

Water-based Finance Mechanisms

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1 UNDERSTANDING WATER-BASED FINANCE MECHANISMS – HOW DO THEY WORK ?

1.1 Overview

A water-based finance mechanism can help raise funding to protect watersheds by persuading key water users to recognize and pay for the valuable hydrological services they receive from upland water sources and forests. Hydrological (water) services are one of the most important environmental services provided by forests. A healthy properly managed watershed functions as a “water factory” that regulates water flow and produces clean water for downstream villages, towns and cities, and supplies a vital resource for agriculture and industry. Around the world, there is a growing recognition of the critical role that forests play in providing water services, as well as the need for industrial and residential water users to play a more active role in protecting water sources in nature. As human populations and commercial ventures expand into upper watersheds and threaten forests and the environmental services they supply, water users will need to re-think the value that they place on maintaining a service now thought of as being provided for “free”.

To understand this new approach, it is necessary to understand that at present only a fraction of the cost of providing water is paid for by consumers. Traditionally, the economy considers many natural resources such as water, to be unlimited and assigns them a low economic value. In the case of water, the cost of maintaining its source is often not factored into the price users pay. This means that while the water services provided by a properly managed watershed are valuable to downstream users, upstream decision makers are not adequately compensated for the broad social benefits they help produce through sustainable land use practices. Given this situation, upstream decision makers are likely to convert forested watersheds to alternative land uses that offer them more immediate and direct economic benefits. This results in degraded forests, and adversely impacts the broad environmental services these forests provided. This situation has left both the public and private sector looking for new and efficient approaches to provide high quality water services at lower costs while maintaining the natural resource base.

A successful water-based finance mechanism requires conservation practitioners, planners and the public and private sector to make the link between water use, the protection of the water source, and the sustainability of the watershed. Although each watershed is as unique as the communities that depend on it, a common theme of this work is the recognition by water users of the financial benefits provided by forests. Water service beneficiaries in turn are encouraged to pay the additional costs necessary to maintain the infrastructure that provides clean water by showing them “what’s in it for them”. Additional funding raised through marginal water rate increases can be used to ensure a sustainable water supply. In many cases, this means the restoration or protection of upstream forests, and other riparian biodiversity, the “natural capital” that supplies essential water services.

Glossary of Terms

Natural Capital – Natural resources and healthy functioning ecological systems that produce environmentally and economically valuable goods and services. Just as economic capital provides steady financial returns, Natural Capital provides steady environmental returns in the form of ecosystem services.

Opportunity cost – In economic terms, the price or rate of return that the best alternative course of action would provide. In the case of watershed management, opportunity costs represent the potential benefits a watershed manager might forgo by adopting sustainable management practices.

Riparian – pertaining to the bank of a river, pond or small lake

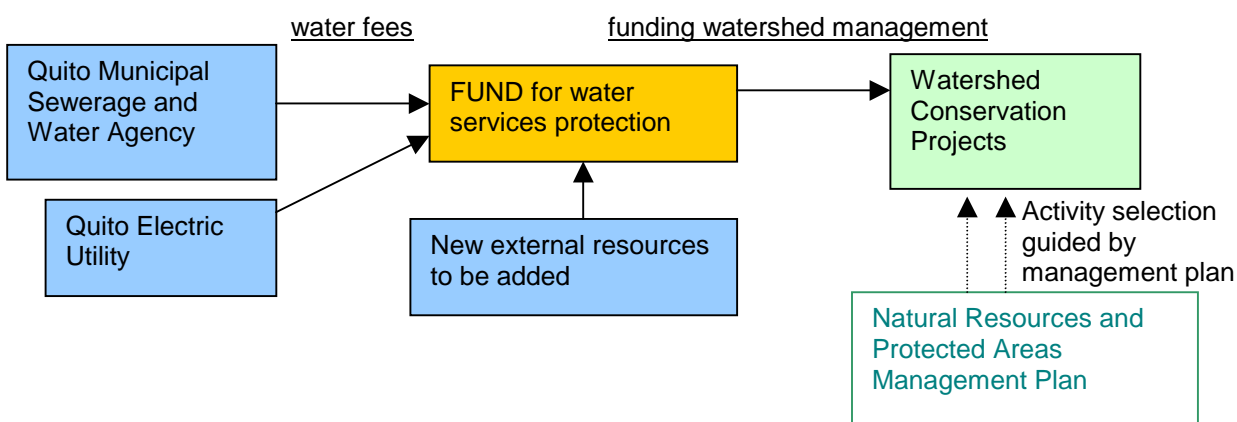
Transaction costs – Costs associated with the buying, selling or creation of an investment. In the development of a water-based finance mechanism examples of transaction costs include: stakeholder coordination and planning activities, outreach, feasibility studies, and legal fees.

Watershed – A region draining into a river, river system, or body of water.

Watershed Management Working Group – Watershed stakeholders that come together to formally collaborate in the development of a water-based finance mechanism.

Innovative water-based finance mechanisms are being developed and implemented at several sites around the world. An example of a public payment water-based finance mechanism can be seen in Ecuador. Water services to the city of Quito are provided by watersheds located inside and adjacent to protected areas such as the Condor Bioreserve. These upland plateaus and the quality of the water services they provide are affected by human activities such as extensive livestock grazing, agricultural practices, various large scale development projects and tourism. In order to develop the funding necessary for the long term protection of these regions a coalition of government agencies, environmental organizations, and water users worked together to develop a conservation fund for the city’s watersheds (*Fondo para la Conservacion del Agua – FONAG*) to be capitalized through water use fees (see Figure 1). These fees were first collected from the municipal water agency, and as the project develops, other key water users have agreed to pay into the fund to protect the watersheds whose services they rely upon. For a more comprehensive assessment of FONAG and a review of lessons learned see the case study [FONAG: The water-based finance mechanism of the Condor Bioreserve in Ecuador](#).

Figure 1 Water Based Finance Mechanism of the Condor Bioreserve in Ecuador



Developing such a water-based finance mechanism to promote watershed best management practices is no small task. It typically requires the participation and cooperation of multiple decision makers with often conflicting interests. The creation of a market for an environmental service will likely need to be promoted and organized by a coordinating body, supported by government institutions, and of course requires the eventual participation of “buyers and sellers”. The task is further complicated by the complexity of watershed management problems. The origin of watershed services are often unknown to users downstream. Additionally, designing watershed protection and rehabilitation strategies requires understanding and working within existing land use patterns and market linkages. The inherent complexity and consequent uncertainty demands a participatory approach with different perspectives needed to understand the problem. It is essential therefore to involve all potential stakeholders in the process to be successful. In short, the long-term success of generating payments from water users to finance watershed management and protection requires the full participation of a wide range of actors. Understanding those actors and their motivations is essential.

1.2 Key Actors and Motivations

The actors involved in developing a water-based finance mechanism (and their respective motivations) are often as unique as the watersheds they seek to protect, and the solutions they develop. Here, the actors are divided into four broad categories, watershed land use decision makers, water service beneficiaries, environmental NGOs and government agencies and policy makers. It is important to understand that these are not always discreet categories. For example, the fundamental need for water makes all involved “water services beneficiaries” to some degree. Likewise, the decisions of midstream water users will impact water services for those downstream from them. Again, to be successful, most water-based finance mechanisms will need to build the support of all of these groups in the early stages.

In some cases, these actors institutionalize this working relationship and establish a “watershed management working group”. Although any of these actors can take the lead in establishing a water-based finance mechanism it is most often a government agency or environmental NGO that assumes this role.

