sources and amounts of financial resources the fund expects to receive, not only to finance priority conservation activities, but also to establish its own capital that will yield necessary financial returns in order to be autonomous in the long term and will operate, ideally, as a non-extinguishable endowment fund.

The creation and operation of a water fund is an adaptive process that requires modifications, adjusting goals, and reviewing objectives, especially because many financial, social and political issues may vary the initially approved investment plan. Rather than seeing these issues as an obstacle for the fund's normal activities, they should be turned into an opportunity to identify a continuous process of improvement and good practices that will result, over time, in an enhancement of the fund's performance.

The first formal activity that a duly established water fund must carry out is the appointment of its board of directors. As mentioned before, the board of directors is the ruling body and in that capacity should provide the first guidelines for the fund's operation.

Each of the fund's member institutions should assign a representative to participate in this board of directors, taking into account that this representative must have a strong commitment to the fund and be able to set aside the time needed and keep his or her institution informed about the activities of the water fund. Generally, the members of the board of directors will be the people who have participated from the beginning in the process of establishing the water fund and have been present in the promotional working group mentioned in Chapter 2 of this document.

The board of directors must identify two very important elements that will guide the fund's permanent activities:

Mission of the Water Fund

This is what motivated the establishment of the fund in the first place. A water fund's mission statement should fully and satisfactorily answer the question: "Why was the fund created?"

Goals of the Water Fund

The only way to determine whether the water fund is achieving its objectives is by identifying clear goals. These should be measurable, so that it will be possible to monitor them and permanently evaluate whether they are being attained. This will allow the fund to make necessary adjustments and changes to achieve greater efficiency. The fund should design a conservative and realistic system to define goals, ensuring at the same time that they are adequate and ambitious enough to accomplish the objectives set forth for the fund in the least possible time and with the least amount of resources. These goals should be part of the expectations of the main water users and should make sense to them.

The board of directors should approve its internal procedural rules, clearly specifying its roles (in some cases this may also be defined in the trust fund contract). These procedural rules must be approved in the first meeting of the board of directors and should include the following components:

- Requirements to be a member of the board of directors.
- Obligations of the board of directors.

Timeframe for meetings of the board of directors.

- Voting mechanism to make decisions.
- Conflict-resolution strategy.

4.2

Appointment of the Technical Secretary

One of the main roles of the board of directors is the appointment of the technical secretary. This is a key position for the fund's performance and its ability to achieve its objectives, as it will be the public face of the fund and be directly responsible for executing the defined activities.

A good example of the appropriate profile of a water fund's technical secretary is shown below:

- Professional degree, preferably with a graduate degree in business administration, economics, social science or environmental science.
- Minimum of five years' experience in watershed conservation projects and/or development projects.
- Experience in preparing, managing and evaluating projects.
- Good knowledge of the watersheds where the fund will operate, including their main issues and stakeholders.
- Experience and ability to leverage national and international funds for projects.
- Experience in coordinating working groups and managing inter-institutional teams.
- Good knowledge of English, both written and spoken.
- Excellent written and oral communication abilities.
- Excellent interpersonal skills.
- High capacity for team work.

4.3

Appointment of the Technical Committee

As an essential advisory board, the technical committee must be proposed by the members of the board of directors. The technical committee will play a key role in the water fund planning process, given the members' experience, knowledge and ability to meet their organizations' requirements and objectives.

Because of this, the technical committee will be a permanent advisory body to the technical secretary, supporting the preparation of the investment plans.

The following are specific roles expected from the technical committee:

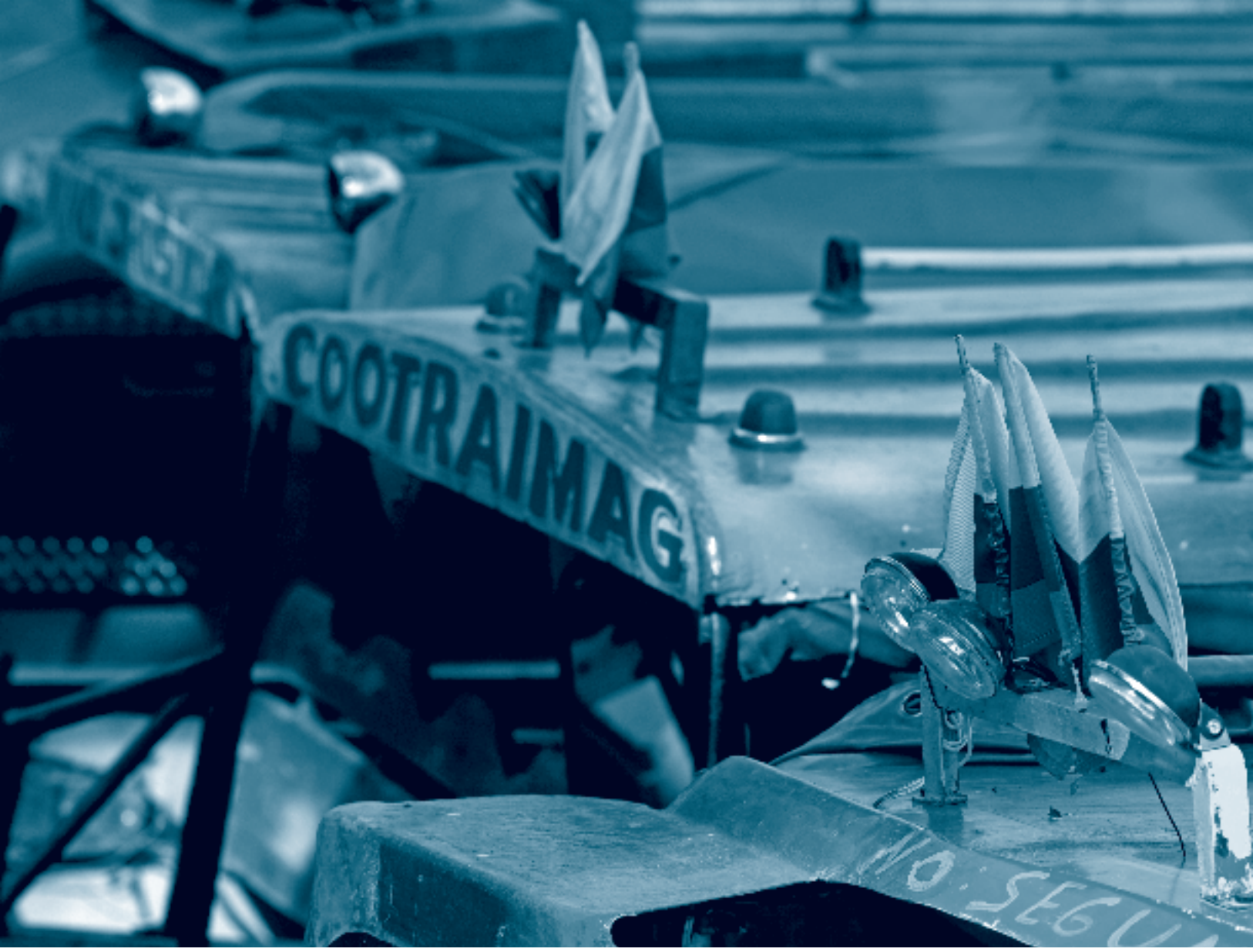
• Provide technical advice to the technical secretary for the preparation of plans, programs and projects to achieve the water fund's goals.

• Provide guidelines to the technical secretary on conservation investments, complying with governmental legal requirements and the requirements of each of the water fund member institutions.

• Advise the technical secretary on the fund's technical and scientific components to prepare the terms of reference for conservation activities.

• Support the process to define the fund's administrative, legal, financial and technical structure.

• Ensure that investment guidelines are coherent and/or complementary to the official policies and guidelines of competent environmental authorities.



4.4

Designing the Strategic Plan

The strategic plan is a fundamental component for the success of a water fund. It should provide permanent guidelines to achieve the conservation goals and objectives that have been defined as a result of the environmental services analysis and the application of the models mentioned in previous chapters. It will be the basic guide for the investments made by the fund.

The strategic plan must be prepared based on the feasibility studies, as its activities should reflect the prioritized areas, the most adequate activities in order of importance, and expected results to conserve watershed ecosystems and to guarantee the supply of the key environmental service identified for the water fund. The strategic plan is the outcome of articulating the results obtained from the literature review, the application of hydrologic models and the socioeconomic analyses that were conducted.

The basic components of this strategic plan are the following:

4.4.1 Goal Definition

The most important element in planning is to have clear goals of what the fund expects to achieve. These goals should be set by the fund's constituents and should clearly reflect the environmental services that are the targets of the fund. For example, goals may be oriented towards reducing and/or avoiding sediments, maintaining or improving water quality, maintaining or improving base water flows, etc. The funds may also have additional goals aimed at biodiversity conservation, or socioeconomic goals. These goals should be defined realistically based on the technical studies previously done.

4.4.2 Defining Priority Areas for Conservation

Priority areas are defined based on the fund's goals. These priority areas result from the application of previously mentioned hydrologic models. When these hydrologic models are not available, priority areas may be defined using existing data for the watershed on water sources, water availability, priority zones for conservation, threats, etc. The next step is to validate these areas with local experts at a smaller scale in order to determine the feasibility of implementing activities and the priority that will be assigned to each of them. This exercise is of utmost importance, as it will allow the clear definition of the possibility and order of the activities the fund will implement. Workshops in which the local community can actively participate and contribute its general knowledge of the area and its residents are recommended. Using maps containing the priority areas identified through the models, this information can be compared with the community's knowledge and expectations in order to obtain a true map of the water fund's working area.

4.4.3 Cost Analysis of the Activities to be Implemented and Design of Financial Flow

The next step is to estimate the cost of the activities the fund will implement to achieve desired changes, to define the water fund's financial goals, and to establish a financial flow. The following components of the cost analysis are important:

- Estimate costs with prices from several sources or providers.
- Estimate costs at current prices.
- Always include transportation costs, particularly for activities that will be carried out far from urban centers, where labor and/or materials may be scarce.
- Always include administrative and unforeseen expenses.

4.4.4 Preparing the Strategic Plan

Once the components mentioned above have been completed, it will be possible to prepare the water fund's strategic plan. The Conservation Action Plan (or CAP) tool designed by TNC (see Annex) may be useful for preparing the strategic plan, which includes the following elements:

a. Water fund goals agreed by the fund partners.

b. Definition of priority areas using conservation scenarios.

c. Cost analysis of proposed activities to be implemented by the water fund.

