A GOOD PRACTICE GUIDE

DRINKING WATER, BIODIVERSITY AND POVERTY REDUCTION

Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is a global agreement that addresses biodiversity, and has 192 Parties today. It was established in 1992, with three main objectives:

1. the conservation of biodiversity;
2. the sustainable use of its components; and
3. fair and equitable sharing of benefits arising out of the utilization of genetic resources.

The Secretariat of the CBD (SCBD) was established to support the goals of the Convention. Its principle functions are to prepare and service meetings of the Conferences of the Parties (COP) and other subsidiary bodies of the Convention, support Parties as appropriate, and coordinate with other relevant international bodies. The SCBD established the Biodiversity for Development Unit in 2008 with the support of the French and German governments. The goal of the Unit is to promote the integration of biodiversity conservation and poverty alleviation objectives in both conservation planning (e.g. National Biodiversity Strategies and Action Plans) and development planning (e.g. Poverty Reduction Strategy Papers or Sustainable Development Strategies).

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CONTENTS

Foreword to the series

The conservation and sustainable use of biological diversity, and the eradication of extreme poverty are two of the main global challenges of our time. It has been recognized by the international community that these two challenges are intimately connected, and require a coordinated response. The protection of biodiversity is essential in the fight to reduce poverty and achieve sustainable development. 70% of the world's poor live in rural areas and depend directly on biodiversity for their survival and well-being. The impact of environmental degradation is most severe for people living in poverty, because they have few livelihood options to fall back on.

The Millennium Development Goals (MDGs) were established by the United Nations in 2000 to combat poverty, hunger, disease, illiteracy, gender inequality and environmental degradation. They integrate the 2010 Biodiversity Target set in 2002 by the Convention on Biological Diversity to achieve, by 2010, a significant reduction in the rate of biodiversity loss. Biodiversity is key to the achievement of all MDG goals, and the fulfillment of this international commitment by 2015.

Building bridges between biodiversity, poverty reduction and development is a crucial task. It involves strengthening the rights of the poor over resources, and developing financial incentive measures whereby the poor who are living in biodiversity-rich regions would receive payment from those who benefit from those services. It also includes strengthening partnerships and collaboration between biodiversity and development sectors.

This series of guides aims to compile good practices that support biodiversity conservation and poverty reduction in a number of different development sectors. It is our hope that these guides provide practical direction for governments, development agencies, businesses, and non-governmental organisations working to ensure that biodiversity conservation and poverty reduction activities go hand in hand.

Ahmed Djoghlaf
Executive Secretary
Convention on Biological Diversity

Foreword from the Ramsar Convention on Wetlands

The Ramsar Convention has long recognized the importance of careful planning and good management for ensuring the sustainability of the world's water resources, and we have stressed the centrality of wetlands, in all their many forms, to any discussion of how to guarantee people's access to adequate sources of safe drinking water. There is no question that uneven distribution of freshwater resources and the pollution and over-exploitation of many sources of freshwater around the world call for urgent measures, both in developing and implementing sound and just policies and institutions and in educating decision-makers and the public about the best practices that experience has provided.

We are very glad to see the publication of this "Good Practice Guide" on drinking water and its relations to biodiversity and poverty reduction. In many ways, the best practices outlined in this guide reinforce the messages that have been emerging in our own guidance for the Parties to the Ramsar Convention on a wide array of related issues, for example, the need for multisectoral national planning, for valuation of ecosystem services, for holistic, integrated approaches to ecosystems and to water management, for involving people through education and participatory management techniques, and often for international cooperation in utilizing shared water resources.

We congratulate the Secretariat of the Convention on Biological Diversity on the publication of this succinct and useful guide, and indeed of the whole series of which it is a part, and we look forward to recommending it to the Parties to our Convention as well.

Mr. Anada Tiéga
Secretary General
Convention on Wetlands (Ramsar, Iran, 1971)

Purpose and scope of the guide

Water is our most valuable natural resource. It is essential to all basic human needs, including food, drinking water, sanitation, health, energy and shelter. Its proper management is the most pressing natural resource challenge of all. Without water we have no society, no economy, no culture, no life. By its very nature and multiple uses, water is a complex subject. Although water is a global problem, the exact issues and solutions are often highly localised.

This guide focuses on only one, albeit important, dimension of water: its use by humans for drinking. Many of us never ponder water's source. We simply turn a tap, and it appears. This luxury is unavailable to billions of the world's people, whose water circumstances lead to a daily struggle involving disease, death, hardship and social injustice; women and children are particularly hard hit. Lack of access to safe drinking water is a primary definer of poverty itself.

Our natural environment supplies clean drinking water. Biodiversity underpins the ability of the environment to do this. The Convention on Biological Diversity (CBD) promotes the restoration and maintenance of biologically diverse ecosystems as a way of improving access to clean drinking water as well as a means to eradicate poverty. By using the services that healthy watersheds and freshwater ecosystems provide naturally, both cities and rural areas can purify drinking water and meet other societal goals at a fraction of the cost of conventional technological alternatives.

Commercial markets rarely put a price on these "ecosystem services," and therefore we often fail to adequately protect these crucial ecosystems. Consequently, they are being lost at a rapid rate. Human activities, including global warming, mean we face a future of falling water tables, shrinking wetlands, vanishing species, and a decrease in both the quality and quantity of available fresh water. We must change our behaviour.

Human needs and environmental needs are often pitted against each other in a false dichotomy; protecting the interests of one side, we worry, harms the interests of the other. But in the case of drinking water, human and environmental interests are clearly aligned. Holistic water management is essential if the world is to achieve sustainable development.

This guide addresses the linkages between **drinking water**, **biological diversity** and **development / poverty alleviation**. It aims to raise awareness of sustainable approaches to managing drinking water, which have been tested globally. They demonstrate how biodiversity can be used wisely to help us achieve development goals. Readers can make use of further tools by consulting the supplementary references and sources (see References pages 29-31).

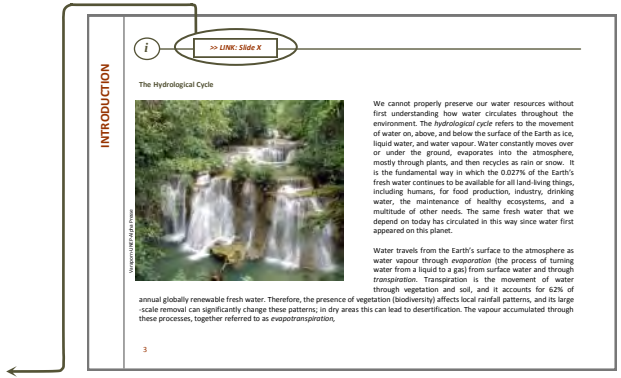
The guide will:

- Introduce the available techniques, technologies and procedures that optimize social and environmental outcomes in the management of drinking water;
- Introduce good practices to the interface between drinking water, development and biodiversity;
- Assist Parties to the CBD in strengthening national and sub-national drinking-water development policies, strategies, plans and projects that integrate poverty alleviation and biodiversity;
- Provide sources and references where readers can find more detailed information.

Guide components:

1. Booklet: *Drinking water, Biodiversity and Poverty Reduction*

2. CD ROM (contained in Booklet sleeve). The CD ROM includes PDF versions of the booklet, key reference materials, and a summary slide presentation, which has been included as a tool for planners in the drinking water sector to share this information in training sessions, workshops, strategic planning meetings, etc. Users can prepare their own presentation by selecting and/or editing each slide.