1.2.1 Watershed land use decision makers

Watershed land use decision makers include anyone whose activities or decisions affect the quality and quantity of hydrological services in a watershed. They can be poor farmers or wealthy absentee landlords, a protected area manager, an industrial facility, or an upland development project. Their distinguishing characteristic is the ability to support the hydrological services of a watershed by engaging in sustainable land management practices, or to diminish those services, for example by degrading forests. Watershed decision makers convert forests to alternative land uses for the simple reason that it offers them greater direct economic benefits. Although the broad social benefits of a forest’s water services are valuable, they are shared by all water users and tend to benefit large scale downstream water users the most. On the other hand, the costs of forest protection in the form of the foregone benefits of alternative land uses (opportunity costs) are borne directly by the watershed managers and decision makers. If water beneficiaries want watershed decision makers to engage in sustainable land management practices (such as forest protection) that yield valuable water services, they will need to provide the economic incentives to make it worth their while.

Adequate economic incentives required to convince watershed decision makers to adopt sustainable management practices must be determined. Land use decision makers must also be confident that institutional arrangements exist to guarantee they will receive this compensation if they adopt the desired land management practices. It is therefore critical that the legal and regulatory framework exists that permits those who make sustainable watershed management decisions to be compensated by a market that values the water services they provide. Often, the land of upper watersheds is inhabited by marginalized groups that are not politically or economically powerful and can be easily overlooked. Yet it is their behavior and the decisions that they make that will determine the success or failure of sustainable forest management and the long term provision of water services. It is imperative that these groups be brought into the overall participatory planning process early. Their participation and support is essential and their interests must be addressed.

1.2.2 Water service beneficiaries

Water service beneficiaries include any individual or organization that benefits from the water services provided by a watershed. This implies an immense and growing market with virtually all residential and industrial users as potential participants. But, as noted, the development of such markets will require a shift in the mindset of consumers as most have come to expect that the provision of such environmental services are free. Water users must first be convinced of the valuable economic services that healthy, properly managed land and forests provide. They must then understand that these services will only continue to be provided if sustainable land management practices are made as economically rewarding for land use decision makers as other more environmentally harmful land uses. It will usually be necessary to convince water users how such fees can benefit them in the long run, and they must also be assured that they “get what they pay for”. Monitoring land management practices and the provision of water services is therefore integral to “selling” the concept of a water-based finance mechanism to water users and maintaining their support.

A large amount of the time needed to develop a water-based finance mechanism will be spent determining who are the users that benefit most from watershed services and what information they will need to understand how watershed protection will benefit them. [Worksheet WBFM2](#) lists many of the typical beneficiaries of watershed services compared to the costs of watershed degradation. In many cases, especially in developing countries, industrial users may be more capable of paying additional water fees than residential users. It might be more politically viable to focus on industrial water users than residential users when initiating a water-based finance mechanism. The private sector might also be more inclined to support such market-based mechanisms if the existing system of public sector protection

of watersheds has proven unreliable in providing key services. Industrial users are also more likely to grasp the basic cost-benefit argument that underlies a water-based finance mechanism - that investments in watershed management are often cheaper than investments in industrial water management facilities. Watershed protection can therefore be viewed as an investment in “natural capital” providing a specific economic good. Finally, a water-based finance mechanism offers industrial users the opportunity of “doing well and doing good”. In other words, a water-based finance mechanism could well be the most efficient means to provide an economic input, *and* companies can also benefit through improved public relations by their support of a project with a positive environmental impact.

1.2.3 Environmental NGOs

Environmental NGOs are interested in protecting or rehabilitating areas they have identified as being of particular environmental significance. This work is often inhibited by a lack of funds and an environmental NGO might see a water-based finance mechanism as a means of raising necessary funding while simultaneously raising public awareness of the value of forest ecosystems. From the perspective of an environmental NGO, it is not necessary to develop a comprehensive economic valuation of all water services for all users. Rather, their focus is to generate funds adequate to protect the watershed priorities identified in their environmental management plan. But it is important for environmental NGOs to remember that a water-based finance mechanism does not just mean the transfer of fees from downstream water users to maintain upstream forests. Often, water-based finance mechanism arrangements address “downstream” problems too such as water treatment infrastructure improvements and demand reduction. Environmental organizations should understand that funds generated could be used for diverse activities such as implementing agricultural and industrial best management practices, and downstream demand issues, as well as managing upland forests.

Environmental NGOs are often strong advocates of maintaining forests in their natural state where possible. In general, this is highly compatible with the objectives of watershed protection, however it is important to realize that forests may also diminish some hydrological services such as total water flow (see box 2). Likewise, some land uses that might be considered less than ideal from an environmental perspective (such as a forest plantations) if properly managed may provide some hydrological services such as erosion control almost as effectively as natural forests. This indicates the importance of hydrological surveys and monitoring work to understand the actual hydrological services provided by sustainably managed forests versus alternative land uses.

1.2.4 Government Agencies and policy makers

Government can support a water-based finance mechanism by providing political backing, and supporting the development of institutional structures that ensure economic incentives are implemented. Government must establish and ensure property rights and land tenure and ensure the enforceability of contracts. Legal and regulatory frameworks that ensure that those who adopt best management practices and those who provide the economic incentives that make it possible, receive the benefits of their actions are essential. In the case of a public payment scheme where government has mandated an additional water fee for the purposes of watershed protection, it should ensure that funds raised are targeted towards the project and if possible not go into general revenues.

Traditionally, government agencies have been largely responsible for funding conservation projects and watershed protection measures. Government therefore may view a water-based finance mechanism as a way to eliminate budget expenditures on watershed protection. This would be a mistake however as government’s role in funding watershed protection will remain an important one as many of the broad social benefits provided by forest conservation are not easily captured by market mechanisms. However, where limited government budgets typically under fund the protection of valuable watershed resources, a water-based finance mechanism can provide much needed supplemental financing.

Finally, although the potential of this financial mechanism to protect watersheds is large because the market is large, creating an essentially new environmental services market requires a long term investment of resources. Those who promote the development of a water-based mechanism need to

guard against the possibility of raising expectations too high. A successful market will not be created overnight.

1.3 Types of Water-based Finance Mechanisms (WBFM)

This section borrows extensively from Johnson, White and Perrot-Maitre's adaptation of Powell and White (2001) to describe three categories of water-based finance mechanisms, distinguished by the degree of government intervention in the administration of the mechanism. In reality, the complexity of watershed management issues, including the legal and regulatory systems that influence them, imply a continuum of mechanisms involving the array of public and private actors discussed above. For a compilation of nine case studies spanning these three categories click here: [Case Studies of Markets and Innovative Financial Mechanisms for Water Services from Forests](#)

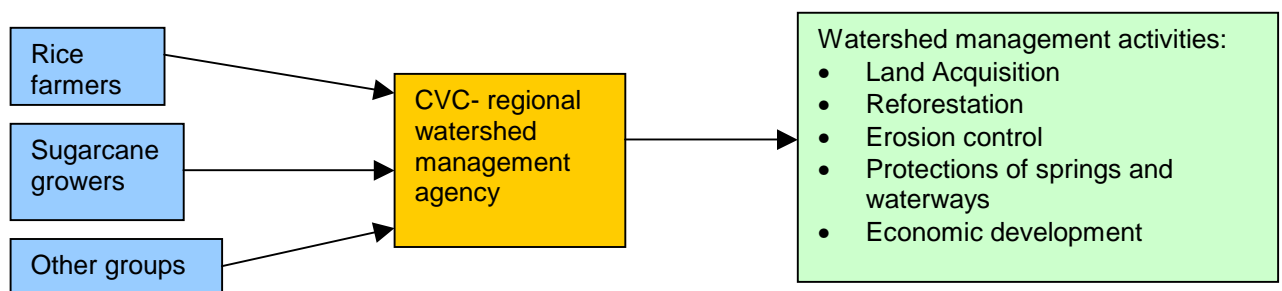
1.3.1 Private deals

In these cases private entities have developed their own mechanism to pay for watershed management and protection with minimal government involvement. These cases are more likely to be found where a watershed management approach can provide private interests with water services at a lower cost than can traditional treatment approaches. In such cases, private interests may bypass inefficient regulatory arrangements by negotiating deals directly between potential buyers and sellers of water services.