The most useful way to present a strategic plan is through a simple table that links the fund's objectives and goals with each of the activities identified. Time and cost variables in the strategic plan allow better follow-up and control of the fund's performance. An example of a strategic plan is shown below:

Objective of the Water Fund	Goals	Activities	Time	Cost
Improve the health of the watershed's ecosystems to guarantee better quality water to a population: less sediment, less pollution, better flows and increased biodiversity.	Reduce the watershed's sediment load by 15%	1) Isolation of headwaters with live fences		
		2) Fencing of water courses		
		3) Conversion to sustainable production systems		
		4) Training of communities and institutional strengthening		
	Improve (or maintain) river flows in the watershed by 2%	1) Strengthening and financing of the management plan for the related protected area		
		2) Implementation of park ranger programs		
		3) Development of ecotourism activities		
	Reduce the pollution load in the watershed's river(s) by 10%	1) Fencing of water courses		
		2) Funding for the conversion to sustainable production systems		
		3) Training of communities and institutional strengthening		
		4) Implementation of park ranger programs		
	Improve terrestrial and freshwater biodiversity in the basins by 5%.	1) Strengthening of reforestation programs for connectivity		
		2) Funding for live fences		
		3) Promotion of ecotourism activities		
		4) Implementation of ecological flow activities		

Figure 17. Example of a strategic plan for a water fund. • *Source: TNC, 2011.*

Agua por La Vida (Water for Life) presents a real case of water fund strategic plan preparation. Although it was established in 2009, the strategic plan for the fund was prepared later, including most of the components mentioned in this document.

The preparation process included the following:

1. Definition of the Water Fund's Goals

Several meetings and workshops were held with local experts, grassroots communities and representatives of the sugar production sector, all of whom expressed their general concern for maintaining base water flow during dry periods and the need to reduce sediments in the watersheds within the area covered by the project. Although it is true that ASOCAÑA had been conducting recovery activities in the higher zones of the watersheds for more than 15 years, there was an obvious need to include more elaborate scientific and technical criteria to improve the return on investment and to set up monitoring systems that would allow follow-up of the results obtained by the recently created Water Fund for Life and Sustainability.

2. Identification of Priority Areas

Three models were applied (SWAT, FIESTA, INVEST) for the nine watersheds included in the project, identifying the most sensitive areas in terms of sediments and contribution to the water flow as well as the fog component in the high mountain forests. Before applying the models again, an analysis compared current land use and desirable land use in the priority areas in order to measure the impact of conservation and variations in land use on environmental services.

Some examples of this analysis are presented in the following table:

Current land use	Simulated land use change
Grasses	Intensive livestock (silvopastoral systems)
Fragmented forests	Restoration
Livestock	Isolation (fences)
Páramo	Conservation
Weed grasses	Reforestation
Natural forests	Isolation and protection

Figure 18. Land use analysis, Water for Life Water Fund, Cauca Valley, Colombia. • *Source: TNC, 2011.*

This analysis was complemented with a series of workshops in which community members worked with maps to validate and modify the information obtained from the hydrologic models according to their knowledge of the area and the experience of the people living in the watersheds. The result was a hand-drawn map that was later digitalized: i) with the priority areas shown according to the models and forecasted changes; and ii) incorporating both types of areas into the fund's strategic plan.

Figure 19. Map of activities proposed by local stakeholders. Water for Life Water Fund, Cauca Valley, Colombia. • *Source: TNC, 2011.*

3. Cost Analysis

The forecasted change analysis was linked to different budgets that were prepared based on the total cost of the activities that would be implemented by the water fund. The areas used as reference for the cost analysis were those revealed by the models as having the best combination of activities. A flow was set up with the implementation and maintenance costs for a five-year period, the necessary timeframe to implement activities. After that period, the fund will cover these activities with a payment for environmental services scheme. A summary of the costs of the activities that would be implemented is presented in the following table:

Activity	Cost
Isolations	US$541/ha
Restoration	US$863/ha
Reforestation	US$2,042/ha
Silvopastoral systems	US$2,378/ha

Figure 20. Cost analysis by hectare of different activities of the Water Fund for Life. • *Source: TNC, 2011.*

The aggregated strategic plan was prepared using the priority areas and the cost per hectare of the activities selected as the most appropriate. A conservation component was also completed with the aim of supporting the management plan for Las Hermosas Park, an area of crucial importance because it is where many headwaters of the rivers within this watershed are located. A value of global support to the park was estimated using data from its financial gap analysis. The result is shown in the following table:

Objective of the Water Fund for Life	Goal	Activity	Area (hectares)	Cost (US $ million)	Time
Maintain base flows and reduce sediment production in 9 of the Cauca Valley watersheds	Reduction of 20 tons/ year of sediments in the project's watersheds	Isolation	8.413	2,9	Five years
		Restoration	3.412	2,8	
		Reforestation	955	1,9	
		Silvopastoral systems	1.388	3,2	
		Conservation / Support to Las Hermosas	125.000	1,2	
			139.167	12,2	

Figure 21. Strategic plan for the Water Fund for Life. • *Source: TNC, 2011.*

Although Water for Life will not bring about great changes in water supply, the fund maintains base flows and better regulates water supply, which is consistent with the objectives and goals initially set forth for the fund's establishment.

This analysis may be complemented with a calculation of the costs that will be avoided by large water users (local aqueducts, beverage industry, etc.) as a result of the investments the fund will make in the field. The idea is to show that investing in watersheds is good business in the long term, not only because the supply of environmental services will be guaranteed, but also because of the significant social benefits a water fund like Water For Life may have. Data from ASOCAÑA and TNC show that, faced with a possible reduction of the water supply during certain times of the year and the increase in the sugar industry's demand for water, irrigation cycles may be reduced from 5 to 4. This will cause a 9% drop in productivity, costing the sector US$33 million. Investing in the watershed to ensure that the 5 cycles can be maintained costs US$2 million per year.

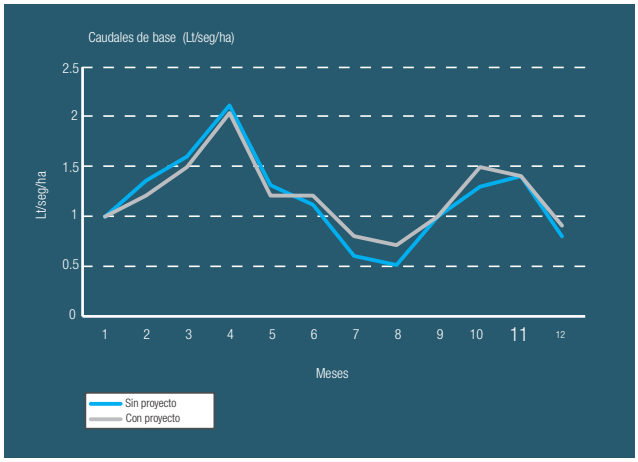


Figure 22. Comparison of base flows. Water Fund for Life.

• *Source: CIAT, TNC, 2011.*

4.4.5 Preparing the Financial Flow

Another very important element that complements the strategic plan is the financial flow, which is an estimation of the incomes and expenditures expected for the fund within a specific period. The resources available for the fund are often limited, so it is very important to design a strategic plan that will consider these limitations as well as the objectives that have been set. Because of this, the strategic plan should have a simple financial component that estimates all incomes, both from capitalization and from investment, that the fund expects to obtain, as well as the costs, expenses and investments that necessary to achieve the fund's goals.

The financial flow is also a control tool that allows for follow-up and evaluation of the fund's performance to raise funds and its expense level. This will be useful for making adjustments, for example, to strengthen the strategy to leverage resources for the fund's capitalization or improve the way resources are used over time. A simple way to prepare a financial flow is presented in the figure 23.

The table shows an example of a 10-year flow. It is very important to specify each of the incomes and expenditures the fund expects to have. The veracity of this information is directly linked to the management, control and follow-up of resources and, hence, a realistic financial flow is essential.

The upper part of the flow shows incomes. Distinctions must be made between those that will be used to capitalize the fund (capitalization resources) and those that will be used for immediate investment in conservation activities. As shown in the example, it may be useful to classify income for each of the institutions that participate in or contribute financially to the fund. This exercise also helps control the use of resources and is sometimes a compulsory requirement for bookkeeping when these resources are disbursed by a public sector institution. Expenditures must also be identified later, with references to all of the fund's expenditures during the period. First, administration

CONCEPT	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
INCOMES										
Capitalization resources										
Contribution organization 1										
Contribution organization 3										
Contribution organization 2										
Resources for conservation investment										
Contribution organization 1										
Contribution organization 2										
Contribution organization 3										
Other resources										
TOTAL INCOMES										
EXPENDITURES										
Administrative costs										
Salaries										
Office expenses										
Rent										
Administrative commissions										
TOTAL										
Conservation investments										
Activity 1										
Activity 2										
Activity 3										
Activity 4										
TOTAL										
TOTAL EXPENDITURES										
Incomes - Expenditures										
Interest										
Capitalization of interest										

Figure 23. Example of a financial flow for a strategic plan. • *Source: TNC, 2011.*

costs must be identified, including operational costs such as salaries, office expenses, and financial fees, among others. Then, investments in conservation, separated by activities for each year, must be identified. Finally, in the lower part of the flow, an annual balance of the fund's finances can be determined. This will be the result of the annual difference between income and expenditures, added to interest generated by the endowment fund.

The size of the water fund is a very important factor to consider. In general terms, this will be directly linked to the following elements:

The financial flow may be much more sophisticated and complex depending on the information available and the financial indicators required. For example, it may be possible to include some financial management indicators such as the Net Present Value (NPV) of the fund's resources, or the Internal Rate of Return (IRR) for certain incomes and expenditures.

- The amount of initial contributions the partners make to the fund.

- The market interest rate.

- The necessary time to capitalize the fund, which generally entails a lower level of investment in the field or none at all.

It is assumed that the fund should grow at least to the point that it is capable of covering its administrative costs, priority investments in conservation for the first few years, the medium- and long-term costs of the conservation agreements and any payment for environmental services scheme. Figure 24 shows an example of the average size of a water fund for a 10-year period. In this case, the fund has a sustained increase of its capital resources until the fourth year, when it should reach an income amount of US$ 5 million. In the experience of some water funds, capitalization resources diminish after this point, because constituents will not be able to sustain their contributions for more than four or five years [5]. After its fourth year, the fund may continue to grow but at a slower pace, because of interest generated by its endowment fund and other fresh resources that may be leveraged.

The fund can be capitalized if it does not make investments in conservation during its first three years of existence. Investments only begin after the third year, when income reaches a level of approximately US$3 million. The difference between income and expenditures plus interest generated makes up the endowment fund that can be seen in the lower part of Figure 24. In this case, the endowment fund grows permanently, but its growth is greater during its first three years of existence, when capitalization efforts should also be greater in order to guarantee its long-term sustainability.