Note: Links between the Booklet and CD ROM Power Point Presentation are indicated throughout the Booklet.

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The Hydrological Cycle

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We cannot properly preserve our water resources without first understanding how water circulates throughout the environment. The *hydrological cycle* refers to the movement of water on, above, and below the surface of the Earth as ice, liquid water, and water vapour. Water constantly moves over or under the ground, evaporates into the atmosphere, mostly through plants, and then recycles as rain or snow. It is the fundamental way in which the 0.027% of the Earth's fresh water continues to be available for all land-living things, including humans, for food production, industry, drinking water, the maintenance of healthy ecosystems, and a multitude of other needs. The same fresh water that we depend on today has circulated in this way since water first appeared on this planet.

Water travels from the Earth's surface to the atmosphere as water vapour through *evaporation* (the process of turning water from a liquid to a gas) from surface water and through *transpiration.* Transpiration is the movement of water through vegetation and soil, and it accounts for 62% of annual globally renewable fresh water. Therefore, the presence of vegetation (biodiversity) affects local rainfall patterns, and its large-scale removal can significantly change these patterns; in dry areas this can lead to desertification. The vapour accumulated through these processes, together referred to as *evapotranspiration,*

condenses to form clouds, where it later returns to the Earth's surface through precipitation (rain, snow, hail and sleet). And the cycle repeats (see Figure 1).

Clearly, water also moves around horizontally, as well as vertically, often flowing across international borders, both at the surface and beneath it. This is an obvious, but important, fact that must be addressed when it comes to managing water resources effectively.

Water that seeps underground becomes "groundwater"—the major source of drinking water for many people. In fact, the bulk of the world's liquid fresh water is actually groundwater. The hydrological cycle works relatively quickly above ground, but slowly below it. It can take only a matter of months or years to recharge, and hence rehabilitate, surface waters, but groundwater recharge periods can be in the order of hundreds of years. As a result, groundwater, once degraded, can be extremely difficult — sometimes impossible — to cleanse.

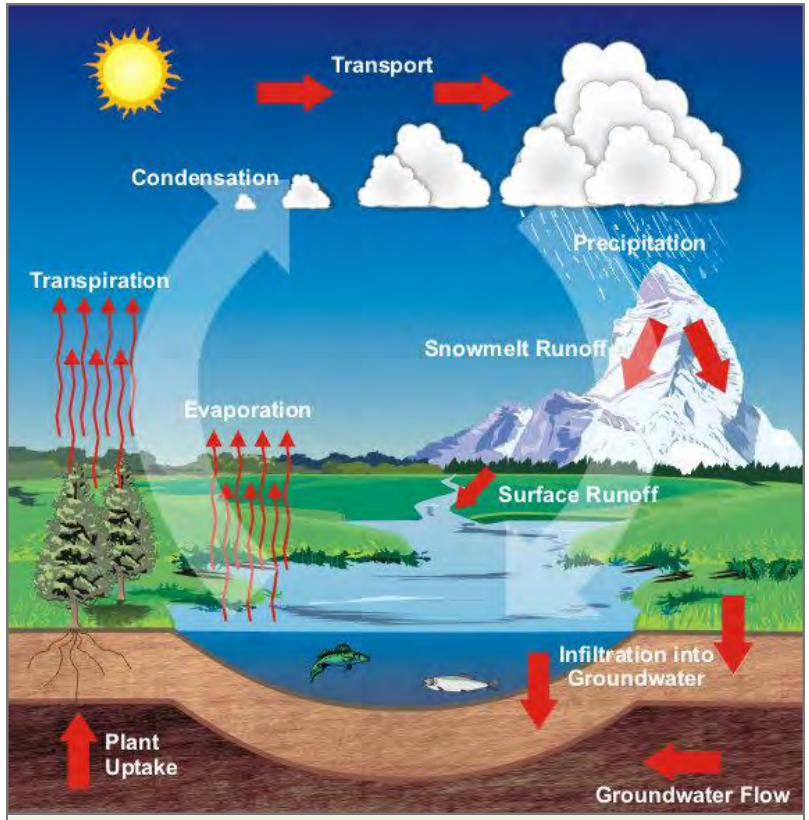

Figure 1: *Schematic of the hydrological cycle.*

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What does biodiversity have to do with this?

Curt Carnemark / World Bank Photo Collection

Water and biodiversity are interdependent — a disruption in either naturally leads to a disruption in both. Because all life depends on water, the hydrological cycle drives how the environment functions; put simply, it sustains *life.* The vegetation and soil in the environment, in turn, drive the movement of water. Understanding the role of the environment, and hence biodiversity, in the hydrological cycle, enables better decision-making when formulating water policies and practices.

Every glass of water we drink has, at least in part, already passed through fish, trees, bacteria, soil and many other organisms, including people. As it travels through these living systems, it is cleansed and made fit for human consumption. Nature provides drinking water by sustaining the hydrological cycle and purifying water, making it fit to drink. The undisturbed natural environment, with a few localized exceptions, provides water that is safe to drink in streams, lakes or wells. This supply of water is a "service" (benefit to humans) that the environment provides. Biodiversity is what underpins the ability of nature to provide this service by sustaining the continuous recycling of water, through the hydrological cycle.

Forests, for example, influence the hydrological cycle by directly affecting rates of transpiration and evaporation and by influencing how water is routed and stored in a watershed. Forest soils readily

absorb and capture water. Forests also sustain the quality of water: removing forests increases soil erosion, which not only reduces land productivity but causes major water quality problems downstream. As a result of the key role they play in the natural supply of fresh water, it is no surprise that at least one-third of the world's largest cities obtain a significant portion of their drinking water directly from forested protected areas. Forest are clearly "biodiversity," therefore these cities clearly depend on biodiversity for their water.

The plants, soils and animals of wetlands also play a significant role in purifying water. Wetland plants commonly remove high levels of nutrients, such as phosphorous and nitrogen, preventing them from reaching drinking water; many wetland plants can also remove toxic substances, such as heavy metals, from water, accumulating them in their tissues at 100,000 times the concentration in the surrounding water. For example, the bottles pictured (adjacent) show water taken from India's Musi River at intervals up to 40 km downstream of the city of Hyderabad (pop. 6.8 million in 2005). On the left, close to the city, it is highly polluted from untreated domestic and industrial wastes. As it flows downstream, water quality improved drastically, as the ecosystem breaks down this waste. Biodiversity, mainly bacteria but also

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Flickr.com / Carol Mitchell

Top: Water samples from India's Musi River at intervals up to 40 km downstream of Hyderabad. On the left, close to the city, water is highly polluted from untreated wastes. Water quality improves downstream as the ecosystem breaks down this waste.

Bottom: Water pollution, Hyderabad, India.

animals and plants, enables this to happen. Managed properly, this service provided by biodiversity can be used to purify water —eventually making it fit to drink.

Curt Carnemark / World Bank Photo Collection

Humans interfere with almost all aspects of the hydrological cycle and the ecosystem of which it is part — shifting water around for different uses, overusing it and degrading the environment that supplies it. In fact, the rate of loss of biodiversity from freshwater ecosystems is the fastest of all biomes. Poor access to drinking water is in most cases a direct result of human behaviour. Therefore, where people face problems of poor drinking water supply, there are two general options to fix the problem:

- "Technological fixes", such as water desalinization or water treatment facilities, are often favoured by planners. These solutions are cost-prohibitive in many poor regions. These costs, in economic terms, reflect the value of the service the ecosystem originally provided before we degraded it (often taken for granted as "free"); or

- "Ecosystem restoration" involves restoring the biodiversity that supports drinking-water provision. This holistic approach is not only often more economical and more effective, as even wealthy nations are discovering. Put succinctly, restoring biodiversity and ecosystems *is* the 'technological fix.'