An example of the private sector initiating voluntary payments to support watershed management can be seen in the Cauca Valley in Colombia (see figure 2). The Cauca Valley Corporation (CVC) was established by the Government of Colombia to develop the region and protect its natural resources. The CVC was to allocate water between the different water users in the valley and manage the upper watershed. However rapid population growth and economic development in the region soon left farmers facing growing water scarcity. Because the CVC had insufficient financial resources to deal with this water shortage, associations of rice farmers and sugarcane producers voluntarily agreed to assess themselves additional fees to finance watershed management practices in upland areas to improve minimum flows during the dry season and reduce sedimentation in irrigation canals. In Colombia private associations are not legally empowered to implement watershed management plans and must work with governmental entities such as the CVC. This prohibition against private watershed management combined with a lack of public funds to support watershed management prompted this partnership. The associations' additional fees to the CVC are used to support reforestation, erosion control on steep slopes, land purchases and protection agreements for springs and stream buffers, and economic development in upland communities. This case did not require legal or regulatory reform. There is evidence that this program has helped stabilize the watershed, and stream flow has improved.

Figure 2 The water-based financed mechanism of the Cauca Valley in Colombia

Private associations pay voluntary fees to the CVC, who in turn fund watershed management activities

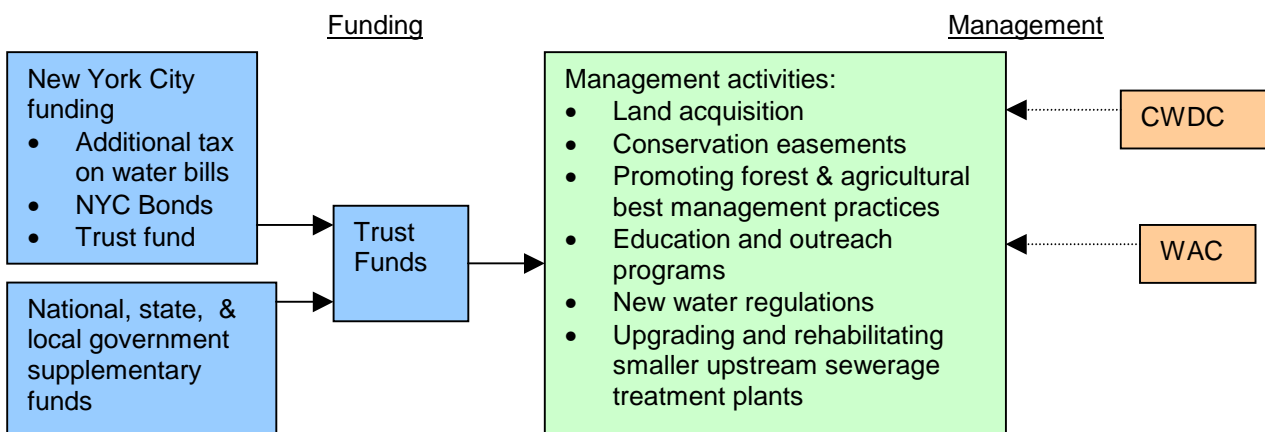


1.3.2 Public payment schemes

In a public payment scheme, government or a public sector organization can generate funding and forge an institutional arrangement to provide or maintain watershed services. Changes to the regulatory environment are often required. Of the three categories of financial mechanisms, public payment schemes are the most common in the world today. The financing can come from various sources including general tax revenues, bond issues, or user fees. Payments are made to private landowners and private or public resource managers. As with private schemes, intensive upstream/downstream negotiations are often necessary. Because of the public goods nature of water services, publicly financed transfer payments are likely to remain the most common financial mechanism used to protect watershed services.

For example in the United States in the early 1990s, the Environmental Protection Agency notified New York City that to maintain water quality standards it would have to construct a filtration plant at a cost of about US \$4 billion. However, an alliance between federal, state, and municipal governments in cooperation with local communities developed a more innovative solution. Rather than construct a new and costly plant, New York City is investing US \$660 million in rehabilitation of the Catskill/Delaware watersheds (see figure 3). National, state and local government also provided supplemental funding at later stages. Management activities include: land acquisition, rehabilitation of septic systems, flood control measures, environmental education, and stream corridor protection projects, as well as new regulations on the use of water. The Watershed Agricultural Council (WAC), a local organization was formed to improve land use practices and support economic development of local communities. The Catskill Watershed Development Corporation (CWDC), a non-profit organization, administers the watershed program.

Figure 3 The water-based financed mechanism of New York City



1.3.3 Trading schemes

Trading schemes are the least common of these three market mechanisms. In a trading scheme, government sets an upper limit or “cap” on the total emissions of particular pollutants. In most cases, individual facilities or landowners have a defined maximum allowable amount of emissions they can release, known as “credits”. If a company or landowner finds they can easily meet their allowable limit, they can then sell their excess credits to other entities who can not meet their limits as easily or cheaply. Trading emission credits enables companies and landowners to make economic decisions as to whether it is cheaper to lower their emissions or to buy credits from others who have been able to do so. Regulators in effect do not care who takes action so long as the overall standard is met or the cap is not exceeded. A strong regulatory system and effective monitoring systems are key requirements for trading schemes.

2 ADVANTAGES AND DISADVANTAGES

Advantages

- Markets for hydrological services are potentially immense
- Has the potential to protect large areas
- Promotes the recognition of the economic and ecological value of forests
- Can help provide essential services to industrial and domestic users more efficiently and at lower costs than traditional solutions
- Long-term sustainable protection of critical ecosystems if implemented properly

Disadvantages

- Possibility of raising unrealistically high expectations.
- Significant investment of resources (time, commitment, etc.) required to involve all stakeholders and build institutions necessary for success
- Changes to regulatory and legal structures may be required.
- Complexity of watershed management problems leads to difficulty in tracing the origin of the ecosystem service downstream
- Costs and benefits are separated between upstream providers and downstream users, and also separated between the present and future.
- Water services are often thought of as a free good coming from public or private land, which people are reluctant to pay for. Change of thinking required, often politically difficult.
- Transaction costs such as stakeholder coordination meetings, legal agreements, and monitoring and enforcement can be expensive.

3 SUCCESS FACTORS

Factors in bold type are essential. Some “critical mass” of the remaining factors should also be present; absence of more than a few greatly increases risk.

Ecological

- The watershed providing hydrological services to key water users has been identified as a conservation priority.
- A water-based finance mechanism is compatible with the overall strategy identified in the conservation management plan.