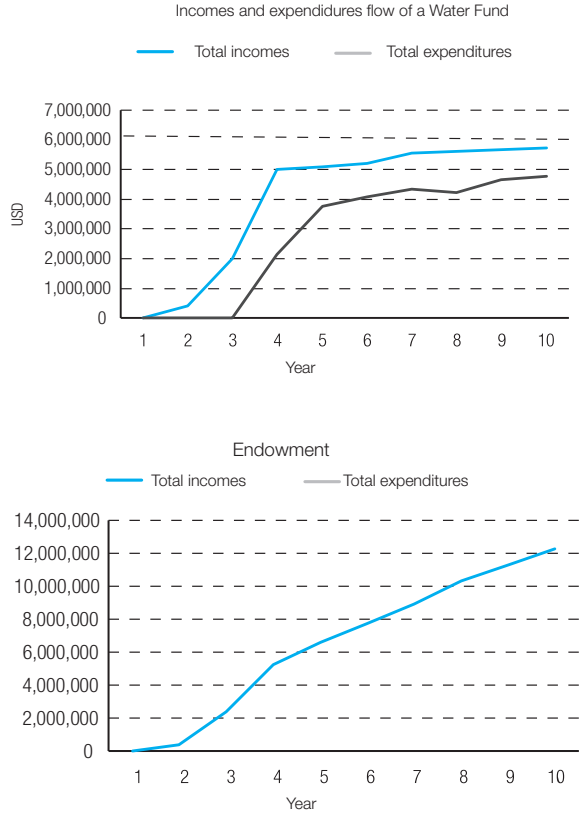


Figure 24. Financial flow and endowment.

• *Source: TNC, 2011.*

5. It would be ideal, in these cases, to have a permanent source of income that guarantees a flow of resources to the fund, such as taxes, environmental cost schemes in water use fees or payments for energy generation. These possibilities are currently being studied for water funds, but they involve political agenda issues and negotiations with the public sector and may take some time to be formalized.

4.5

Designing a Fundraising Strategy

The idea of setting up financial funds for watershed conservation was a response to the need to use the advantages of the financial system in terms of guarantees, profitability and independence.

A financial fund managed by an independent institution with participation of the public and private sector will help achieve better governance and protect resources due to the legal guarantees of the commercial financial system. Given the previously mentioned structure of the fund, its board of directors will have the prerogative of investing in conservation in accordance with the previously established goals and resources, and the fund will be capitalized to be self-sustainable in the long term, without the need for leveraging significant additional resources.

However, initial capital will allow the fund to make some investments as soon as possible to kick-start its activities. Some of the fund's initial resources may also be invested in fundraising strategies, such as donation campaigns or marketing activities. The following are some of the main financial sources which may be proposed, evaluated and eventually used to leverage more resources for a water fund:

Voluntary Private Donations

These are donations by individuals or philanthropic organizations. They also include donations made by corporations to support the management of protected areas and, in some cases, donations made by private companies with a strategic interest in protecting the watershed, such as reducing sediment levels and improving water quality and soil stability, among others.

Direct Domestic Government Resources

These are financial resources obtained from a country's national budget for natural resource management. In many cases, because of their public nature, a series of requirements must be met before gaining access to these funds as part of grant applications and public bids. The fund must have the human and technical capacities to apply and obtain those resources channeled through specific projects. A strategic partner with this experience and capacity may also be very helpful for the fund to gain access to these resources while the fund positions itself and builds the necessary experience and recognition to do so by itself.

Resources from Multilateral Organizations

These include resources from bilateral and multilateral funds. In many countries, these resources, as well as governmental resources, make up the majority of conservation financing. Multilateral funds include the Global Environment Facility (GEF), widely known around the world, and specific funds for managing water resources, such as the Inter-American Development Bank's AquaFund and the Spanish Government's International Cooperation Agency (AECID).

Governmental Resources:

These are the result of applying measures to transfer and raise financial resources within a country's different economic sectors. The most common ways to obtain and transfer these resources are through taxes and subsidies. In some countries with more developed legislation, these may include compensation, fees, and royalties, among other mechanisms.

Rates that Include Environmental Costs

It is generally accepted that resources obtained from water fees, when applied, do not cover real costs, particularly the environmental costs of using the water resources. Important and innovative steps have been taken to contribute to the creation of new regulatory frameworks that guarantee funds for watershed conservation as part of water fees, as well as to achieve the acknowledgment and true valuation of water by consumers. This may be one way to obtain resources for water funds, because it could help ensure a steady flow of resources over time that the fund could capitalize to invest in the watershed's conservation.

Resources from Environment Funds

These are systems that manage funds obtained from a variety of public, private, international and domestic sources, usually to strengthen protected areas. The resources may be managed through endowment trusts and used for investment in specific projects. Although these types of resources may become a new source of funding for watershed conservation funds, there must be clarity to avoid duplicating efforts or competing for resources.

One or many of these financial sources may be present at different times during a water fund's existence. TNC's experience indicates that funding sources may sometimes be interested in supporting a specific phase of the development of a water fund and, therefore, demand that resources be invested in that specific activity. Some examples are shown in the figure 25:

Sources of Funds	Use of resources
International NGOs	Feasibility studies: hydrologic models, characterization of the study area, studies related to climate change, analysis of environmental services
Water facilities and hydroelectric companies	Operation: capitalization and investment in conservation projects
Interested productive sectors	Operation: capitalization and investment in conservation projects
Multilateral organizations	Operation: additional studies, monitoring and adaptive management
Cooperation funds	Operation: additional studies, monitoring and adaptive management

Figure 25. Sources of funding and most common use of the contributed resources. • *Source: TNC, 2011.*

In order for the water fund to be sustainable, it is necessary to ensure that large water users commit significant, repeated financial contributions over time. Water is a local environmental service and local stakeholders should have the greatest interest in maintaining or recovering this environmental service over time. International or national cooperation organizations can help in the beginning, but sustainability will depend on local institutions. Likewise, cooperating institutions usually value global benefits.

Water for Life and Sustainability, maintaining water flows with a multiple concert strategy

FONDO AGUA POR LA VIDA Y LA SOSTENIBILIDAD
¡Agua para todos!

The Sugar Cane Farmers Association — ASOCAÑA — has worked for more than 15 years in the watersheds that supply aqueducts of some municipalities and sugar cane plantations in the Cauca Valley in southwestern Colombia. Although it is a highly fertile and productive region, climate factors cause occasional water scarcity during the summer.

ASOCAÑA's work has focused on activities with the communities of the higher zones of 12 specific watersheds: Amaime, Bolo, Bugalagrande, Desbaratado, Frayle, Guabas, Palo, Piedras, Riofrio, Tulua Molares and Zabaletas. This is an important region in terms of biodiversity. Some of these rivers have their headwaters in Las Hermosas National Park, a haven for endemic species where high-Andean forests and páramos are being increasingly threatened by livestock activity. These rivers feed the Cauca River, which is part of the greater Magdalena River basin.

The promotion of community organizations called river users' associations has helped fund activities such as reforestation and restoration, isolation of headwaters and water courses with fences, creation of rotating funds to finance alternative productive activities and environmental education and training, among others. The activities promoted by ASOCAÑA have provided great benefits. Significant progress has been made in watershed management from both the environmental and social perspective. Community organizations have been strengthened, new ways to participate have been created and governance has been improved in an area that is sometimes complicated in terms of civil order and safety.

In 2008, TNC approached ASOCAÑA to propose the establishment of a long-term financial mechanism that would include an additional technical component based on the

use of scientific tools that would allow for greater returns on the investment made in the field. The idea was to have additional technical tools to identify priority conservation areas in the region where ASOCAÑA had been working up to that point, with the objective of finding the most efficient ways to maintain base flows, reduce sediment load and protect the areas that contribute the most to the hydrologic balance of the region's watersheds.

With support from its strategic partners, Natural Capital Project and CIAT, TNC carried out the necessary studies to develop a strategic plan for Water for Life. These included the following components:

• Use of hydrologic models to identify priority areas for conservation using land use alteration scenarios

• Cost analysis of investment alternatives, using different activities that would be developed to identify which alternatives were most cost effective

• Preparation of an investment portfolio for Water for Life, identifying medium- and long-term goals for the fund

At the end of 2009, a cooperation agreement was signed by ASOCAÑA, seven associations of users of the Cauca Valley's rivers, the Vallenpaz Foundation, and TNC. Through this document, the parties committed to developing a conservation program in line with TNC's studies and to creating management bodies to implement such a program. They agreed to establish a board of directors with representatives from all partner institutions, to appoint a technical secretary to carry out projects and to contribute resources to a trust fund in order to guarantee transparency in their management and earn interest. To that end, ASOCAÑA initially allocated US$1.8 million to cover operational costs, the technical secretary's salary and the necessary funding for conservation projects in accordance with the guidelines provided in the TNC's studies.

In 2010, Water Fund for Life made two calls to finance projects. The project selection criteria included consideration of the studies carried out by TNC and its partners regarding priority areas for intervention to the greatest extent possible, social participation criteria, in-kind match contributions by the applicant organization and environmental education. One of the project lines seeks to support some activities in Las Hermosas National Park. Water for Life will fund the legal settlement of some land parcels within the park and the work of 10 families residing in its buffer zone to implement a silvopastoral system that will replace extensive livestock grazing.

Since its creation in 2009, five new river users' associations have been accepted as partners of Water for Life, as well as CENICAÑA, a top-level research center that promotes sugar cane research, and Procaña, a trade association of sugar cane producers. This shows that the project has been broadly accepted. As a result of the two calls for projects, 11 initiatives have been funded by a total of US$500,000. In addition, new resources have been leveraged from ECOPETROL (the Colombian oil company), Coca-Cola FEMSA, and the IDB, with amounts yet to be defined. Finally, USAID has contributed US$300,000 to prepare a monitoring protocol that TNC is jointly developing with CENICAÑA. This monitoring protocol will aid in follow-up of the impacts of Water for Life's investments at a local scale, including hydrologic, biological and socioeconomic components.

Chapter 5

Launch of Activities and Operation of the Water Fund

The water fund's operation requires executing the plans prepared during its planning phase, as discussed in previous chapters.

The fund has already identified environmental services and goals; involved stakeholders; and defined its internal structure, strategic plan and fundraising strategy. All that remains is to begin developing the activities planned according to the goals set forth. This chapter covers three key aspects that must be considered during the water fund's operation.

5.1

İmplementing the Strategic Plan

The implementation of the strategic plan is the most important process during the water fund's operation. It consists of taking all of the necessary steps for recruitment, follow-up, control and verification of the activities proposed to conserve ecosystems and the supply of environmental services that consumers have agreed upon.