While more cost-effective, ecosystem restoration is not cheap. Examples of restoration costs in the U.S.A., not exclusively for drinking water, range from $5.3 billion for the Upper Mississippi River to $14 billion for Coastal Louisiana. These costs, in fact, represent the value of the service that nature originally provided for free and were previously lost through development — which we now discover we want back. Better not to have lost them in the first place?

A particularly famous example of ecosystem restoration is New York City's use of biodiversity to address its deteriorating water quality. Instead of creating a massive water treatment facility to provide water for over 9-million users at a cost of US$ 4-6 billion, the City adopted an integrated water resource management approach to protect the Catskill/ Delaware watershed, costing about US$1 billion. The city motivated institutions, businesses and people to adopt improved land management in order to sustain the largest unfiltered water supply in the United States. Programme components include state acquisition of environmentally sensitive lands, such as wetlands, floodplains and riparian buffers; regulating the release of pollutants and erosion; and improving agricultural practices. The programme has provided for 275 miles of protected stream buffers and 307 site -specific forest management plans on private lands.

Flickr.com / lonecelloftheory

Hudson River, New York

Such examples are by not limited to rich nations. Brazil's Parana River (2,570 km), the second-longest river in South America, supplies drinking water to South America's largest city, São Paulo. Water quality in the Parana declined due to the intensive deforestation of the Atlantic Forest at its headwaters. Without forest cover around the river's edge (riparian zone), rainwater washed away soil, leading to a build-up of sediment that altered the water quality. The Nature Conservancy helped develop the Water Producer Programme, which uses a portion of water fees from major water users, such as water supply companies and major industries, to motivate farmers and ranchers to plant trees along riparian zones in the river's headwaters. Landowners also receive technical assistance on reforestation, soil conservation and erosion prevention. *(Sources: from the Third World Water Development Report)*

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Drinking water and poverty reduction

Water that is fit to drink without risk of immediate or long-term harm is fundamental to human well-being. Without food we can survive weeks. But without water, we can die of dehydration in as little as two days.

Water is often scarce. Although roughly 66% of the Earth's surface is covered by water, most is satlwater and therefore unusable. Less than 2.5% of all of the Earth's water is fresh water. And only a small fraction of that is available to supply the multitude of human uses — most of it is locked in the polar ice caps.

This fraction of useable water is also very unevenly distributed. About 2.8 billion people, more than 40% of the world's population, experience some form of water scarcity. Scarcity, as measured by available water per capita, is expected to worsen where the population is still growing significantly — in Sub-Saharan Africa, South Asia and some countries in South America and the Middle East.

Availability, however, is only part of the story. Access to drinking water is a continuing serious global water issue, particularly for the poor. Access to water depends on a complex of factors, including the local availability of water, its quality and the economic ability to obtain it. Some 1.6 billion people have limited access to water, even though it is locally available. For example, many poor communities in deserts may need to travel long distances to get surface water because they cannot afford to drill wells to the groundwater flowing beneath their feet.

Curt Carnemark / World Bank Photo Collection

Limited access to water is not simply about dying of thirst — there are profound socio-economic implications as well. In rural Asia and Africa, women and girls, who are usually responsible for collecting water, can walk an average of three hours a day to haul enough water for their families, leaving little time for household tasks, income generation, or school.

Even in water-rich areas, if the local water is polluted and there are no economically viable alternatives, access is effectively denied. Over one billion people in the world lack access to safe water supplies. The third UN World Water Development Report states that roughly 2-million people die each year of diarrhea caused by infectious water-borne diseases; roughly 70% (1.4 million) are children (source xxxxx) In addition, up to 50% of malnutrition is related to repeated diarrhea or intestinal infections as a result of unclean water, inadequate sanitation or poor hygiene. Exposure to environmental health risks in early childhood leads to permanent growth faltering, lowered immunity, and increased mortality. Poor water, sanitation, hygiene and inadequate water resources management contribute to 50% of the consequences of childhood and maternal underweight and hence child growth (World Bank xxxx).

The main source of drinking-water contamination in much of the world is the poor management of human waste. Inadequate sanitation jeopardizes the health of almost a quarter of the

Water is unique amongst our natural resources because whilst it is renewable, it is not replaceable. We have various substitutes for energy sources and most commodities, but there is no substitute for water. Once it is gone or degraded through overuse or pollution, it cannot be substituted.

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developing world's population, 2.4 billion people. Current trends indicate that the Millennium Development Goal target of halving, from 1990 to 2015, the proportion of people without basic sanitation will not be met.

Yet humans need only two-to three litres of drinking water per day — not a significant source of stress on the environment, even when we add amounts for other household uses (which vary considerably from tens of litres to more than several thousands of litres a day, depending on economic circumstances). Agriculture, industry and energy are the biggest users of water — agriculture alone accounts for 70% of water use worldwide. By comparison, it can take 10,000 litres to produce a single hamburger, 1,000 to 4,000 litres for one litre of biofuel and 230,000 litres for a tonne of steel. These amounts, and the stresses they represent on water resources, can be expected to climb in the coming years.

There are few areas on the planet that do not face serious water availability or management problems. Water is not just an issue facing the developing world — but the poorest communities certainly face the most pressing challenges and have the most limited capacity to act.

Box 1: ***Projected Impacts of Climate Change on Drinking Water***

Climate change is threatening drinking water supplies in two major ways. First, extremes of rainfall, or lack thereof, are forecast to get worse, resulting in heavier floods and more frequent droughts in regions already affected by these events.

Second, rising sea levels will destroy a significant proportion of the freshwater supplies of coastal communities by inundating groundwater supplies, creating brackish (a mixture of fresh and salt water) water that is not safe for human consumption. Almost 40% of the world's population lives in coastal areas.

Arne Hoel / World Bank Photo Collec-

The elements of good practice in the drinking water sector

Clean water, free of pollution, bacteria and other contaminants is the bedrock upon which sustainable, thriving and equitable human societies are built. Good governance of the ecosystems that provide us with quality drinking water is an essential pre-requisite involving the cooperation of private sector enterprises (particularly developers), all levels of government, relevant public agencies, indigenous and local communities, NGOs and other relevant stakeholders.

Water is a deeply local issue in terms of availability, economic and environmental setting, climate and conflicting interests. The details of water management are complex. This guide cannot therefore provide definitive and prescriptive advice for all conditions. But there are themes and approaches common to good "biodiversity-aware" drinking-water management; they are highlighted here, and include: Legal and normative tools; Integrated management approaches (Integrated Water Resources Management, Forest-related approaches, The Ecosystem Approach); International cooperation; Measuring, baseline information, reporting, auditing, monitoring and evaluation; Economic, financial and market-based Instruments; Capacity building; and Education and communication.

Ray Witlin / World Bank Photo Collection

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Policy and strategy tools

Good policy approaches for drinking water require holistic strategic approaches involving full consideration of:

Water quality and availability:

- invariably the root cause of water quality loss, and in many cases decreased water availability, is a degraded ecosystem; it is often better, and more sustainable, to solve the root cause of the problem than to deal with the consequences;
- access to drinking water is a different and important dimension, involving the added dimensions of a multitude of socio-economic considerations (in particular poverty) and human rights;
- sanitation, and other human impacts on water, as intimately related to drinking water supply; and
- groundwater, "out of sight" should not be "out of mind".