Hydrological

- **The watershed provides verifiable hydrological services of measurable economic value.**
- **Watershed protection and its effect on the hydrological services provided can be monitored.**
- Water services (flow regulation, quality, etc.) are well defined. Single and controllable sources of pollution or environmental degradation lead to a clear cause and effect between forest management and water services.
- Small scale watersheds where users can readily see the connection between sustainable forest management and the provision of watershed services.

Usage Demands

- **A relatively dense population or industrial presence capable of paying for water services.**
- Users can be convinced that a valuable service is being provided by forested watershed.
- **The economic activity linked to the ecosystem service is relatively important.**
- Users are confident that funds raised for improving watershed management is maintaining or enhancing the watershed and the quality of water services.
- Users are confident that the source will remain reliable.

Land Use/ Provision of Water Services

- **Sustainable management practices compatible with the provision of water services is made economically competitive with alternative more environmentally harmful land uses.**
- Substitutes for water service are expensive or unavailable.
- The economic service provided by the watershed is scarce or declining or the demand is increasing.

Legal/Regulatory Framework

- **Property rights and land tenure are well defined. Those who provide water services through sustainable forest management practices are able to receive compensation.**
- Additional funds raised through water rate increases do not go into general revenue, and can be set aside to address targeted threats.

Political Context

- **Political stability, with transparent legal, economic and administrative institutions.**
- **Solution must be deemed equitable.** If relatively poor users are required to make additional payments that are perceived to benefit rich land owners, or if relatively affluent water users are not required to make extra payments, the water fee will be unfeasible, or unsustainable.

Institutional Arrangements

- **Transaction costs of initiating and implementing deals must not exceed long-term benefits.**
- **Institutional arrangements that reduce uncertainties, promote collaboration, and enable enforcement of agreements so that those who provide water services will receive compensation.**
- Institution or agency that administers the watershed should be coterminous with the watershed itself.

4 STEP-BY-STEP METHODOLOGY

As noted, the development of water-based finance mechanisms to fund the long-term management and protection of critical watersheds is a fairly new approach. Consequently, the relative lack of experience in developing such mechanisms combined with each watershed's unique biophysical characteristics, and the particular social, economic, and institutional arrangements surrounding each watershed precludes any sort of "blueprint" for water-based finance mechanisms. However, there are common tasks and best practices that should be considered while assessing the feasibility of a water-based finance mechanism (WBFM), and initiating implementation. In the methodology presented below, stakeholders come together to collect and share information and begin a strategic planning process, identifying threats to the watershed, possible management responses, and how to finance those responses. Through this process, information gaps are identified and targeted feasibility studies are developed and implemented to obtain the information still needed to convince key water users of the merits of watershed protection.

These steps assume the water-based finance mechanism is initiated by a lead organization whose primary goal is the protection of critical upper watershed forest resources. The lead organization works in close cooperation with public sector institutions. It is important to note that precise sequencing and implementation of these steps will vary, depending on many specific circumstances. In general however, many of these steps can and will be pursued as parallel processes. Details on these steps and basic tools for collecting, summarizing and analyzing relevant information are provided in the following sub-sections.

GETTING STARTED

Step 1: Lead organization establishes a conservation rationale for pursuing WBFM

- A lead organization (NGO, protected area management team or government agency) reviews any existing conservation management plan for a landscape-scale region and consults conservation managers to determine if existing priorities, threats, and strategies can be addressed by a water-based finance mechanism.

IF CONSERVATION RATIONALE EXISTS:

Step 2: Lead organization conducts an evaluation to understand the extent of work required for WBFM

- Review existing literature on water-based finance mechanisms and consult experts as appropriate to understand the extent of work involved in successful implementation. (see the "resources" section at the end of this chapter)
- Review internal capabilities to determine what aspects of project might require special assistance (see Box 1)
- Defines its goals for a water-based finance mechanism.
- Determine how process can be funded; seek potential financial and in-kind assistance ([see worksheet WBFM1](#)).

STAKEHOLDER CONSULTATION:

Step 3: Lead organization begins to identify, engage, and consult all stakeholders involved

- Identify initial list of stakeholders (domestic and industrial water users, individuals and groups who make land use decisions in the watershed, local and regional government officials, development projects in watershed, etc. [See worksheet WBFM2](#))
- Convene stakeholders workshops to learn their perspective on the problem. Determine what they believe is needed and who they think has a different perspective.
- Educate potential beneficiaries and providers of watershed services about the concept of a water-based finance mechanism.

- Stakeholder group defines the goals for the watershed.
 - Build stakeholder support for economic incentives, and legal and regulatory changes necessary to implement a water-based finance mechanism.
- Step 4:** Interested stakeholders create a Watershed Management Working Group and decision-making structure and assign roles for information gathering
- Agree on composition and decision-making procedures. Assign roles
 - If necessary, recruit advisory and technical services from NGOs and government agencies with experience in WBFM.
- Step 5:** Watershed Management Working Group begins to collect and share information (hydrological, social, economic, legal, etc.) to come to a common understanding of key water services, threats to those service, threat abatement strategies and other issues
- Identify the broad hydrological services provided by the watershed.
 - Examine the legal and regulatory framework concerned with land tenure, and rights and responsibilities of water use management.
 - Reassess key threats to water services (protection of upstream sources and downstream demand and infrastructure) with stakeholders.
 - Identify strategies to address threats and key management actions.
 - Identify the resources needed to protect watershed services (e.g. technical assistance, training, financial compensation for land acquisition or conservation easements, etc.).
 - Develop general cost estimates for strategies to address threats to watershed services ([see worksheet WBFM4](#)).
 - Discuss institutional arrangements necessary to implement a WBFM – who will collect water fees; select projects to be supported; manage funds raised; implement management actions?
- Step 6:** Working group prioritizes water users and builds support for watershed management
- Finalize list of water users and beneficiaries of hydrological services provided by the watershed.
 - Prioritize beneficiaries that benefit most from, and should pay for, protection of watershed services.
 - Identify and engage key allies to gain support of priority users for WBFM.
- Step 7:** Define the terms of reference for a targeted feasibility study to obtain and analyze the information needed to gain the support of priority water users (see Terms of Reference – in Assessment section).
- Review information developed up to this point to determine what hydrological, economic, legal information etc. is needed by priority water users to demonstrate how watershed protection can benefit them. Develop terms of reference.
 - Hire technical expert(s) to conduct targeted feasibility study (e.g. third party consultants, NGOs, academic institutions, legal experts, local government officials, etc.)

FEASIBILITY STUDY:

- Step 8:** Technical expert(s) conduct a targeted feasibility study
- Identify the specific hydrological services that benefit priority users and the parts of the watershed most responsible for these services. Identify where water services are being compromised.
 - Estimate the value of economic services provided to priority water users. Examples of valuation methods include: cost of replacing service, value of economic activity that depends on service; general willingness to pay – contingent valuation models.

- Identify ways to measure and monitor the impact of watershed protection on water services and the impact on biodiversity conservation.
- Examine the legal framework which promotes or inhibits a water-based finance mechanism solution and what changes may need to be enacted.
- Determine what institutional arrangements will need to be developed for a WBFM.
- Estimate likely transaction costs to establish a water based finance mechanism.
- Develop detailed cost estimates for strategies to address threats to watershed services.
- Identify payment options and potential revenue generation for each option, linked to targeted water users.
- Outline specific WBFM options available and recommend concrete next steps for pursuing priority mechanisms.