Although the implementation of the strategic plan will be the responsibility of the technical secretary, it has been mentioned before that this person must be permanently supported by the technical committee in order to have greater supporting information to make the best decisions regarding the investment of resources for conservation.

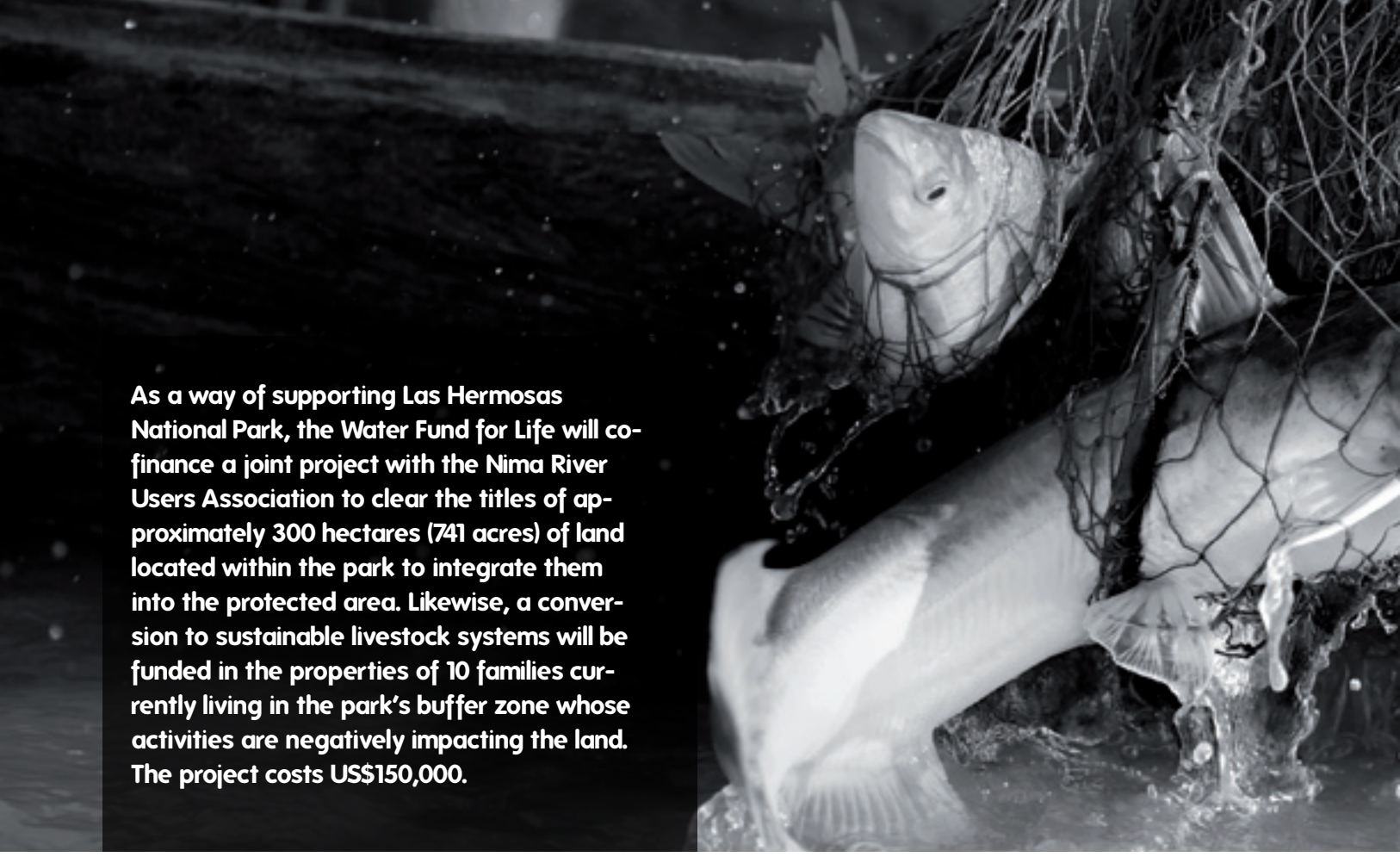
To implement the investment plan, the appointed technical secretary should develop a detailed work plan that clearly explains how the proposed activities will be carried out. This work plan must be presented to the board of directors and will be the roadmap that the technical secretary will follow.

Once the areas have been defined, it is necessary to identify which activities will be more suitable for achieving conservation objectives. İt is important to analyze the effectiveness of each proposed activity and what its outcome will be. A useful exercise is to build land use alteration scenarios when applying the models in order to establish what would happen to the supply of a specific environmental service in the event of a specific desired change. For example, the models predict what would happen with water supply and sediment retention if the forestcover of a certain area increased by a given percentage during a specific timeframe. Similarly, models can predict what would happen if that forest cover were lost. The goals set forth for the water fund must be realistic, quantifiable and verifiable.

5.1.1 Staring activities

The activities to be carried out should answer the question: "How can the fund's objectives be achieved?" It is very important to include the estimated time variable for the implementation of each activity, as this will be an efficiency indicator to measure the fund's performance and results. Likewise, responsibility must be assigned for each activity to control and verify their fulfillment.

There are many specific activities a water fund can carry out in order to conserve environmental services and achieve desired changes. The investment plan must be realistic and include activities that will contribute in a real way to the protection of ecosystems and the supply of environmental services. TNC's experience has helped identify some activities that make proven contributions to watershed conservation, among them:



As a way of supporting Las Hermosas National Park, the Water Fund for Life will co-finance a joint project with the Nima River Users Association to clear the titles of approximately 300 hectares (741 acres) of land located within the park to integrate them into the protected area. Likewise, a conversion to sustainable livestock systems will be funded in the properties of 10 families currently living in the park's buffer zone whose activities are negatively impacting the land. The project costs US$150,000.

Protected Areas Support

Watershed conservation funds are a complementary strategy to bridge the financial gaps many protected areas have. Considering that many watersheds that supply water to cities are located within protected areas, a financial fund for the conservation of a watershed will help pay for different programs and projects included in the protected area's management plan that will benefit not only the watershed but also the protected area and its financial sustainability. It is even possible that an inverse relationship could develop; a financing strategy put in place for a watershed can result in the creation of a new protected area.

Ecosystem Conservation and Restoration

Many activities (such as reforestation and ecological restoration) leading to the conservation and restoration of particularly strategic areas in the watershed are aimed at improving the health of ecosystems and the watershed (Dudley and Stolton, 2005). Special care must be taken when designing this activity portfolio to ensure that it is in line with the feasibility studies and the priority environmental services identified.

Support for Reconversion to Eco-Friendly Production Systems

TNC is generally acknowledged for its experience in implementing eco-friendly production systems that not only generate additional economic benefits to communities settled in areas surrounding the watershed, but also have a positive impact on environmental services. A clear example of this is the implementation of silvopastoral production systems, which ensure greater benefits from products obtained from livestock activity and the reduction of the sediments in the watershed (Minella and Reichert, 2009). The following table, prepared by CIPAV, TNC and Fundación Natura for the Andean Region in 2006, shows the socioeconomic and environmental benefits that a silvopastoral system may provide:

Model	Impacts	Current usage (hectares)	Conversion (hectares)
30 hectares *(74,1 acres)*	Environmental impacts		
	Forests	5,0 *(12,3 acres)*	8,0 *(19,7 acres)*
	Pastures	24,80 *(61,28 acres)*	11,0 *(27,1 acres)*
	Crops	0,2 *(0,5 acres)*	0,2 *(0,5 acres)*
	Silvopastoral systems		10,3 *(25,4 acres)*
	Fodder banks		0,3 *(0,7 acres)*
	Firewood		0,2 *(02 acres)*
	Total Area	30 *(74,1 acres)*	30 *(74,1 acres)*
	Live fences, kilometers		1,0
	Number of animals	12	12*
	Socioeconomic impacts		
	Number of animals (UGG)	0,6	1,0
	Births (%)	60%	80%
	Productivity (per cow per day)	4 liters (8.5 pints)	7 liters (14.8 pints)
	Lactation (days)	240	270
	Incomes in Colombian pesos (thousands per year)	2.024	7.079

Figure 26. Benefits of the implementation of silvopastoral systems.

• *Source: CIPAV, 2006.*

Protection of Watersheds and Riverbanks

The lack of financial resources generally causes watersheds and riverbanks to be exposed to threats such as chemical pollution, waste, illegal water extraction, animal waste pollution, and sediments, among others. Projects to isolate riverbanks with fences and other forms of physical protection may significantly contribute to the reduction of these threats.

In Colombia's Cauca Valley, Watershed Users' Associations have promoted the "Yellow Line" fencing program (so-called because the upper ends of the poles are painted yellow), which consists of protecting several rivers through community activities carried out by the rivers' users associations. This program has fenced more than 2,000 km (1,242 miles) of riverbanks in the last 15 years and has become a model that will be replicated by the Water Fund for Life in the same area.

Ecotourism

Given the high ecological and landscape value that a watershed may have, ecotourism strategies to may help protect water resources and bring in new funding for conservation projects in the watershed. There is an increasing interest in this type of tourism, which could be part of a water fund's conservation strategy. Once the key features to attract visitors have been defined, the next step is defining the investments required to implement this strategy, such as trails, adequate access, lodging infrastructure, etc. (Drum and Paramoe, 200).

Control and Surveillance

Any conservation strategy devised must consider some kind of control and surveillance, especially in areas that are far from urban centers and where authorities have limited operating capacity. An additional limitation is the often scarce technical and financial capacity of environmental authorities to carry out control and surveillance activities in the watersheds. Park ranger strategies directly involving local community members may be attractive for a water fund and may reduce improper use of natural resources.

More than 80% of the water that supplies Quito's Metropolitan District is obtained from protected areas that are part of Ecuador's National Protected Areas System. For more than five years, FONAG has been implementing a program to develop strategies and actions to protect water resources within the protected areas managed by Ecuador's Ministry of Environment. The program funds 11 community park rangers who work in the Cayambe Coca and Cotopaxi national parks and in the Antisana and Illinizas ecological reserves. Their tasks include protecting these areas and their water sources, measuring water flows as designed by FONAG, developing community projects and managing the areas under their responsibility. This program is supported by the local communities.

The Water Fund for the Conservation of Paute River Basin (FONAPA) supports a microenterprise for community park rangers. Founded and run by local communities, this microenterprise seeks to maintain and train park rangers in several areas of the watershed, such as Sangay National Park, conservation zones acquired by the fund's constituents, and other public, private and community areas that are important for conservation. The microenterprise currently manages 13 park rangers.

Education and Training

One of the most important components that must be taken into account when designing a water fund is the need to maintain permanent learning processes among the communities that will be directly affected by the fund's activities. It is imperative to raise environmental awareness in the communities, and the most effective ways to do so are workshops and courses giving participants access to the information they need for adequate management of the watershed and implementation of fund's programs and projects.