Managing drinking water for both present and future needs:

- increasing populations and shifting consumer needs (not only for drinking water but also food, energy and consumer products) have major implications for planning and can potentially undermine the sustainability of existing drinking water supplies; and
- climate change is about water changes and must be factored into all water resources planning and management.

Maintaining ecosystem integrity and functions:

- ecosystems supply water, so changing the ecosystem changes water supplies;
- the role of water in the ecosystem and the associated hydrological cycle is critical to effective management responses;
- the "ecosystem" as natural infrastructure – a gift to be used through more intelligent management to meet human needs; using it to supply water more sustainably and to deal with water quality problems (including for water purification);

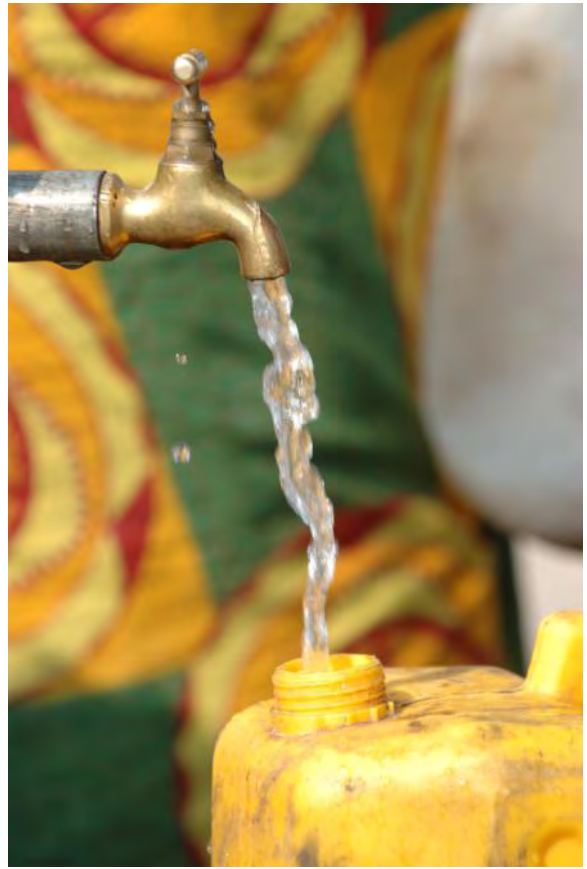
- physical infrastructure (e.g., dams, water-treatment facilities) has contributed much globally to improving drinking water supply, but it needs to be planned, sited and managed in the context of the wider natural infrastructure, landscape and its functioning;
- water storage is a priority consideration in most circumstances – but there are options for using the natural infrastructure to store water, offering multiple benefits; and
- water management is largely about managing risks associated with water; natural infrastructure offers significant opportunities for reducing these risks by buffering the large variations in rainfall and storing water in safe places (e.g., underground).

The role of biodiversity:

- in relation to drinking water - "biodiversity" is not just about "conservation of species";
- biodiversity maintains ecosystem functions and services that we need to sustain drinking water supplies; and
- biodiversity is a resource to be used sustainably to achieve sustainable drinking water objectives.

Realistic approaches:

- "Biodiversity" approaches do not solve all problems relating to development and drinking water. Invariably a mix of approaches is needed. But they offer intelligent solutions – and in more frequent and significant ways than is often thought.



Flickr.com / Julien Harneis

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Legal and Normative Tools

A common approach to water supply and quality issues is to set criteria which are then enforced through legal/regulatory means. This requires (i) the setting of water quality and quantity criteria, (ii) monitoring these, (iii) monitoring who is causing infringements of regulations, and (iv) influencing behaviour through regulation and enforcement. There are many constraints to achieving objectives through this approach alone, which centre on capacity, costs and the legal/regulatory landscape. The approach is particularly difficult regarding pollution control – whereas point-source pollution (e.g., factory discharges) might be identified, monitored and polluters held accountable, non point-source pollution (e.g., from dispersed small scale agricultural activities) is especially difficult to manage, even in developed countries. Experience also shows that people are more likely to modify their behaviour with encouragement and incentives, rather than through punishment.

Ramsar Convention on Wetlands

The Ramsar Convention has developed comprehensive guidance on policies and management of wetlands. This represents a veritable arsenal of tools and approaches, all relevant to sustainable drinking-water supplies. This guidance is largely provided through *The Ramsar 'Toolkit'* (Ramsar 2007) including *The Third Series of Handbooks for the Wise Use of Wetlands*. Particularly relevant tools are:

- Handbook 1: the conceptual framework for the wise use of wetlands;
- Handbooks 2 and 3: relevant cross-sectoral policies, laws and institutions;
- Handbooks 6 - 9: for wetlands and water, including addressing the impacts of land use;
- Handbooks 11-13: on inventory, impact assessment and monitoring; and
- Handbook 16: managing wetlands.

Wetlands management is at the core of the issues and solutions regarding drinking-water supply. There are different interpretations of what a "wetland" is but for present purpose we shall use the Ramsar Convention definition, which

includes all different types of inland aquatic ecosystems – including rivers, lakes, swamps and marshes, groundwater and artificial wetlands such as reservoirs. Wetlands are intimately associated with both land and water. They are critical to sustaining the water cycle and to dealing with nutrients and pollution. Looking at drinking water from a "wetland perspective" is no different to the ecosystem (land-water cycle) perspective presented above. It is just different terminology. In fact looking at the issues from a wetlands perspective reflects the ecosystem context of land and water much better. The wise use of wetlands essentially involves managing by applying the ecosystem approach in order to achieve sustainable development.

Most problems with drinking-water supply essentially come from unwise use of wetlands (including over-use of water and allowing them to be degraded through land activities and deteriorating water quality). And most solutions centre on using wetlands wisely.

The mission of the Ramsar Convention on Wetlands is “the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world.”

Flickr.com / Kulbowski

Poleski National Park, Poland. Ramsar site no. 1565.

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Integrated management approaches > *Integrated Water Resources Management (IWRM)*

Sustaining, or improving, drinking-water supply essentially requires the integration of land- and water-management activities, in both ecosystem and socio-economic contexts, to achieve desired water resources outcomes.

Since 1992, water has been seen less as a commodity and more as a resource that needs to be equitably distributed among all users, including nature. Integrated Water Resources Management (IWRM) is increasingly being recognized as the most effective and holistic means of managing our water resources. Article 26 of the WSSD Plan of Implementation (Source xxxx) called for the development and implementation of IWRM by 2005. Progress was very slow by that date but has recently rapidly advanced in response to experience and increasing urgency.

IWRM essentially involves all institutions and stakeholders with an interest in water working together to identify the full suite of benefits and costs of various kinds of water use, finding an appropriate balance between development, and sustaining the ecosystems upon which it depends. For most sections of society, drinking water is a priority demand. Modern IWRM is a process that promotes the coordinated use of water, land and related resources. It seeks to maximize the resultant economic and social development in a fair manner that does not compromise the sustainability of aquatic ecosystems. It recognises that we all live in and with the hydrological cycle. We use it in many ways and at many points and need to share it in a way that recognises the need to sustain the ecosystems that provide it. Most successful management actions regarding water resources involve a strong element of IWRM, if not based largely on its principles.

Principles of Integrated Water Resources Management >> Based on the idea that sustainable development must address three fundamental issues (environmental integrity, economic development, and social justice), four principles for IWRM were agreed at the International Conference on Water and the Environment in Dublin in 1992:

- Fresh water is a finite and vulnerable resource, essential to sustain life, development, and the environment.
- Water development and management should be based on a participatory approach involving users, planners, and policy-makers at all levels.
- Women play a central part in the provision, management, and safeguarding of water.
- Water has an economic value in all its competing uses and should be recognized as an economic good.