IF DETERMINED FEASIBLE

Step 9: Watershed Management Working Group and key allies educate priority water users of the benefits of protecting watershed services through a WBFM.

- Drawing on feasibility study results, develop materials and craft messages targeting priority water users.
- Work with key allies to convince priority water uses of benefits of WBFM.

Step 10: Municipal or other appropriate government entity begins discussions with priority water users and land use decision makers and negotiates watershed protection payments agreement

- Discussion of expectations and what each side considers a fair deal.
- Agree on the prices that water users will pay that enable adequate protection of watershed services.
- Execute the watershed protection payment agreement.

Step 11: Watershed Management Working Group finalizes institutional arrangements and implements projects

- If necessary, create fund structure to channel water payments.
- Put in place formal procedures and rules for fee collection, fund governance and management, project selection, monitoring, etc.

Step 12: Watershed Management governing structure reviews performance and makes appropriate changes as necessary

- Implement monitoring and evaluation program
- Adaptive management changes as needed (e.g. adjustment to fee system, threat reassessment, conflict negotiation, etc.)

4.1 Assessment Phase

Details on the step-by-step methodology are provided below, with links to basic tools for collecting, summarizing and analyzing relevant information.

4.1.1 Getting Started

The step-by-step methodology assumes that a water-based finance mechanism is initiated by a lead organization whose primary goal is the management and protection of watershed biological resources. Such an organization would be well advised to start this process by reviewing any existing conservation management plans for the region. Conservation managers and practitioners should be consulted to determine if previously identified conservation priorities (such as threatened species and priority ecosystems) are likely to overlap with the areas within a watershed that provide critical hydrological services. If protecting key watershed resources is consistent with conservation priorities and strategies then a strong conservation rationale exists and the time and effort required to establish a water-based finance mechanism may be well spent.

It is important that any organization interested in taking the lead to promote a water-based finance mechanism understand what they are getting into and the extent of work involved. As seen in the step-by-step methodology above, establishing a water-based finance mechanism can require a significant commitment of time and resources. The potential advantages and disadvantages of a WBFM and the related success factors indicated in section one help convey the scope of work involved. A great deal of technical literature and case studies are available, including the references listed in the “Resources” section at the end of this chapter. A successful lead organization will have expertise in a wide range of activities (see Box 1) or be able to identify and work collaboratively with those who do. The lead organization should also have constructive working relations with relevant governmental agencies at various levels and have (or be able to cultivate) the trust and respect of the diverse array of stakeholders that will be involved in watershed protection.

Box 1. Capacity needs to establish a water-based finance mechanism

- Conservation planning
- Strategic planning
- Stakeholder co-ordination
- Interviewing or surveying
- Education and outreach
- Negotiation and conflict management
- Workshop organization and facilitation
- Economic valuation
- Financial analysis and management
- Policy analysis
- Financial assets or fund raising capabilities for start up activities
- Monitoring and evaluation

Early in the process, the lead organization should also understand its motivations and define its goals for a WBFM. The first thing that should be asked is: Why are we promoting a WBFM and what are our goals? Some of the answers may be:

- To develop a stable and permanent financial resource for the protection key watershed resources with high conservation value.
- To demonstrate to water users the valuable economic services provided by standing forests.
- To promote sustainable forest management practices amongst watershed decision makers.
- To improve water quality through agricultural and industrial best management practices.

The answers will differ for every group depending on its particular circumstances. If an environmental organization's goals are primarily conservation related, they should be clear about this from the beginning. This does not mean that conservation goals will or should be the only factors driving the process. Conservationists must understand from the outset that establishing a successful water-based finance mechanism will not mean that all water fees will necessarily go to conserve high priority watershed sites. The various stakeholders involved such as government agencies, the private sector and community groups will have broader objectives than just the protection of high biodiversity watershed

resources. Many resources may well be devoted to “downstream” activities such as reducing demand and improving infrastructure. This is to be expected, and does not prevent the development of mutually beneficial solutions. But environmental organizations must be clear as to what their conservation priorities are when working with a broad array of stakeholders to develop a WBFM.

The lead organization must also consider the financial resources needed to develop a WBFM. Before any money is raised directly from water users, a great deal of work will need to be done. Activities such as convening stakeholder meetings, education and outreach, and conducting feasibility studies will all require financial support. It is not required that the lead organization be the sole source of these financial resources, but it would do well to begin to develop budget estimates for the expected start-up activities. Exploring short-term funding sources from government agencies, concerned stakeholders, and international organizations interested in leveraging their resources to develop a permanent source of funds for watershed protection should occur as early as possible. It is still too early in the process to have an accurate picture of the exact watershed management activities that will be supported, but it is important to start thinking about these costs early in order to determine how they can be financially supported.

Worksheet WBFM1 provides a framework to record and/or project the monthly expenditures incurred for WBFM start-up activities, i.e. the transaction costs.

Instructions for WBFM1: Summary of expenses incurred (monthly) for WBFM start-up activities

- (i) Review the sample start-up activities listed in column A and compare to planned activities; modify as needed.
- (ii) For each activity record actual or expected expenses associated with each start-up activity (transaction costs).
- (iii) Total columns to determine the monthly expenditures on start-up activities.

In analyzing these costs, key questions to consider include:

- How can transaction costs be kept to a minimum and still achieve project objectives?
- Where will funding come from to support these transaction costs?
- Does a positive cash flow need to be maintained for start-up activities, or can the lead organization or watershed working group absorb initial transaction costs?

4.1.2 Stakeholder Consultation

Regardless of the lead organization, no single government agency or NGO has the capacity to effectively develop and implement a water-based finance mechanism. A government agency might lack sufficient knowledge of local conditions or the manpower that would be needed for monitoring and enforcement, and NGOs often represent particular interests, not a broad array of stakeholders. Consultations with relevant stakeholders from the earliest stages in order to develop participatory decision making structures are a priority in creating or expanding a new environmental services market. This is a complex undertaking that will take time, but developing true participatory structures that encompass decision making, implementation and conflict resolution amongst the various stakeholders will lower costs and provide more effective and permanent solutions in the long run.

The lead organization should begin to identify and engage stakeholders early on. Worksheet WBFM2 provides examples water beneficiaries. Click here to [link to worksheet WBFM2](#) This list can be used to spur thinking about the particular stakeholders in an actual watershed. Identified stakeholders can then be approached by the lead organization or other key allies to learn about their perspectives on watershed management issues, and begin discussions on the potential benefits of a water-based finance mechanism. Stakeholders can be approached on a one-on-one basis and as interest grows, meetings and workshops should be arranged, to bring key actors together to work on collaborative solutions.

A key goal during this stage should be defining a common vision for the WBFM. Again, each group may come to the process with different immediate objectives, such as “protect biodiversity”, or “develop a more cost efficient way of providing water”, or “meet regulatory standards”, but these are not mutually exclusive. It is critical to not exclude typically disenfranchised groups from the process such as poor small-holder farmers in upper watersheds, or poor urban domestic water consumers. Equity concerns must be considered in order to fashion a politically viable agreement. Inequities will lead to unsustainable solutions.