FONAG currently funds several training activities that range from specialized technical workshops on páramo ecology to environmental education and water resource management classes with young students in rural schools, which include field activities and camping. In 2009 and 2010 alone, 5,000 young students and 2,800 children from 44 schools participated in these initiatives.

Similarly, the Water Fund for Life is funding training activities with local communities to build awareness of resource management and to give local people technical tools (such as hydrologic models that will be complemented with field monitoring and sampling techniques) to help them better understand the area's dynamics. These training programs are led by rivers users' associations. During its first year of operation, the fund had a goal of training more than 150 people.

Environmental Flows

The development of guidelines and recommendations for managing water flows is an important and innovative topic. TNC has specific models and a working group with broad experience in this field, which seeks to ensure that the management of water flows responds not only to a minimum amount of water that should remain in a watershed's flow, but also to a series of ecological variables to guarantee the conservation of both terrestrial and aquatic habitats and species.

As a pilot project, TNC and the Bogota Aqueduct and Sewage Company carried out a study to establish and apply specific recommendations for environmental flows to maintain a healthy freshwater ecosystem in the Chuza-Guatiquia system, which supplies 80% of Bogota's water. This pilot project also seeks to build ecological models that will relate aquatic biodiversity variables with the flow regime, based on the biological and ecological information provided by EAAB and field data collected by researchers. The objective is to provide the aqueduct company with precise guidelines on water volume flow management in order to protect ecosystems and preserve natural regimes, avoiding negative impacts on habitats and species in the area. The first phase of the study ended in 2010, and the scale of the study area is expected to be expanded during a second phase.

Incentives and Payment for Environmental Services and Conservation Agreements

The water fund may include payment for environmental services schemes as a conservation strategy. Based on the explicit acknowledgment of the contribution of environmental services to the society's well-being in general, setting up a payment scheme for environmental services requires making a voluntary transaction with a well-defined environmental service (or type of agreed land use that will supply it), a consumer, and a supplier, and it should be provided continuously. The water fund is the financial mechanism or means to make this transaction between the consumer and the provider identified for the watershed as a result of the feasibility studies that determined and valued the different environmental services present in the watershed.

The Water Fund for Life has started funding conservation projects particularly aimed at protecting rivers, reforestation and restoration, protecting headwaters and promoting eco-friendly production systems, such as silvopastoral systems. These activities will provide the basis to implement a payment for environmental services scheme in the medium and long term that will acknowledge the cost of protecting new forests and sustainably using the land as a result of the activities previously implemented. The idea is to establish conservation agreements with private landowners, which entails long-term commitments to protect resources.

Monitoring and Research

Unfortunately, the gap in scientific information often hinders adequate decision-making on watershed management and, as mentioned in Chapter 2, the feasibility studies are aimed at valuing environmental services in order to prioritize which ones will be conserved. The fund must consider the possibility of developing new, more in-depth studies to help establish priorities and leverage resources. Some particularly important topics are those related to climate change and its influence on the hydrologic cycle of a specific area. Therefore, it would be worthwhile to evaluate the possibility of including these types of studies in the fund's investments.

The Bogota Water Fund is currently undertaking complementary studies that will help improve the quality of information on which investment decisions are based. With support from IDB, studies are being carried out to describe erosion and hydro-geological processes in the fund's area of influence. The aim of this study is to provide the fund with additional tools to prioritize investments. In addition, a study is being undertaken to define the fund's financial, legal and administrative viability in terms of leveraging resources from the public and private sector to have all legal guarantees for the fund's adequate operation, fulfilling public and private legal requirements.

The Water Fund for Life is conducting a study on the impacts of climate change on some environmental services, such as water regulation, sediment retention, biodiversity and food security. The aim of this study is to include climate change adaptation strategies in the investments Water for Life will make. Using the ecosystem-based adaptation methodology, the study is building scenarios with InVEST software by running 20 different climate change models in order to reduce the uncertainty of the possible effects of climate change on the project's area and to make decisions regarding Water for Life's best investment alternatives.

FONAG's hydrologic monitoring program included setting up meteorological stations and water volume flow measurement stations as well as performing water quality analyses. One of the program's main objectives is to determine the fund's impact in terms of hydrologic services. In addition, it has carried out joint studies with TNC to measure its socioeconomic impact and its contribution to biodiversity conservation. These studies aim to measure impacts after 10 years of operation and investments in the watersheds. It will also help identify best practices and lessons learned that could be useful for other water funds.

Ecosystem-Based Climate Change Adaptation

As mentioned before, water funds are an ideal tool to apply climate change adaptation strategies because they are long-term investment mechanisms that allow work on an adaptive management scheme and monitoring of climate change impacts. Ecosystem-based adaptation refers to the use of biological diversity and environmental services as part of a general adaptation strategy that draws on a range of sustainable management, conservation and restoration opportunities to provide services that will help people adapt to climate change impacts. Ecosystem-based adaptation strategies seek to maintain or increase resilience and to reduce the vulnerability of nature and people to adverse climate change effects.

Some examples of these strategies are:

- **Conservation and restoration of riparian corridors to diminish impacts of floods**
- **Conservation of forests within a watershed to avoid an increase in sediments during heavier rainfall periods**
- **Conservation and restoration of mangroves and coastal wetlands to diminish the impact of sea level rise**
- **Analysis of connectivity routes to develop private and community-managed biological corridors. This helps maintain ecosystem resilience and the strategic resources of natural ecosystems.**

5.1.2 Lessons Learned

The following are some important issues that need to be considered when implementing the investment plan:

Anticipate: Anticipate, as much as possible, incidents that may hinder the normal development of the fund's activities, such as changes in regulations and policies for water resource management, new strategic partners, etc.

Inform: Use all communication channels available to keep fund partners informed about the activities being developed in order to ensure transparency.

Innovate: To the greatest possible extent, try to include in the fund's operations innovative schemes and tools, particularly those that will help improve efficiency and optimize resources. Apply best practices and lessons learned and involve universities and local and national research centers to conduct applied research and improve the reliability of the technical tools being used.

Learn: Incorporate lessons and share successful case studies from similar experiences to improve the fund's performance.

5.2

Implementing a Fundraising Strategy

One of the key activities of the technical secretary, and the fund partners if they agree, is to approach every entity identified in the fundraising strategy to obtain new resources.

Although a water fund takes time to show conservation results, it is essential to continually update potential partners and new fund investors on the activities carried out so far. As the following section will show, this will help in designing an adequate communication strategy. In addition, the fund's long-term sustainability depends on local financial resources from municipal aqueducts, irrigation districts, hydropower plants, highly water-dependent production sectors and large users, among others. Water is a local environmental service and local stakeholders should be in charge of maintaining and controlling its sustainability.

The fundraising strategy must have a specific timeline establishing deadlines and goals for obtaining resources. An increasing interest from new partners to participate in the water fund will depend on the fund's good management and the efficiency of the investments it makes. The table shown in the following figure is a very simple but useful tool to follow up on financial resources for each of the institutions expected to contribute resources to the water fund:

Organization	Under implementation		Fundraising goal		Probability	Estimated date	Strategy	Responsible
	Fund	Co-financing	Fund	Co-financing				
Organization 1								
Organization 2								
Organization 3								
Organization 4								

Figure 27. Example of a fundraising plan. • *Source: TNC, 2011.*

As mentioned earlier, it is important to distinguish resources that will be part of the endowment fund from those that are matching funds or those that will be directly used to invest in the field rather than go into the endowment fund. This distinction must also be made when estimating future fundraising goals, as shown in the second column of the table. This information may be complemented by including a realistic value for the probability of successfully obtaining those funds. This will provide an idea of where the fundraising strategy should focus and whether it should be applied to each institution separately or for several institutions at the same time. Finally, each strategy must have an estimated follow-up date assigned and a responsible person, which could be the fund's technical secretary or a member of the board of directors.

5.3

Communicating Results

A good strategy for disseminating results is an ideal complement for the adequate performance of the water fund. The fund's partners must be kept informed about the fund's activities and the results of its investments.

At the same time, the public must know what progress has been made in executing the investment plan, particularly if the fund's income includes resources obtained through voluntary donations made by individuals or private companies.

Depending on the availability of resources, it may be best to hire a firm specialized in marketing strategies to prepare brochures and press releases, organize press conferences, promote presentations and relevant events for new partners to participate and communicate results through mass media.

Annual reports must be generated with quantifiable results for the goals set forth for the fund's environmental, social and financial components as well as for the watershed's environmental services. Results of the proposed goals must be presented to the public to water users and to people living within the watershed.

In addition, the water fund must have its own resources to pay for annual or biannual external audits, which should be led by the water fund's board of directors.

Studies for the creation of the Water Fund for Medellin and the Aburra Valley

The Aburra Valley is part of the Medellin River's natural basin, a sub-region located in the south-central Antioquia Department in Colombia, nestled in the Andes Mountain Range. With more than three million residents, the Aburra Valley harbors the city of Medellin and nine neighboring municipalities. This large urban area obtains drinking water from three dams:

• Riogrande II: Located in the northwestern region of Medellin, close to the Don Matias Municipality, this dam began operations in 1991. It has multiple objectives: Hydropower generation (through the Niquia and Tasajera pants), drinking water and sanitation. It has a useful storage capacity of 152 million cubic meters and receives water from the Grande and Chico rivers via gravity.

• La Fe: Located in eastern Medellín approximately 5 kilometers (3.1 miles) from El Retiro Municipality, this dam joined the system in 1974. It has a useful storage capacity of 12 million cubic meters and receives water from the Las Palmas, Potreros, La Miel and Espiritu Santo streams via gravity and from the Buey, Piedras and Pantanillo rivers via pumps.

• Piedras Blancas: Located in eastern Medellin 6 kilometers (3.7 miles) from the Guarne Municipality, this dam began operations in 1952. It has a useful storage capacity of 1.2 million cubic meters and receives water from the La Mosca and La Honda streams via pumps and from the Piedras Blancas and Chorrillo streams via gravity.

This supplying system is supported by 11 treatment plants and a large number of storage tanks to satisfy the demand for aqueduct services until 2020.

Some environmental and social challenges exist, however, particularly in the Riogrande II and La Fe systems. Some of the biggest challenges are:

• Changes in the hydrologic regime and water quality, mainly caused by the diversion of base water flows, drainage of wetlands, loss of connectivity due to dams, and extraction of materials and water.

• Disturbance of aquatic systems as a result of some improper land use practices such as livestock and agriculture (tomatoes, potatoes, etc.) in neighboring areas, along with increased sediment loads and their direct influence on the silting of water reservoirs and the health of terrestrial and aquatic ecosystems.