CASE STUDY / Integrated Watershed Development (India)

Jacqueline Grekin / SCBD

By the 1960s, severe deforestation had created serious effects on the ecosystem, climate and populations of Madhya Pradesh in India: widespread soil erosion, overgrazing and inappropriate land use resulting in barren landscapes and also seasonal migration of men in search of employment. Multiple interventions were attempted which aimed at the natural resources rejuvenation and socio-economic improvement of people. The project promoted an integrated approach, based on community needs. Activities included:

- Protected afforestation on community land;
- Soil and water conservation;
- Water harvesting;
- Distribution of seedlings to encourage planting on private land;
- Pasture improvement through planting pasture grasses;
- Distribution of subsidised fuel and energy saving devices;
- Integration of land-use innovations with measures to improve community livelihoods;
- Promotion of alternative income generating activities to reduce poverty and discourage seasonal migration.

In addition to immediate land productivity benefits, ecosystem-wide benefits were very positive. A marked increase in groundwater recharge was noted, as well as increased water supply from harvesting, and better livelihoods. The model was subsequently adapted to neighbouring states. This project was implemented by the National Centre for Human Settlements and Environment (NCHSE) and the local communities with funds from the Government of India. (Source: xxxxxxxxxx)

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Integrated management approaches > *Forest-related approaches*

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There are strong links between forests and sustainable drinking water supplies because of the role of forests in watershed protection and in the water cycle.

Forests, drinking water and cities At least one-third of the world's largest cities obtain a significant portion of their drinking-water directly from forested protected areas. The proportion increases to about 44% when we include water sources originating in more distant protected forested watersheds, and those from forests managed in a way that gave priority to their functions in providing water (although not necessarily "protected"). Drinking-water supply is therefore a major driver of the establishment, and improved management, of protected areas.

The economic value of water-related forest services The water-related ecosystem services provided by tropical forests, for example, include water provisioning, regulation of water flows, waste treatment/water purification and erosion prevention. These collectively account for a value of up to $US 7,236 per hectare per year — more than 44% of the total value of forests — exceeding the combined value of climate regulation, food, raw materials, and recreation and tourism (*The Economics of Ecosystems and Biodiversity (TEEB)* (Soure xxxx)).

Sustainable forest management (SFM) Sustainable forest management (SFM) is the most widely inter-governmentally accepted language for common forest management conservation practice approaches. Undertaken properly, SFM gives due attention to forests and water and thereby sustains the water-related services provided by forested ecosystems. It is a dynamic and evolving concept that aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations.

At the core of SFM lies the *Forest Principles,* which were adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. These aim to manage the benefits of forest resources and forest lands

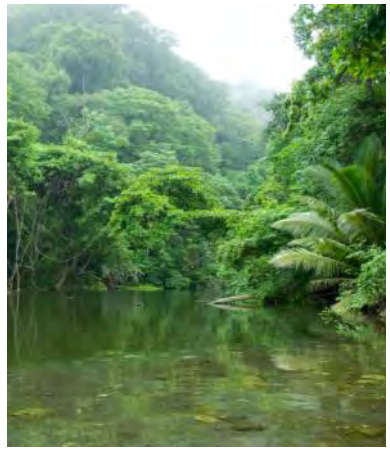
(including forest products and services such as wood and wood products, water, food, fodder, medicine, fuel, shelter, employment, recreation, habitats for wildlife, landscape diversity, and carbon sinks and reservoirs, among others).

Seven common themes have emerged as the theoretical basis for developing forest management practices worldwide:

- Extent of forest resources
- Biological diversity
- Forest health and vitality
- Protective functions of forests
- Productive functions of forests
- Socio-economic functions
- Legal policy and institutional framework.

In practice, SFM has resulted in the development of national forest programmes, landscape restoration, integrated mountain development, and integrated, participatory watershed management, among others.

Example > Costa Rica's National Forestry Financing Fund



Flick.com/dmason

Costa Rica's National Forestry Financing Fund (FONAFIFO) compensates forest owners who adhere to approved management plans for protecting freshwater, biodiversity, and landscape beauty and for carbon storage. FONAFIFO is financed by selling these services to different types of buyers. Hydroelectric companies and municipalities may pay for watershed benefits, tourism agencies for landscape beauty, and foreign energy companies for carbon storage. Additional funds are derived from a fuel tax. The programme built on lessons learned and institutions established for an earlier ten-year payment for reforestation programme. FONAFIFO has expanded its range of activities, most recently in 2002 when agroforestry and indigenous reserves were added. A recent assessment of FONAFIFO's social impacts in the Virilla watershed found it has had significant benefits in terms of strengthened capacity for integrated management of farm and forest resources, and has contributed to the protection of 16,500 ha of primary forest, sustainable management of 2,000 ha, and reforestation of 1,300,000 ha, with spin-off benefits for biodiversity conservation and prevention of soil erosion. *(Source: Miranda, Porras and Moreno 2003)*

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Integrated management approaches > *The Ecosystem Approach (EA)*

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The Ecosystem Approach (EA) developed under the Convention on Biological Diversity is defined as: *A strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way.* This is an essential requirement for sustainable drinking-water supplies.

The EA is based on the application of appropriate scientific methodologies focused on levels of biological organization, which encompasses the essential structures, processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of many ecosystems. It therefore includes scientific, economic, social, sustainable development, and institutional and process dimensions. Other integrated ecosystem-based management approaches (such as IWRM and SFM), if implemented comprehensively, are essentially variations in the application of the EA.

EA also emphasizes the need for adaptive management and enhanced benefit-sharing to deal with the complex and dynamic nature of ecosystems and the absence of complete knowledge or understanding of their functioning. Moreover, the EA recognizes that there is no single way to implement the approach since it depends on local, provincial, national, regional, and global conditions. Other management and conservation approaches may be integrated into the EA framework. It is steered by twelve EA Guiding Principles together with operational guidance for implementation (SCBD n.d.).

Most case studies leading to more sustainable drinking-water provision reflect most of these elements of the EA, even if the EA is often not mentioned specifically.

Case Study / Rainwater harvesting (Kisamese, Kenya)

Kisamese is a semi-arid area in the Kajiado district of Kenya. The area is inhabited by the Maasai community which is traditionally nomadic but settled over the last 2-3 decades. Water was a major problem and women and children . Despite the fact that women were responsible for ensurinspend eight hours to fetch water. The situation was worsened due to the increase in drought frequency where most families lost their livelihoodg water for the home, they did not contribute to the management of the resource due to customary restrictions. Since 2000 UNEP has supported the community to improve access to water in a gender sensitive manner.

UNEP

Maasai women at water tank.

Recognising that women did not have the capacity to contribute to water management, the first phase of the project enhanced the capacity of women in water management through formal and on-the -job training. Rainwater harvesting (RWH) was used because it is a low cost technology that is decentralized and enabled individuals and communities to manage their water. The women insisted on building rainwater harvesting tanks at the school to enable their children to get water from school. The second phase consisted of using rainwater harvesting for domestic, environmental and productive purposes. Activities included construction of roof-top RWH tanks for domestic water supply, as well as furrows for recharging groundwater and to establish and maintain the family woodlots which provide energy, food, medicine for the home.