Ideally, stakeholder participation will grow to the point that interested stakeholders will create a watershed management working group and assume the coordination role that has been filled by the lead organization to this point. In this case stakeholders need to agree on a composition of the working group and set decision-making procedures and assign roles. Key considerations for establishing such a working group include:

- Balanced composition – adequate representation of all stakeholder groups including community groups, private sector, and government.
- Developing institutional arrangements that co-ordinate numerous stakeholders and ensure their respective issues are given a voice.
- Clear decision-making structures that represent the consensus goals and desires of working group members.
- Assigning roles for information gathering that do not introduce political or scientific bias
- Maintaining sufficient funding to cover the transaction costs incurred by the working group (see worksheet WBFM1).
- Legal considerations for establishing a working group.

4.1.3 Information Gathering

Implementing a water-based finance mechanism will require gathering a great deal of information (environmental, hydrological, social, legal, economic, etc.) in order to develop a balanced solution, and demonstrate to water users the benefits of additional fees to maintain water services. This information gathering process will take place in two distinct phases. In the first phase, the lead organization or watershed management working group will collect information themselves in order to gain a shared understanding of the watershed management issues faced. From here they can begin to answer the broad questions including identifying threats and appropriate management responses to address those threats. Ultimately, this first phase of information collection will help stakeholders determine significant

information gaps, and help them define the terms of reference for consultants to answer key remaining questions necessary to gain the support of “priority” water users.

One area that requires careful consideration is the inter-relationship between forests and water. Although forests do produce broad water services such as filtration and prevention of soil erosion, some misconceptions still exist regarding the linkages between forests and water. Anyone interested in implementing a WBFM should understand the basic relations described in Box 2 – *Biophysical Relationships that Link Forests Water, and People*. These linkages are important to keep in mind when determining appropriate watershed management activities. Identifying and quantifying the specific hydrological services provided by a watershed is not an easy task and can be costly. Often broad assumptions are made as to what services are being provided and their economic value. However, the more accurate the information that is available, the stronger an argument can be made to show water users that they will receive economic benefits through the protection of forested watersheds. The step-by-step methodology presented in this section attempts to make the task of hydrological assessments more manageable by conducting *targeted* studies focused on the information needs of priority water users.

Box 2 Biophysical Relationships that Link Forests, Water, and People

The biophysical relationships between forests and water are highly variable from one location to another depending on climate, soils, and vegetation types; there is no substitute for site-specific information. The following are a few simplified basic relationships:

Forests slow the rate of runoff in a watershed. Forest vegetation takes up water and delays the time to soil saturation (after which water pools or runs off the land into the nearest watercourse). Forest soils also usually have a higher water storage capacity than non-forest soils (Falkenmark et al. 1999). And, the more complex structure of the forest ground surface and underlying soil allows more efficient soil infiltration compared to a deforested watershed. By slowing the rate of runoff, forests can help to minimize flooding in smaller watersheds (although they may not influence large-scale flooding). By slowing the runoff rate forests may also increase minimum stream flows during the dry season.

Forests reduce soil erosion and sedimentation of waterways. Interception of rain and snowfall by forest canopies means that less water falls on the ground compared to a deforested watershed. Understory forest vegetation and leaf litter protect the soil from the impact of rain that does fall through the canopy. Extensive root systems help hold soil more firmly in place and resist landslides compared to clear-cut or heavily disturbed watersheds. Sedimentation levels in waterways of forested watersheds are generally lower than in nearby agricultural or urbanized watersheds, but the degree depends on soil types, topography, and climate (Falkenmark et al. 1999).

Forest soils filter contaminants and influence water chemistry. Forest soils are more waterlogged than other soils (except wetlands) and contain more nutrients, allowing them to filter out contaminants (Falkenmark et al. 1999). Clearing and cultivating forest soils tend greatly to accelerate decomposition and to release large amounts of nutrients that leach into groundwater, surface water runoff, and streams. For example, streams in agricultural areas in temperate regions typically have nitrate levels 10 times higher than streams in nearby forested watersheds (which is partly the result of fertilizer applications).

Forests reduce the total annual water flow in a watershed. Contrary to popular opinion forests generally reduce the total annual stream-flow (Calder 1998). This is because trees consume water for transpiration, which is then evaporated back into the atmosphere. In general, trees consume more water than other types of vegetation, including grasses and annual crops. The degree to which forests reduce stream-flow, however, depends on various factors. For example, shallow-rooted trees tend to use less water than deep-rooted trees. Young regenerating forests tend to use much more water than mature and old growth forests (Bruijnzeel In press).

Forests can increase or decrease groundwater recharge. Forest cover can lower groundwater recharge because more precipitation is intercepted by vegetation and returned to the atmosphere through evapotranspiration. In some areas, however, removal of forest cover can result in a crusting of the soil surface that reduces or prevents water infiltration and groundwater recharge (Falkenmark et al. 1999).

Forest loss shifts aquatic productivity. Forest cover plays an important and complex role in sustaining aquatic productivity (Thomas et al. 1993). Trees shade waterways and moderate water temperatures. Woody debris provides fish with habitat while leaves and decaying wood provide nutrients to a wide array of aquatic organisms.

Forests may influence precipitation at a large regional scale, but the effect of forest cover on rainfall in most areas is limited. The distribution of forests is a consequence of climate and soil conditions — not the reverse. Some evidence suggests large-scale deforestation has reduced rainfall in China and some climate models indicate extensive forest losses in Amazonia and Central Africa could lead to a drier climate (Institute of Hydrology 1994; Xue 1994). Still, afforestation is not an effective strategy to increase rainfall (Kaimowitz 2000).

Source: Johnson N., A. White and D. Perrot-Maître (2001)

The watershed working group should also begin to examine the related watershed management issues circumscribed by the existing legal and regulatory framework and associated customary or informal rights. Property rights and responsibilities and land tenure are critical but often poorly defined. Equity issues should also be explored and discussed. Key questions to consider for legal review include:

- Do land owners have the “right to pollute” ? (i.e. what are the restrictions on the use of their land or adjacent water?)
- Do downstream users have a right to clean water?
- Can those who help provide water services receive compensation for best management practices, non-use, or alternative use?
- Is there a way that one can charge water users an additional fee to protect watershed resources?
- Can additional water fees be separated from general revenues and “ear-marked” for watershed management activities.
- What institutional arrangements are allowable to disperse fees for watershed management activities?
- What enforcement mechanisms are possible (for not paying fees, not adhering to agreed management activities, etc.).

In general larger more complex watersheds will require more complex legal and institutional arrangements so that those who pay for the maintenance of water services are assured that management agreements are enforced, and those who implement best management practices are assured that they will received benefits promised.

The overall objective of the working group collecting and sharing relevant watershed information is to develop a basic understanding of the issues at hand so that they can begin strategic planning and identify remaining information gaps. With a common understanding of the ecological, social, regulatory and economic processes at work in the watershed, stakeholders can identify key threats and management activities to address those threats. Worksheet WBFM3 can be used to summarize the most important concepts in this strategic planning process. Stakeholders should use this sheet to list:

- Key conservation priorities and/or areas providing hydrological services
- Stakeholders or socio-economic processes that have an impact on water services
- The key threats to water services (as a result of the stakeholders or socio-economic processes)
- The key management actions planned in response to these threats
- Management Goals – the benchmarks for assessing progress and measuring success

Click here to [link to worksheet WBFM3](#)

The worksheet WBFM3 is intended to encourage users to think about the broad concepts of strategic planning in the early stages. As more information is developed about the watershed, especially from the targeted feasibility studies, users can refine these details. As planned management activities take shape, the working group can begin to develop general cost estimates for implementing these activities.

[Worksheet WBFM4](#) provides a framework to record and/or project the yearly expenditures incurred for planned management activities. These management activities are divided into four main categories: land management, training, technical assistance and monitoring and evaluation.