• Inadequate disposal of solid wastes and industrial and domestic wastewater from the dairy industry and from the use of insecticides.

The Public Companies of Medellin (EPM) and local environmental authorities that regulate the area (CORANTIOQUIA and CORNARE) have been conducting activities aimed at reducing impacts on both aquatic and terrestrial systems, particularly in areas considered strategic as water sources, such as the Belmira basin, which is the source of the Grande and Chico rivers and harbors well-conserved páramos and high-Andean forests. Among these activities, in line with the management plans, are the purchase of land parcels, the initial upgrading of infrastructure for ecotourism, flora and fauna research and the introduction of agro ecological practices.

Although these activities are significant, they must be complemented with the design of long-term financial tools and mechanisms that will allow investments to be made in conservation to protect terrestrial ecosystems that are still in good condition, mitigate sediment and pollution risks for aquatic systems and improve inter-institutional administration for the integrated watershed management.

EPM and TNC signed a cooperative agreement in April 2010 to conduct studies necessary for the design of a water fund for the Aburra Valley. These studies include the following components:

• Developing a map of stakeholders and interest groups that interact in the watersheds and that could participate in the financial mechanism.

• Identifying areas that provide hydrologic environmental (water quality, quantity and retention, and potential sediment generation) and biodiversity services in the watersheds and estimating a value for those environmental services.

• Setting goals to conserve aquatic and terrestrial biodiversity and ensure the supply of environmental services, and designing a monitoring plan to assess the achievement of those goals, including environmental, social and economic variables.

• Analyzing financial, legal and institutional structure options for the creation of the investment mechanism.

• Designing a fundraising proposal that involves local, national and international institutions and leading the process to obtain seed money to kick-start the mechanism.

• Generating capacity building within EPM and other regional institutions – identified and agreed by the parties – in the management of environmental services models and spatial planning.

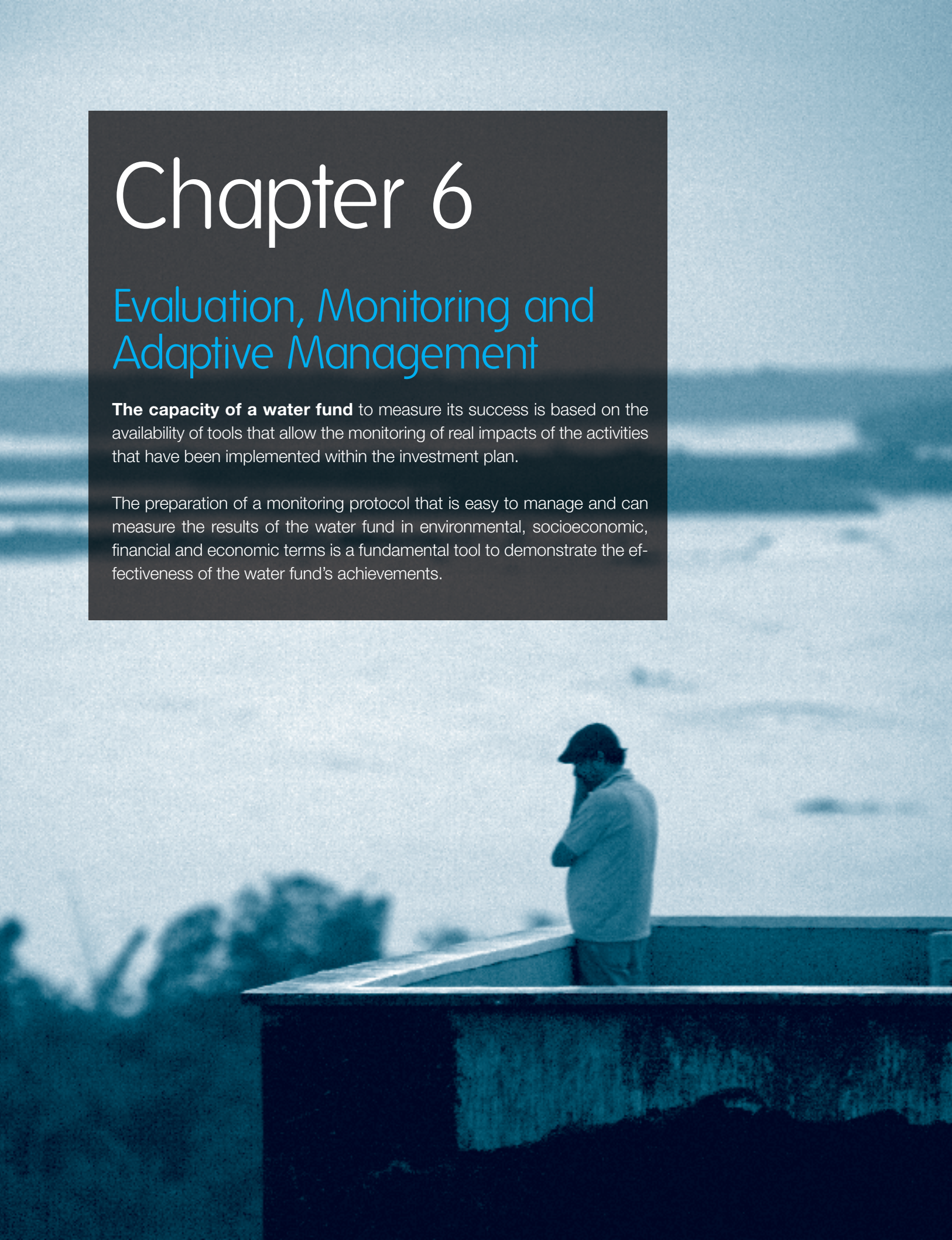
Once these studies have been completed, all of the necessary elements will be available to legally establish the Water Fund for Medellin and the Aburra Valley. In the meantime, this initiative has already been presented to several organizations to gauge their interest by demonstrating the benefits of participating in such a mechanism. The final results of the studies will help set goals for both conservation and the financial resources required to carry out activities set forth in the plan. The strategic alliance with EPM, a well-known company supplying public services, will strengthen the case for improving water management and supporting integrated watershed management among public and private stakeholders.

Chapter 6

Evaluation, Monitoring and Adaptive Management

The capacity of a water fund to measure its success is based on the availability of tools that allow the monitoring of real impacts of the activities that have been implemented within the investment plan.

The preparation of a monitoring protocol that is easy to manage and can measure the results of the water fund in environmental, socioeconomic, financial and economic terms is a fundamental tool to demonstrate the effectiveness of the water fund's achievements.



A water fund must have a clear monitoring strategy that, among many other aspects, helps:

- Evaluate the fund's progress in achieving its mission and objectives.
- Maintain an adaptive management approach that allows continuous revision of the effectiveness of the goals and objectives as identified in the strategic plan and to adjust activities if necessary.
- Improve the way the fund reports and communicates its achievements and progress to constituents, water users and beneficiaries.
- Achieve transparency in its management.
- Maintain and increase technical and financial support to the fund's management.

This final chapter focuses on the most important issues in developing a monitoring plan. It presents a proposal to establish a monitoring system that takes into account topics dealing with hydrologic environmental services, biological diversity and socioeconomic components.

6.1

Designing a Monitoring Plan

Water funds are mechanisms that allow for long-term investments in conservation and must have solid tools to measure achievement of the stated objectives and goals. Additionally, water funds can support long-term monitoring of hydrologic, biologic, economic and social variables.

VARIABLES	Hydrologic Monitoring: Improvements in the quality of environmental services	Ecological Monitoring: Improvements in biological diversity	Socioeconomic Monitoring: Improvements in communities
	- Changes in water quality - Changes in hydrologic flows - Changes in sediment levels	- Impacts on aquatic species - Impacts on terrestrial species - Impacts on riparian vegetation	- Changes in the income level of local communities - Access to new services - Changes in the mechanisms of community participation and organization

Figure 28. Example of components of a monitoring system.

• *Source: TNC, 2011.*

Water funds must have systems to monitor, organize information and define indicators to measure progress in terms of the process as well as its impact, as shown in the following table:

Type of indicator	Element being monitored	Example
Process	Activities	Number of training workshops carried out
Process	Intermediate result	Number of trees planted in reforestation activities
Process	Intermediate result	Number of children participating in environmental education activities
Process	Budget	US$ spent in reforestation activities
Impact	Goal/Objective	% of sedimentation reduced in one micro-watershed
Impact	Goal/Objective	# hectares of priority ecosystems effectively conserved

Figure 29. Examples of impact monitoring and process monitoring.

• *Source: TNC, 2011.*

In general, projects usually have follow up processes indicators but they lack of real impacts indicators. That is why this section is focused on having a good monitoring system for impacts.

The monitoring system can be simple, but it must focus on measuring the impact of the fund's activities in achieving its objectives and goals. Impacts can be measured in a simple manner and at low cost through a group of indicators that will help measure the beginning, progress, performance and results of investments in conservation. As the water fund grows, it will have more resources to invest and therefore be able to implement more complex monitoring systems that can provide scientific information on hydrologic and ecological processes in the long term. Below are some important factors that must be taken into account to establish an impact monitoring system:

Based on Strategic Planning

Impact monitoring should stem from a planning process that clearly establishes the fund's measurable objectives and goals that will be the basis for defining indicators. Conceptual models and results chains are important tools during the planning process for monitoring and identifying indicators. Results chains are tools that help clarify the relationships between the proposed strategies and activities and the objectives and goals that have been set forth. Results chains have graphic diagrams that present causal relationships: "If an action takes place, then this will happen." These chains are focused on achieving results, not on fulfilling activities, and are composed of assumptions that can be proven.

The example below shows a simple results chain that presents the expected effect of a strategy and its indicators:

Reforestation in degraded lands	Reduce soil losses in degraded lands	Reduce sedimentation in rivers	Water quality
# of trees planted per hectare	# of tons per hectare per year of sediments losses	# of tons per year of sediments in the river	GOAL: Improvements in water quality due to sediments reduction
Process indicator	Impact indicator	Impact indicator	

Figure 30. Example of a results chain.

• *Source: TNC, 2011.*

Establishing Adequate Indicators

The use of good indicators will help measure the fund's progress. Indicators must have the following characteristics:

- Measurable: they can be recorded and analyzed in a quantitative and qualitative manner.
- Precise: defined and comprehended in the same way by different people.
- Consistent: they cannot change with the passing of time and always measure the same thing.
- Sensitive: they change proportionally in response to real changes in the condition they measure.
- Cost-effective: the cost of measuring the indicator is reasonable in terms of the information it provides.

Allocating Sufficient Resources for Monitoring: Setting up an impact monitoring system requires both human and financial resources. During the planning process it is important to designate who will be responsible for monitoring activities and the resources needed to perform them.