This project facilitated the establishment of microfinance. As women were trained in keeping records and the importance of repaying loans, they are now able to borrow money from commercial enterprises for income generating activities. The project has spread to neighboring villages and improved access to water for 936 families. As RWH only works if it rains, the future plan is to use rainwater to recharge groundwater on which the community depends if it does not rain. (Source: UNEP n.d.)

>> LINK: Slide 22

International cooperation

At the international level, multiple frameworks (often born after a major crisis) support the protection of freshwater systems and the mitigation of impacts. Using these considerably strengthens cooperation efforts and institutional support for them. The OECD monitors the level of commitment to these instruments by its member countries (OECD environment online compendium).

Some of the most important instruments for pollution mitigation and water conservation are:

- Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1972), which obliges parties to prevent, control and reduce water pollution from point and non-point sources;
- Ramsar Convention for Wetlands Protection (1972), and Convention on Biodiversity (1992) for all ecosystems;
- UN Convention on the Law of the Non-Navigational Uses of International Watercourses 1997 (UN Watercourses Convention);
- Convention on the Protection and Use of Transboundary Watercourses and International Lakes 1992 (UN Economic Commission for Europe Watercourses Convention – an amendment to which, not yet ratified, opens up this convention to states beyond the UNECE);
- Convention to Promote Environmental Impact Assessment (ESPOO Convention, 1991);
- Convention for the Reduction of Pesticides (Rotterdam, 1998);
- Conventions or agreements focused on pollution in shared receiving bodies, such as regional conventions (Barcelona Convention on the Protection of the Mediterranean Sea Against Pollution set in 1976; Baltic in 1992) and basin agreements (Rhine Cooperation);
- Processes such as the CSD process, the outcomes of the Rio and Johannesburg Summits including Agenda 21 (Chapter 18), which support 'sustainable use', or IWRM plans that promote integrated water resource management / monitoring.

A detailed discussion of the use of international watercourse agreements (in particular the UN 97 and UNECE 1992 conventions) and how they provide frameworks for sustainable water resources management, including implementation of the objectives, Articles and decisions of the CBD, is provided in Brels *et. al* (2008).

CASE STUDY / Sustainable water institutions promote regional cooperation and stability (Sénégal River)

Flickr.com / keith.hazleton

Sénégal River, St. Louis, Sénégal

Waters flowing along the Sénégal River, in West Africa, arise from and flow through four different countries. All countries share the common problem of managing the water sustainably. Because activities in one country can have impacts in another, international cooperation in water management is required. This includes the need to manage water quantities but also to maintain essential water quality (critical for drinking water supply).

The "Organisation de Mise en Valeur du Fleuve Sénégal" (OMVS) was created in 1972 through an agreement amongst Mali, Mauritania and Senegal; Guinea joined in 2005. In 2002, a Charter on the use of the river was adopted, which aims to adopt principles and modalities of water distribution among different sectors, and defines project approval criteria and environmental rules as well as participation modalities for broader public engagement.

The OMVS functions as a key institution where Parties agree on future projects (e.g. dams, electricity, agricultural investments), provides usage guarantees, such as navigation, and agree on sectoral priorities. Because of the central role of the river in many activities in all countries, cooperation has gradually extended to inter-country discussions at the central and local levels in other sectors, such as agriculture and local enterprises. The OMVS also has at its disposal an Environmental Observation organ that provides information on the state of the resource and its associated ecosystem, in order to guarantee sustainability.

This long history of cooperation around a central waterway has been recognized as a key contribution to regional stability and integration. It is known as an example of a solid water-based institution for the promotion of collaboration on the multiple uses of water and the promotion of integrated water management. (Source: xxxx)

>> LINK: Slide 24

Measuring, baseline information, reporting, auditing, monitoring and evaluation

These requirements are substantial and complex for sustainable drinking water. They vary from monitoring standards for drinking-water quality (generally using the guidelines for this published by the WHO), tracking all relevant socio-economic indicators and activities (generally undertaken by various sectors and institutions), and obtaining and dealing with information on environmental trends. There is already much monitoring etc. ongoing in many of and other relevant areas, although serious gaps in information exist. One challenge is to coordinate and manage these efforts collectively in order to facilitate integrated information systems.

- At the global level, the WHO and UNICEF run The Joint Monitoring Programme (JMP) for water supply and sanitation, based largely on national data sources. This also tracks progress towards the MDG targets on water supply and sanitation.

- The World Water Assessment Programme (WWAP) monitors freshwater issues in order to provide recommendations, develop case studies, enhance assessment capacity at a national level and inform the decision-making process. Its primary product, the World Water Development Report (WWDR), is a periodic, comprehensive review, providing an authoritative picture of the state of the world's freshwater resources. The latest, third, edition of WWRD makes particular note of the need for improved monitoring of water resources worldwide and in many related subject areas.

- The Ramsar Convention, in conjunction with its Parties at the national level, undertakes much monitoring, evaluation and reporting on the status and trends of wetlands and changes in their ecological character.

Benchmarking can be achieved through local or regional case-studies and literature research. Areas where drinking-water supply has been sustained or improved using or enhancing ecosystem services can be identified. The ways and means through which success was achieved, including environment, social, institutional and financial/economic considerations, can be identified. It is critical to consider and compare the costs and benefits of alternative options fairly and comprehensively – including long-term sustainability, transparent financial costings, co-benefits achieved (including non-financial benefits), and a thorough knowledge of the levels of risk (reduced or increased). Local, regional or national strategies and action plans for building upon good practice can be developed.

CASE STUDY / Monitoring the glaciers of the Himalaya

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The global nature of the water cycle means that, in addition to local issues and management needs, global or regional influences must also be factored in. The Himalaya region supplies water to most of the major rivers in Asia. 1.3 billion people live in the Himalaya region – with probably a similar number in lowlands dependent on this water. Much of the flow arises from melting snow/ice in the spring; many rivers receive at least 50% of their supply from this source. Climate change is already affecting this, with noticeable glacial retreat and changes in freshwater flows. Forests, farms and people downstream are affected. While floods may increase in the short-term, there will be a tipping point as glacial area contracts, leading to reduced flows and increasing water scarcity – threatening, amongst other things, drinking water supplies for probably around 2.6 billion people by 2030.

The Nepal Himalaya has 3,252 glaciers with a coverage of 5,323 km^2 and an estimated ice reserve of 481 km^3. In order to manage the impacts of climate change, WWF-Nepal started a project to better understand these impacts and plan an appropriate community-driven management response. Climatic and hydrological data is being collected for five glaciers in Nepal and India. Freshwater vulnerability assessment (FVA) for the glaciers examines the effects of glacier retreat on the downstream freshwater regime and the implications of these changes for the people, economic sectors and biodiversity in the downstream areas. Community Driven Management Responses will be developed. Findings will be disseminated among stakeholders at local, regional and national levels, local institutions such as village committees, civil society organizations, scientific organizations, media, international community and donors, etc. Some lessons learned already are: the impacts of climate change on glaciers and freshwater ecosystems are not yet fully understood; prediction models and vulnerability assessments are two available tools that can support the development of appropriated adaptation strategies; because changes in freshwater ecosystems directly affect people and their livelihoods, the formulation of adaptation strategies must be completed with full participation of stakeholders at all levels (local, regional and national). (Source: xxxx)

>> LINK: Slide 26

Economic, financial and market-based instruments

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Supplying drinking water, no matter how it is done, costs money. Financing its provision is a major constraint in developing countries and a major investment in developed countries.