Instructions for WBFM4: Summary of expenses incurred for WBFM management activities

- (i) Review the sample management activities listed in column A and compare to planned activities; modify as needed.
- (ii) For each activity record actual or expected expenses associated with each management activity.
- (iii) Total columns to determine the expected funding needs to implement management activities

In analyzing these costs, key questions to consider include:

- What are the priority activities required to achieve management objectives?
- Will priority water user fees be able to cover these expenses? If not, are other funding sources available (e.g. government appropriations) or will management activities need to be curtailed.

[Click here to link to worksheet WBFM4](#)

	KEY MANAGEMENT ACTIONS	200_	200_	200_	200_	200_	200_	200_	200_	200_	200_	200_	Total
LAND MANAGEMENT													
<u>Conservation Land Subprogram</u>													
	Land Acquisition												0
	Property #1												0
	Property #2												0
	Property #3												0
	Conservation Easements												0
	Property #1												0
	Property #2												0
	Property #3												0
	Owner Contact												0
	Surveys, Appraisals, Legal Fees, etc.												0
	Land Management Plan												0
	Other												0
<u>Protection Subprogram</u>													
	Reforestation												0
	Agricultural Land Use Agreements												0
	Enclosure of Water Sources												0
	Erosion Control												0
	Boundary Demarcation												0
	Vigilance Program												0
	Other												0
TRAINING													
<u>Forestry Subprogram</u>													
	Sustainable Forestry Management												0
	Alternative Livelihoods Program												0
	Fire Management												0
	Other												0
<u>Agricultural Uses Subprogram</u>													
	Agricultural Best Management Practices												0
	Other												0
<u>Industrial Uses Subprogram</u>													
	Industrial Best Management Practices												0
	Pollution Prevention & Cleaner Production												0
	Other												0
<u>Community Outreach Subprogram</u>													
	Public Education												0
	Watershed Management Education												0
	Public Media Campaign & Materials												0
	Other												0
TECHNICAL ASSISTANCE													
	Equipment and Infrastructure												0
	Legal Services												0
	Other												0
MONITORING AND EVALUATION													
	Hydrological services (flow, quality, etc.)												0
	Change Land Use												0
	Implementation of Best Management Practices												0
	Other												0
TOTAL		0	0	0	0	0	0	0	0	0	0	0	0

Finally, the watershed working group should prioritize the identified water users by a consensus of who should pay to protect watershed services based on who receives the most value from those services. Stakeholders shouldn't expect everyone to pay, and don't necessarily need everyone to pay additional water fees to achieve management goals. "Who should pay" is somewhat subjective, but this determination should be based on who receives the greatest economic benefits from watershed protection, and who is most capable of paying. This step is critical as the feasibility studies will be designed to target information that will help these priority users understand why paying additional water fees is in their best long term economic interests. The working group should then begin to identify and engage the key allies who can help educate and gain the support of the priority water users.

4.1.4 Targeted Feasibility Assessment

4.1.4.1 Overview of feasibility assessments

Due to the vast scope of watershed management issues it is essential that feasibility studies be focused on the critical remaining information gaps. In the methodology described above this means targeting the information necessary to demonstrate to priority water users the economic and ecological rationale *relevant to them* for protecting watershed services. For example, if the target audience is an electric utility, and a watershed working group wants to prove the importance of reduced sediment in the operation of their turbines, a feasibility study does not need to put great effort into monitoring the level of health risk contaminants. However, if the example is an audience concerned with drinking water, the level of toxic pesticide run-off becomes an important factor in the study. Getting the focus right will allow cost-effective studies that take several months, not several years.

In the generic terms of reference presented below four major tasks are highlighted for priority user-targeted feasibility studies: 1) Hydrological studies 2) Economic valuation 3) Legal and regulatory review and 4) Monitoring and evaluation options. These diverse tasks will likely require multiple consultants working in collaboration to satisfy the goals of this study. As a good deal of information collection and analysis should have already been done by the watershed working group, consultants should start by reviewing these details and strategic planning decisions with key stakeholders in order to build on this work and make recommendations on next steps. Ideally, consultants will have been identified and brought into the information collecting process early enough offer input to the watershed working group on key objectives such as identifying priority water users.

4.1.4.2 Generic Terms of Reference (TOR) for feasibility assessment

OVERVIEW OF TOR

[INSERT WATERSHED NAME] is _____ ha. in size and located in [FILL IN PROVINCE(S)] of [FILL IN COUNTRY]. The watershed provides hydrological services of economic value to a wide range of stakeholders identified by the [NAME OF WATERSHED WORKING GROUP]. In order to more effectively protect and manage watershed resources and the water services they provide, a long-term sustainable financing system is required. Initial planning discussions by the working group have identified strategic planning information such as conservation priorities, threats to the watershed, and key management activities in response to threats. The watershed working group has also identified a list of "priority water users" [FILL IN priority users]. To examine these opportunities in-depth [NAME OF CONTRACTING ENTITY] is commissioning a this targeted feasibility study to obtain the information needed to educate priority users about the long-term economic benefits of watershed management, and make recommendations on options for a water-based finance mechanism.

The study will collect specific information relevant to these priority water users and evaluate key issues and conditions influencing the feasibility of collecting additional water fees from priority water users to finance watershed protection. Through on-site interviews, technical surveys, collection of existing data and other activities, the consultant will conduct an overall analysis of information pertinent to the identified

priority water users. Through extensive interviews with the priority users and other watershed stakeholders including relevant government agencies, local community leaders, land-use decision makers and [LIST SPECIFIC STAKEHOLDERS TO BE INTERVIEWED], the consultant will collect and analyze relevant information and recommend specific options for viable water-based finance mechanisms.

Tasks:

1. Hydrological study

- Document the water requirement(s) for priority user(s) (quality/quantity).
- Describe the key water sources in the watershed and the hydrological factors associated with them (topography and slope, scale and size of basin, geology, types of soils, total rainfall and distribution, location of forests and protected areas).
- Describe the threats and interim uses of the water between the source and arriving to the priority users.
- Determine the hydrological changes (quality and quantity) to water services under current conditions if these threats are not abated.
- Determine the potential improvements to water services if key management activities are implemented.

2. Economic Valuation study

- Assess the relationship between current quantity or quality of water used and effective levels of production or income generation for priority users.
- Select appropriate valuation methodology and document the economic impact on current production levels with projected decreases in quantity or quality of water.
- Document the relationship between public health costs and watershed protection.
- Assess and summarize how the existing water fee program is structured, document how fees are spent, and revenue generation trends.
- Determine the potential to generate revenues from priority water users.
- Based on the above, develop 10-year revenue projections drawing from all fee mechanisms determined to be viable or particularly promising.

3. Legal and regulatory framework

- Assess the current water norms and regulations on use and discharge.
- Determine if regulations preclude critical elements of a water-based finance mechanism: increased water fees for watershed protection, collection of fees, spending on watershed management activities, enforcement mechanisms, etc.
- Determine if legal regime exists or could be put into place to support proprietary allocation of income channelled directly to conservation activities.
- Determine if a process exists for implementing environmental easements for watershed protection.
- Describe overall political support for a water-based finance mechanism.