Management of Data and Information in the Long Term

Impact monitoring should be maintained throughout the fund's existence. In addition to resources, a good information management system is required to store, organize, analyze and report monitoring results.

Participative and Inclusive Monitoring System

It is very important that key stakeholders participate in the fund's design and operation. This will allow resources to be managed in a transparent and trustworthy manner.

TNC has published a document with guidelines for developing water fund monitoring systems (Goldman et al, 2010). The following is a summary of those guidelines:

The monitoring system must arise from an adequate strategic planning process that clearly links the strategies implemented by the fund with the expected goals in terms of the hydrologic services that are the fund's targets (i.e., water quality).

Impact monitoring must be designed to ensure that impacts can be attributed to water fund investments and not to other external variables. For example, if there is an improvement in the availability of water flows during the dry season and the team believes it is a result of the water fund, it must be proven that the change is due to the fund's actions and not to an increase in rainfall during the dry season. An experimental design of the monitoring protocol will help prove that the strategy developed by the fund is causing the expected impact.

The ideal design of a monitoring protocol will have good baseline data about the indicator before the launch of the fund, and it will measure the expected impact in the area of the project and establish a control site. The control site must be a location with similar characteristics to those of the project site, but one in which no actions are carried out by the fund. The indicator differences between the control site and the project site will reveal the impact that the fund's actions have had on the indicator.

6.1.1 Hydrologic Monitoring

Hydrologic monitoring is a basic component of the water fund since it allows for the measurement of impacts on its key goals, such as: maintaining or improving water quality, water regulation, sediment reduction, etc. In addition, the information obtained from a monitoring process that has been established with a strict scientific base will deliver valuable data on how different land uses affect hydrologic services and could help make important recommendations for integrated watershed management actions, particularly in regions such as Latin America where the knowledge of the hydrologic functions of many ecosystems is still limited.

As mentioned before, monitoring should focus on the fund's goals.

The following figure shows an example of indicators and methods for hydrologic monitoring focused on the improvement and maintenance of regular water supply at the micro-watershed level. The same indicator and measurement protocol should be used for the control site and the project site (paired watersheds). It is critical that the control and project sites have similar environmental characteristics so that the differences may be attributed to the intervention of the fund's activities. In areas where there is no good climate data, it is also important to measure variables that can affect the amount of water, particularly rainfall.

Goal/ Objective	Indicator	Methods in brief	Frequency of measurement	Equipment (examples)	Advantages/ Disadvantages
Improve or maintain regular supply of water	Volume and timing of flow is more regular and continuous; stream flow is maintained.	Manual x-sections & simple velocity measure.	Measured as regularly as possible, depending on hydrologic regime, as well as capture of extreme low flows and high flows right after a storm. Warning: manual velocity measurements can be dangerous during high flows.	Velocity - flow meter or manual measurement with a ping pong ball or a stick and stop watch. Cross-section tape measure and measuring stick (or long, marked-off stick).	Most appropriate for small streams, as larger streams may be dangerous to wade in and will be time-consuming to measure. May miss out on capturing the full range of high and low flows, and the timing of runoff vs. flow, but this method is very inexpensive.
		Automatic equipment that requires calibration but then calculates volume and timing automatically.	Continuous	Most cost-effective mechanized equipment.	Requires calibration. Continuous readings can be well worth the cost of the equipment.

Figure 31. Description of methods and indicators. Hydrologic Monitoring.

• *Source: TNC, 2011.*

6.1.2 Biodiversity Monitoring

Many water funds also have ecosystem conservation objectives. The ecological integrity of the ecosystems is often closely linked to good maintenance of hydrologic services. For example, a páramo with good ecological integrity provides better services in terms of regulating base flows. In addition, biological indicators such as macro-invertebrates are very useful to measure water quality. The following figure presents an example of indicators and methods to measure terrestrial biological diversity. This method also must compare a water fund's work area to a control site:

Goal/Objective	Indicator	Methods	Equipment	Comments, Advantages, Disadvantages
Maintain the integrity of terrestrial ecosystems (such as páramo).	Ecosystem area with good integrity/ coverage and abundance of plant species.	Multi-temporal analysis of satellite images, using NDVI.	Satellite images.	This is a method that allows the analysis of extensive areas and, due to the area's coverage, does not represent a high cost. In areas with heavy cloud cover its use is limited. It is best combined with field work and the use of transects (such as the point intercept method using flexible quadrants).
		Measuring plant coverage in transects by using the point intercept method and adding an area of one to several meters (flexible quadrant) on each side to quantitatively include the rarest species. (Halloy and Ibañez, 2010).	Tape measure, GPS, marking tape, stakes.	Plants are a good indicator of the ecosystem's condition. This method requires having botanic experts with good knowledge of the ecosystem under study. Field work is simple and quick. It is possible to train local participants in the method. It works fairly well when it is combined with the analysis of satellite images.

Figure 32. Description of methods and indicators. Biodiversity Monitoring.

• *Source: TNC, 2011.*

6.1.3 Socioeconomic Monitoring

The water funds must be able to measure the impacts that they have on their beneficiary communities. Many of the fund's activities — for example, activities aimed at improving livestock management, reforestation with local communities, environmental education and payments for environmental services, among others — are expected to have positive impacts on local communities. Socioeconomic monitoring should take into account the intrinsic characteristics of each community, and it should also establish indicators that are relevant to people living in the community. For example, indicators on quality of life may be different for indigenous communities and farming communities. In addition, indicators must be focused on the fund's objectives for its work with the community. For example, the fund can work in family-owned organic vegetable gardens in order to contribute to food security but not necessarily to increase family income. Working with control communities (without water fund influence) could be a good way to measure social benefits. Even if this is not a practical approach, a baseline needs to be raised to be compared to sites with water fund interventions.

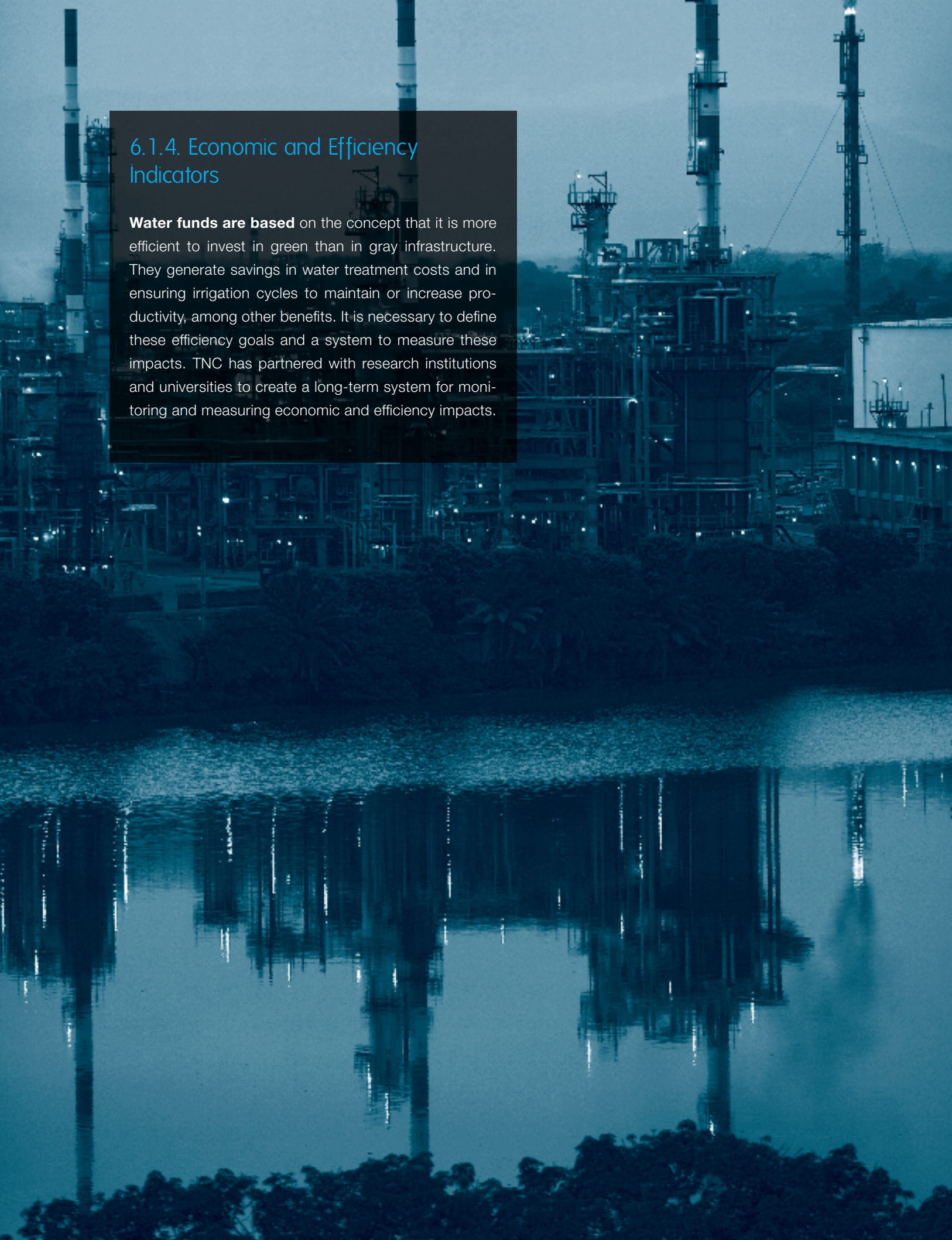
FONAG assessed its socioeconomic impact by selecting the communities that have worked with the fund and comparing them with control communities with similar socioeconomic conditions where FONAG has not intervened. To determine the impacts of the program, three types of indicators were considered:

• Socioeconomic İndicators: These determine the direct effects of the intervention. The basic indicators are multidimensional poverty, income, expenses and production.

• Behavior Change İndicators: These indicators determine behavioral changes in the community on issues related to the management and use of water.

• Perception of the İntervention İndicators: These indicators help determine knowledge about the intervention and the community's acceptance of it. To apply this indicator, it is necessary to define the program's short-, medium- and long-term objectives, as well as how the program's corporate image will be managed.

• İndicators of behavior change and of perception of intervention are determined by the type of activities that FONAG has carried out, training topics and the fund's organizational strategies.



6.1.4. Economic and Efficiency Indicators

Water funds are based on the concept that it is more efficient to invest in green than in gray infrastructure. They generate savings in water treatment costs and in ensuring irrigation cycles to maintain or increase productivity, among other benefits. It is necessary to define these efficiency goals and a system to measure these impacts. TNC has partnered with research institutions and universities to create a long-term system for monitoring and measuring economic and efficiency impacts.