Better management of water often involves getting some groups of people to alter their behaviour in order to benefit others. One mechanism to encourage behavioural change is to transfer incentives (payments) from users to suppliers to achieve the drinking water objectives. The classic example of this need is within watersheds (river basins) where the activities of people in the upper regions can be carried down river (or through groundwater) to affect people living lower down. A mechanism to facilitate this is called Payments for Ecosystem (or Environment) Services (PES). There are many examples where this is successfully achieved for maintaining water quality – particularly for drinking water.

The PES approach is becoming popular as a means to finance biodiversity conservation (see Box 2). The system works particularly well with water because usually a financial mechanism is already in place – and expenditure can be redirected to more efficient use and better overall outcomes. Downstream users usually already pay for the provision of clean water, where they have it, either directly (e.g. through user fees) or indirectly (e.g. through government investment).

Box 2: Selection of Payment for Environment Services (PES) financing schemes

Direct Public Payments: the government body makes payments (from general revenue or user fees) directly to providers of ecosystem services.
Direct Private Payments: organizations or businesses "buy" the ecosystem service directly from those able to provide it.
Cap-and-Trade Schemes: a government body sets a limit (a “cap”) on the amount of ecosystem degradation permitted in a given area; firms or individuals subject to these regulations meet their obligations either by complying, or by financing other landowners to undertake activities that fully offset that damage. “Credits” reflecting such offsets may be traded and thus acquire a market price.
Eco-Certification Programmes: consumers opt to pay a premium price for products produced in a certified ecologically friendly way.

CASE STUDY / Using PES to improve water quality — The Bogotá Water Fund (Columbia)

The water supply for the city of Bogotá, Colombia's capital, is provided by the Chingaza, Tunjuelo and Tibitoc catchments where forest and páramos (high-altitude grasslands) harbour extraordinary biological diversity and habitat for many endangered species, including spectacled bears and Andean condors. But unsustainable agriculture and ranching practices are converting these ecosystems and causing water-quality problems. Consequently, the water consumed in Bogotá increasingly requires additional treatment to reduce sediment concentrations.

Flickr.com / Aztlek

Chingaza National Park, Columbia

Recognising the limited funding available through the usual channels for conservation work, The Nature Conservancy (TNC) worked with partners (including a brewery company needing improved water) and local authorities to create the Water Conservation Fund to support clean drinking water provision for Bogotá's eight million residents. The fund, launched in 2008 after extensive stakeholder consultation and consensus building, transfers voluntary contributions from Bogotá's water treatment facilities and other partners to subsidise conservation efforts. Water treatment costs are lowered due to decreased soil erosion, biodiversity conservation efforts are supported, and positive social outcomes anticipated. The fund is projected to raise more than $US 60 million for conservation projects over the next 10 years. Conservation expenditure will arise through investments, leading to long-term sustainable financing.

The example demonstrates that PES can guarantee water quality and supply for a city, while contributing to the conservation of biodiversity and other desirable social outcomes. It can reduce water treatment costs without increasing the citizens' user fees. Experience in the project also showed, as elsewhere, that isolated decisions from different water users do not allow long-term watershed conservation and management. PES systems (such as water funds) enable better technical oversight and more efficient management. (Source: TNC n.d.)

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Capacity-building

Capacity-building is essential to influence outcomes for sustainable drinking-water supplies. In developing countries, relevant NGOs play an important role in supporting capacity-building initiatives both at national and local levels. The subject is very broad and capacity needs to be developed in many sectors, or with stakeholders with specific interests and needs. Throughout capacity -building approaches it is essential for people to understand: the water cycle and its implications for drinking water supply; the role of ecosystems and natural infrastructure; tools and approaches to meet drinking water objectives; the need for cooperation and collaboration amongst different interest groups to achieve common objectives (dialogue, communication, participation, compromise). Some examples of capacity building opportunities with different stakeholder groups are:

- Engineers: build capacity to understand and manage natural infrastructure and processes as part of engineered approaches – working with nature, not against it.
- Environmental interests: capacity, including communication skills, to move beyond "conservation" and regulatory approaches to coming to the table with environment-based solutions to drinking water supply problems.
- Finance and planning: build understanding of the values of ecosystem services and incorporating these in financial assessments and more holistic investment analysis; stress long-term risk reduction as a sound investment strategy.
- Sectors (forestry, agriculture, tourism, industry, energy): build understanding of the water cycle and ecosystem context of what a sector does in relation to water supply, whether they depend on it directly or indirectly, or impact it through their activities; raise awareness of PES tools – and how they can help finance better behaviour in their sector.
- Local authorities: these are particularly important regarding drinking water because many management decisions are taken locally; build capacity in all of the above.
- National planning authorities: all of the above; strengthen capacity to improve cross- institutional dialogue and coordination; build capacity to enable local authorities to implement measures consistent with national guidance but adapted to local circumstances; reviewing national legislation and policy so it supports more sustainable outcomes.

There are usually very many ongoing relevant capacity-building initiatives at the national level – but not necessarily addressing the topics covered in this guide. For example, engineers build capacity for engineering; farmers build capacity for farming. It is often far more effective to integrate current capacity-building needs into these other efforts. The important point in this subject is: you must speak the language of the audience and present the arguments in a way that benefits the stakeholders in question.

CASE STUDY / Train-the-trainers workshops (UNITAR Workshop Series on Biodiversity)

The United Nations Institute for Training and Research (UNITAR) office in Hiroshima, Japan, has held a series of workshops on biodiversity in collaboration with several partners. Key trainers at the national level throughout the Asia-Pacific region are selected and learn-by-doing how to build their own skills and those of others on their return home.

Request photo from UNITAR

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UNITAR and its Faculty have thus far developed the series with a three-dimensional approach:

- a focus on water resources and wetland management, to make best use of the workshop venue and the vital tool for ecosystem management — water;
- a focus on socio-policy aspects and development of appropriate methodologies to enable participants to acquire applicable and ready-to-use knowledge;
- utilization of lessons learned and best-practice approaches to enhance participants' own thinking as to how best to apply the ecosystem tools to their own contexts.

Launched in 1998 and having a large alumni network of over 200 experts, the series has gained reference and recognition in Asia and the Pacific. The Series utilizes the case studies of the workshop venue, Kushiro, which has the first Ramsar wetland in Japan — the Kushiro Wetland — and the most recent one, Lake Akan. The stories related to wildlife conservation in these places are also part and parcel of the overall learning process. Integration of conservation and development objectives is a cornerstone of the activity.

Recent workshop themes have included: new tools for ecosystem management (2004); ecosystems, water and biodiversity (2006); mountain and forest ecosystems (2007); wetlands, biodiversity and climate change (2008). (Source: xxxx)

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Education and communication

Many people across all areas of society are still unaware of the role and importance of nature in supplying drinking water. Land- and water-management and development activities are still driven largely by narrow "sector"-based planning and management. This usually leads to undesirable outcomes for water.

Communication, education and awareness-building are therefore essential. And because water supplies, and their condition, are influenced by many stakeholders, there are endless needs and opportunities for this. The principles outlined in this guide are often more effectively communicated alongside other activities designed for related purposes for particular stakeholder groups. Speaking the language of the audience, and framing things so they see an interest for them, is always a prime consideration.