4. Monitoring and Evaluation

- Develop a baseline and on-going water monitoring plan with special attention to information needs of priority users. Determine the “what”, “where”, “when”, and frequency of monitoring for water quality and flow rates.
- Initiate monitoring plan and determine the current levels of contaminants, sedimentation, flow rates, etc.
- Determine the sources of contaminants and toxics that exceed established regulations and acceptable norms.
- Develop monitoring plan for measuring results of proposed management activities (forest cover, conservation easements, agricultural best practices, etc.)
- Develop monitoring plan for measuring relationship between implementation of management actions and improvements to biodiversity targets.

5. Next steps

- Outline options available and recommend specific next steps for establishing water-based finance mechanism.
- Provide specific comments on the appropriateness and feasibility of the strategic planning points identified by the watershed working group:
 - Conservation priorities/ areas providing water services
 - Stakeholders / Socio-economic uses of watershed services
 - Threats to watershed
 - Key management activities
 - Measure results

Deliverables:

1. Feasibility report. A preliminary report capturing all of the task points outlined above will be submitted to a “Review Team” for comments and discussion prior to the finalization of the report for submission to the contractor. A final report will be submitted in written and electronic form.

2. Contact list. List of key contacts (name, title, address, email, phone number) will be attached to final report.

3. Briefings. Concluding briefings will be provided in [LIST CITIES] to summarize preliminary results for contractor and other interested stakeholders.

Staffing and timetable:

The project will be implemented during the period [FILL IN]. A preliminary report will be due on [FILL IN DATE] and a final report will be due on [FILL IN DATE]. The level of effort will require a total of [FILL IN #] consultant days. [IF A TEAM OF CONSULTANTS:] The consulting team will consist of: [FILL IN NAMES, BREAKDOWN OF DAYS AND ROLES]

4.2 Implementation Phase

If the targeted feasibility study concludes that a water-based finance mechanism is indeed viable, then the key actors enter into an implementation phase, which can take a year or more to complete depending on the complexity of the watershed management issues, the number of stakeholders involved, the intricacies of negotiating payment agreements, and the support level of government. The key implementation steps are outlined in the Stepwise Methodology (Steps 9 -12) above.

Work with key allies to develop message and educate priority users

The watershed working group needs to identify and work with key allies who can help them convince priority users of the benefits of watershed management and protection. Allies should support the idea of a water-based finance mechanism and have some influence with priority users. Examples of water users and potential key allies are shown in table 1.

Table 1 – Examples of Water Users and Key Allies

Users	Key Allies
Domestic Users of Potable Water	Mayor Regional Government Water Utility
Agriculture	Individual producers/ farmers Co-operative Agricultural Union
Hydro-electric power industry	Electric Utility Governmental Regulatory Agency

Messages to priority users and their associated allies must be crafted to address the information presented in the targeted feasibility studies. Water users must understand that incentives for better land management upstream will result in downstream benefits. This is also an opportunity to make the case to industrial water users that support of a water-based finance mechanism is an opportunity to improve community relations.

If this outreach message is successful, the next step is for the municipal or other government entities to begin negotiations with priority users to pay additional fees dedicated to watershed protection activities. The economic value of the water resource to a user (as determined by a consultant) is only the departure point for establishing a fee, which is likely to be a trial and error process based on political and business negotiations. Economic incentives for land users to implement best management practices will need to be determined through experimentation and negotiation as well. For example, incentives are inadequate, too few landowners will participate in best management practices and watershed protection and water services will suffer. It should be kept in mind that a single optimum solution does not exist. The amount of funds raised and the selection of watershed management activities undertaken depends to a large extent on the stakeholders and what they consider a fair distribution of costs and benefits. User buy-in can also be done on a rolling basis. As additional users are convinced of the merits of the program, they can enter into new agreements to support watershed management activities. This was the case in the Quito and Cauca Valley watershed case studies illustrated above.

Box 3 Rules of Thumb for Innovators

There are many opportunities to develop markets for hydrological services and many innovators eager to seize these opportunities. Although these approaches are relatively new, there has been enough experience to suggest several rules of thumb. A preliminary set of these rules follow.

Biophysical

- Protect or restore wetlands and riparian vegetation first.
- Maintain natural forests before investing in reforestation.
- Focus on road-building and soil compaction before reforestation.
- Do not rely on fast growing tree species to slow erosion or extend dry season flows.
- Anticipate differences between species, young versus old forests, natural versus plantation forests.

Economic

- Focus on services that are scarce, declining, and have expensive or no substitutes.
- Focus on services directly linked to downstream investments or beneficiaries.
- Base compensation levels on the estimated value or the economic importance of the service.
- Package hydrological services with other ecosystem services if possible.

Social

- Seek out and use local knowledge of the watershed.
- Clarify rights and responsibilities under the existing law and customs.
- Identify stakeholder groups and involve key members in early planning.
- Consider equity implications of watershed investments.

Operational

- Initiate work at reasonably small scales — tens of thousands of hectares rather than hundreds of thousands of hectares — before scaling up.
- Treat major assumptions as hypotheses — monitor and test once implementation begins.
- Do not underestimate transaction costs — seek government or donor help.
- Assemble an interdisciplinary planning and management team.
- Share experiences and findings early and often, especially with decision-makers and stakeholders.
- Choose financial mechanisms that fit existing institutional conditions. Practitioners in areas with weak public institutions, for example, in Colombia's Cauca Valley, may find that self-organized private deals are the most effective. Those in a highly regulated environment, such as the United States, may find that the additional effort to set up a trading system is more than compensated for by dramatic improvements in the efficiency of reaching water management goals. Where public institutions play an important role in land and/or water management, public payment schemes are likely to be important.

Source: Johnson N., A. White and D. Perrot-Maître (2001)

5 RESOURCES

5.1 Bibliographic references

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5.2 Web Sites

<http://www.fao.org/ag/agl/watershed/>

Web site of the FAO’s electronic workshop on “Land-Water Linkages in Rural Watersheds”. Resources include summary of discussions, workshop papers and case studies.

<http://www.unesco.org/water/>

The UNESCO Water Portal provides links to the current UNESCO programs on freshwater and will serve as an interactive point for sharing, browsing and searching websites of water-related organizations, government bodies and NGOs. Links can be searched according to water-based themes, geographic scope, or by organization. Other on-line resources include a searchable list of water-related events, and learning modules.

http://www.unesco.org/science/waterday2000/who_is_who.htm

“Who is who in the world’s water” provides links to International Organizations, NGOs, Organizations and Companies working on water related issues. Links to sites in French and Spanish available.

<http://www.wsscc.org/interwater/keyorgs.html>

Links to key international organizations in water and sanitation, including: World Water Council, UNEP, UNESCO, World Bank, UNICEF, Global Water Partnership, World Health Organization, and Water Supply and Sanitation Collaborative Council.

<http://www.iwrn.net/mainenglish.html>

The Inter-American Water Resources Network seeks to strengthen integrated water and land resources management in the Americas by building and strengthening water resources partnerships between nations, organizations, and individuals. Resources include publications, directory of organizations, a calendar of events and discussion groups.

<http://www.eclac.cl/default.asp?idioma=IN>

The Economic Commission for Latin America and Caribbean is one of the five regional commissions of the United Nations. It is concerned with the economic and social development of Latin America and the Caribbean. A data base search on “water” will yield many valuable links.

<http://www.worldbank.org/nipr/>

A site for researchers, government officials, and citizens interested in understanding and improving control of industrial pollution, especially in developing countries. NIPR is the primary source for materials produced by the World Bank's Economics of Industrial Pollution Control Research Project.

5.3 Contacts

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