Studies for the creation of a fund in Cartagena

The water supply system of the city of Cartagena obtains 90% of its water from catchments in the Juan Gomez-Dolores lagoon system located approximately 4.5 kilometers (2.8 miles) southeast of the city, and 10% from the Gambote settlement, also very close to the lagoon system. Both systems are supplied by the same source: the Dique Canal built at the beginning of the 20th century to unite the Magdalena River with the Caribbean Sea. The canal has an average flow of 450 cubic meters per second, which ensures enough supply to satisfy the city's current demand for approximately 2.5 cubic meters per second.

The Juan Gomez-Dolores lagoon system is an ecosystem sensitive to changes (positive and negative) caused by both nature and humans. The Juan Gomez swamp is managed by a mechanism of hatches and pumping stations operated by the company that provides water service to the city, Aguas de Cartagena (Waters of Cartagena) – Acuacar – to guarantee the city's water supply throughout the year, including the dry season, through the water flow from the rest of the lagoon system.

The delta of the Dique Canal has the third most important mangrove ecosystem in the Colombian Caribbean and provides habitat and refuge for a diverse array of aquatic and terrestrial animal species. The area is also located next to El Corchal Fauna and Flora Sanctuary's proposed expansion area, which harbors a group of swamps of great importance – such as the Juan Gomez lagoon system, Palotal, Honda, Biojo, Cotorra and Hondo Stream – because of the environmental services they supply not only to the population settled within the area but also to

Cartagena residents. The study area covers 14,284 hectares (35,296 acres) including 9,917 hectares (24,505 acres) of a fluvial-marine area that is affected by the intrusion of salt, favoring the existence of a large mangrove forest cover, mainly in the southeastern portion of El Corchal Fauna and Flora Sanctuary. The Juan Gomez lagoon system is located between kilometers 80 and 92, (the Rocha-Correa segment) southeast of the municipal headquarters of the Arjona Municipality, which is on the right-hand bank of the Dique Canal and includes the towns of Rocha and Puerto Badel within its jurisdiction. Both the Juan Gomez Swamp and the lagoon system are exposed to strong human and natural pressures, including the following:

- Fishing activities.
- Wood extraction.
- Increase in livestock pasture, significantly reducing areas around the edges of water sources.
- Mining and quarrying activities.
- Dumping sites for human waste from settlements.
- Impacts of climate change.

The Juan Gomez-Dolores system operated naturally as a swamp in the 1960s, but during the 1970s a transformation in the natural systems began to occur due to the construction of public works projects to control the entry and exit of water. This caused abrupt changes in water dynamics during flooding and drought periods, which modified the shape of the system as well as its ability to supply and recycle nutrients, sediments and oxygen. This resulted in a change in the hydrologic and ecosystem functions from a swamp to a lagoon system, which in turn has had dramatic consequences, such as the reduction of fish populations.

The lagoon system slowly imposed itself, aided by the closing of the natural pipes that communicated the swamp with the Dique Canal. According to local fishermen, there has been a definite shutdown of the swamp system, which has been threatened by pollution and changes in the natural balance. This phenomenon can be verified through the multi-temporal interpretation of aerial photographs during the last decade. This endangers the health of not only the Juan Gomez Swamp – which supplies water for one million Cartagena residents – but also of other swamps on which communities rely for water and other natural resources that their livelihood depends on.

In 2009, the Andean Development Corporation (CAF) and TNC signed a Memorandum of Understanding to fund feasibility studies for the creation of a financial conservation mechanism for the Cartagena de Indias' supplying system, including an area for possible expansion of the El Corchal Fauna and Flora Sanctuary. Consultants were hired to conduct two studies:

1. Management Plan for the Juan Gomez-Dolores Lagoon System, including the possible expansion area of the El Corchal Fauna and Flora Sanctuary: This involved an analysis of conservation targets (viability, threats) and a zoning proposal taking into account those conservation targets. The study also proposed a series of strategies that could be implemented with local communities to promote better use of resources.

2. Study of the Opportunity Costs to Establish a Compensation Scheme for Users of the Juan Gomez-Dolores Lagoon System: This study estimated the total compensation to be paid in the study area, using the opportunity cost methodology to assess environmental services. It also helped set a financial goal for what would become the Cartagena Water Fund, with the strategies proposed in the management plan as its starting point.

The studies were completed in 2010. They provided the basis to prepare a formal proposal that will be presented to ACUACAR, which is expected to be the main partner for this water fund. Presentations of the water fund are also being made to several organizations that might be interested in participating, such as the Cartagena tourism sector, the chemical industry and the local government.

It is expected that the Cartagena Water Fund will be created during 2012. The financial resources for the implementation of the fund's first phase of activities total US$8.7 million.

Annex

Conservation Action Plan (CAP) Methodology

A good way to approach the design of the strategic plan is the use of existent planning tools. One of them is TNC's Conservation Action Plan (CAP) methodology[6], which has been widely tested, accepted and used in multiple planning processes carried out by both public and private organizations throughout the world[7].

This methodology can be applied to prepare a water fund strategic plan to conserve watersheds. This process guides work teams in the identification of effective conservation strategies and presents guidelines to develop an objective, consistent and transparent way to record and present the results of the actions and expected outcomes — both current and future — of conservation projects. The method allows project leaders to make responsible decisions that will improve the effectiveness of strategies and achieve greater conservation impacts, which in turn helps make investments in conservation in accordance with the technical and financial resources available. The CAP methodology is highly participatory, and workshops are generally used to complete several steps. The main steps of this methodology are described below:

6. More information about the CAP can be found in the manual on: http://conserveonline.org/workspaces/cbdgateway/.

7. For example, the Colombia National Parks Unit has adopted this methodology as a key tool to determine priority sites that must be protected in the country.

1. Define the Context of the Project/Water fund

Identify the Work Team That Will be Involved in the Planning Process

An initial step in applying this methodology is identification of the work team a core team. This group should be composed of individuals who are responsible for the overall design, implementation and documentation of the project. A work team is ideally composed of between three and eight people representing varied disciplines. These team members should have collective knowledge of the area (its hydrologic, ecological and socioeconomic context), and the team should include people with experience in managing and conserving watersheds and also people with experience in CAP.

Define the General Context of the Intervention Area

The aim of this step is to compile the necessary information to conduct a strategic planning exercise. This information includes maps of the area (hydrologic, base maps, land use maps, boundaries of reserves or protected areas, water-related infrastructure, dams, irrigation, etc.), hydrologic information (water quantity and quality, water use), biological information (vegetation cover, important biodiversity areas), and socioeconomic information (population censuses, economic activities).

2. Define the Scope and Conservation Targets

This step involves defining the extent of the fund's intervention and select focal conservation targets. This step helps the project team reach a consensus on the overall aim and scale of the water fund.

Description of the project area and its overall vision

Describe what the fund hopes to achieve in the long term and what its geographical area of intervention will be.

Selecting conservation targets

Conservation targets are those species, communities, and ecological systems that the fund aims to conserve in a specific area. In the case of water funds, these targets are linked to water resources, such as water sources protection, wetlands, rivers, sediment retention, guaranteeing water flows, and improving water quality, among others. In addition, many water funds also have biodiversity conservation objectives and, therefore, will need to include biodiversity elements as conservation targets. Other funds, such as the Tungurahua water fund (in Ecuador) have objectives dealing with improving livelihoods of rural communities. In such cases, it is important to include socioeconomic elements as conservation targets.

Assessing the integrity of focal conservation targets

Once focal conservation targets have been selected for the area, an assessment of their condition must be made. This step is of great importance to understand from the hydrologic/ecological perspective what the conservation target needs in order to be sustained in the long term. This exercise will help identify which targets require immediate attention and what variables need to be measured in order to determine whether the target's long-term conservation has been successfully achieved. When dealing with socioeconomic targets, it is important to understand the needs and indicators of those components. The following are key questions that must be answered during this step:

- "What do our conservation targets need in order to be in good condition?"
- "What is the current condition of the targets?"
- "What is the desired condition for the targets?"

3. Analyze Threats

This step involves identifying the various factors that affect the project's conservation targets and rank them in terms of their threat level. The questions that must be answered during this step are:

- "What problems affect the conservation of the targets?"
- "What are the most critical problems?"

Once clear and measurable goals have been set forth, the team will be able to identify the strategies that must be implemented to achieve them.

4. Develop Strategies

In order to develop strategies, a situation analysis will reveal the causes, motivations and stakeholders linked to the threats and targets. In the situation diagram, different elements can be graphically linked.

Set goals that describe the success of the water fund: Goals are specific and measurable statements of what the project hopes to achieve. They represent the team's assumptions as to what the project intends to accomplish. Goals can be set for and linked directly to the focal conservation targets and their threats. Capacity goals must also be established (institutional strengthening, long-term funding, etc.) to ensure that the water fund has the tools and resources to achieve its goals.

5. Create an Action Plan

During this step, the team will develop specific activities for the project. Specific questions to be answered include:

- "What do we specifically need to do?"
- "Who will be responsible for each task?"
- "What resources do we need?"

It is best to use a format that allows the team to organize information and plan activities, as well as follow up on the completion of activities and achievement of objectives. The action plan should include the following:

Conservation Targets

A general summary of the desired status of the water fund. Characteristics:

- Visionary .
- Relatively general.
- Short.
- Quantifiable.

Goals

Specific and measurable statements of what the water fund hopes to achieve in terms of improving viability and reducing threats. Characteristics:

- Impact-Oriented: They reflect desired changes in critical threat factors that affect the project's target.
- Limited in Time: They are achievable within a specific timeframe.
- Specific: They are clearly defined in a manner that all people involved in the project will have the same understanding of their significance for the project.
- Quantifiable: They can be defined in relation to a standard scale (numbers, percentages, fractions, or an all-or-nothing situation).
- Practical: Realistic.

Strategic Activities

A line of action taken by the project team in order to achieve one or more goals. Characteristics:

- Linked: They should be directly linked to the achievement of a specific goal.
- Feasible: They should be achievable considering the project's resources and constraints.
- Adequate: They should be acceptable and admissible in accordance with the specific cultural, social and biological regulations for the site.
- Focused: They outline specific tasks that must be carried out.
- Strategic: They maximize efficiency or impact.

Indicators

Indicators are established to perform adequate follow-up of the management plan's implementation and help measure the achievement of goals. Characteristics:

- Quantifiable: They can be recorded and analyzed in terms of quantity or quality.
- Sensitive: They change proportionally in response to real changes in the conditions or concepts measured and anticipate changes.
- Precise: They are defined the same way by all people involved.
- Consistent: They do not change over time and always measure the same thing.
- Cost-effective.

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