Some key messages to get across are:

- drinking-water supply is important – and in most areas, supplies are under threat from over-use of water and pollution; climate change will make this worse;
- nature provides drinking water by sustaining the water cycle and purifying water, making it fit to drink;
- when we have to artificially purify water before we drink it, it is usually because we have degraded nature in the first place. Prevention is better than cure;
- we can use nature (wetlands) to sustain supplies and purify the water for us – and often more cheaply;
- because water moves around, everything is connected – rarely can drinking water (or any other water use) be considered on its own, invariably drinking water management is an important component of broader water management needs;
- the wise management of water involves collective efforts by all stakeholders, not just those dealing directly with water, but also most land based activities;
- better solutions to more sustainable drinking water supplies exist, they involve:
    - > thinking about where the water comes from, why it is degraded and the role of nature in helping us achieve water related objectives;
    - > communication, compromise and understanding amongst all stakeholders, identification of common goals and ways and means to achieve benefits for all;
    - > changing behaviour in relation to land and water use, and where necessary providing incentives for behavioural change.

CASE STUDY / China recognises the educational value of new Ramsar site

Flickr.com / AlanYe

Hangzhou Xixi Wetlands, China

The State Forestry Administration, China's Ramsar implementing authority, in collaboration with the Hangzhou Xixi Wetland Park Management Commission, the Institute of Subtropical Forest Studies, and Zhejiang University, has designated as China's 37th Wetland of International Importance the fascinating Hangzhou Xixi Wetlands (325 hectares, 30º16'N 120º03'E), a National Wetlands Park just a few kilometers from the Hangzhou urban centre, southwest of Shanghai. The new site is a complex of approximately 400 permanent freshwater ponds connected by channels and rivers representative of both natural and human-made wetlands in Eastern China. The area has visually spectacular wildlife and high biodiversity conservation value. But the wetlands also play an important role in recharging groundwater (much of it used for drinking) and flood mitigation for downstream Hangzhou City. The wetlands have been valued locally for their importance for 2000 years of cultural history, and a special local wetland-management approach has developed over the past 1000 years, which combines fish ponds, silk production and mulberry trees. The site has a sacred Autumn-Snow Temple and has long been an inspiration to famous writers and poets. But the urban population of Hangzhou City is not fully aware of the dependence of their city on the wetland. China has therefore developed the site into an important centre for wetland education. The site receives an average 720,000 visitors per year.

Practically all urban centres, from small towns to mega-cities, rely upon nature in the surrounding area to sustain their water supplies, and in particular to protect valuable groundwater resources. There are literally billions of city inhabitants worldwide, the bulk of them poor, that need to be more aware of this and for us all to understand that "sustaining nature" is not a luxury for the rich. Supplying water for cities is one of the best examples of how biodiversity contributes in a major way to poverty reduction and development. (Source: xxxx)

CBD Programme of Work on Inland Waters Biodiversity (Decision VII/4)

The 192 Parties to the CBD have committed themselves to implement xxx actions under the programme of work on inland waters biodiversity, which is structured into 3 thematic elements and 13 goals (see below). Many of the actions are directly aimed at conserving and restoring inland waters, maintaining or improving drinking water quality and supply, and creating or maintaining sustainable livelihoods.

Programme Element 1: Conservation, sustainable use and benefit-sharing

Goal 1.1: To integrate the conservation and sustainable use of biological diversity into all relevant sectors of water-resource and river-basin management, taking into account the ecosystem approach

Goal 1.2: To establish and maintain comprehensive, adequate and representative systems of protected inland water ecosystems within the framework of integrated catchment/watershed/river‑basin management

Goal 1.3: To enhance the conservation status of inland water biological diversity through rehabilitation and restoration of degraded ecosystems and the recovery of threatened species

Goal 1.4: To prevent the introduction of invasive alien species, including exotic stocks that potentially threaten the biological diversity of inland water ecosystems, and to control and, where possible, eradicate established invasive species in these ecosystems.

Programme Element 2: Institutional And Socio-Economic Enabling Environment

Goal 2.1: To promote the integration of conservation and sustainable use of the biological diversity of inland water ecosystems into relevant sectoral and cross-sectoral plans, programmes, policies and legislation

Goal 2.2: To encourage the development, application and transfer of low-cost appropriate technology, non-structural and innovative approaches to water resource management and the conservation and sustainable use of the biological diversity of inland water ecosystems, taking into account any decision taken by the Conference of the Parties at its seventh meeting on technology transfer and cooperation

Goal 2.3: To provide the appropriate incentives and valuation measures to support the conservation and sustainable use

of inland water biological diversity, and to remove, or reform appropriately, any perverse incentives opposing such conservation and sustainable use of ecosystems, as it relates to biodiversity conservation

Goal 2.4: To implement the programme of work for the Global Initiative on Communication, Education and Public Awareness (as adopted by the Conference of the Parties to the Convention on Biological Diversity in its decision VI/19), giving particular attention to matters relating to the conservation and sustainable use of the biological diversity of inland water ecosystems

Goal 2.5: Promote the effective participation of indigenous and local communities and relevant stakeholders in the conservation and sustainable use of biological diversity of inland water ecosystems in accordance with national laws and applicable international obligations.

Curt Carnemark / World Bank Photo Collection

Programme Element 3: Knowledge, Assessment And Monitoring

Goal 3.1: To develop an improved understanding of the biodiversity found in inland water ecosystems, how these systems function, their ecosystem goods and services and the values they can provide

Goal 3.2: To develop, based on inventories, rapid and other assessments applied at the regional, national and local levels, an improved understanding of threats to inland water ecosystems and responses of different types of inland water ecosystems to these threats

Goal 3.3: To ensure projects and actions with the potential to impact negatively on the biological diversity of inland water ecosystems are subjected, in accordance with national legislation and where appropriate, to suitably rigorous impact assessments, including consideration of their potential impact on sacred sites and on lands and waters traditionally occupied or used by indigenous and local communities

Goal 3.4: To introduce and maintain appropriate monitoring arrangements to detect changes in the status and trends of inland water biodiversity sites and on lands and waters traditionally occupied or used by indigenous and local communities.

Checklist of good-practices: Drinking water, biodiversity and poverty reduction

Planning process

Transboundary (international) considerations:

- Are your water resources (the source of your drinking water) affected by transboundary activities — that is, are the quantity, availability, and quality influenced by activities in other countries?
- Have you considered this also for groundwater supplies?
- Do you have the same problem but between different sub-national levels of jurisdiction (between states or provinces)?
- If so, do you have institutional mechanisms in place, or under development, to improve transboundary cooperation (internationally or between states, etc.)?

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National level considerations:

- Is there a federal-level institutional framework that brings together all relevant Ministries and government agencies in governing / implementing policies and strategies for integrated land and water management?
- Have you included all relevant agencies that use and / or have an impact on water resources (including agriculture, forestry, water sector, environment, urban planners)?
- Have you reviewed your national legislation regarding integrated land / water management – including identifying inconsistencies and rectifying these?
- Do your national legislation, regulatory frameworks and policies clearly indicate the desirable approach to sustainable drinking-water supplies, whilst enabling local authorities to implement this innovatively according to local conditions?

Policies and Strategies

- Do your approaches recognise, or make mandatory, the role of ecosystems and ecosystem restoration in supplying drinking water sustainably?
- Do you use available tools, or encourage / legislate their use by stakeholders, for the integrated management of land and water (i.e. IWRM, Sustainable Forest Management, Ecosystem Approach, Integrated Watershed Development, etc.)?
- Are they fully integrated – meaning that due attention is given to managing the ecosystem (nature) to achieve drinking water related objectives?
- Have you taken a long-term view of your planning – including projected needs for water other than for drinking (in particular by agriculture, industries and cities) and taking into account the additional risks and uncertainties imposed by climate change?
- Do policies / strategies encourage dialogue and participation of all relevant stakeholders?

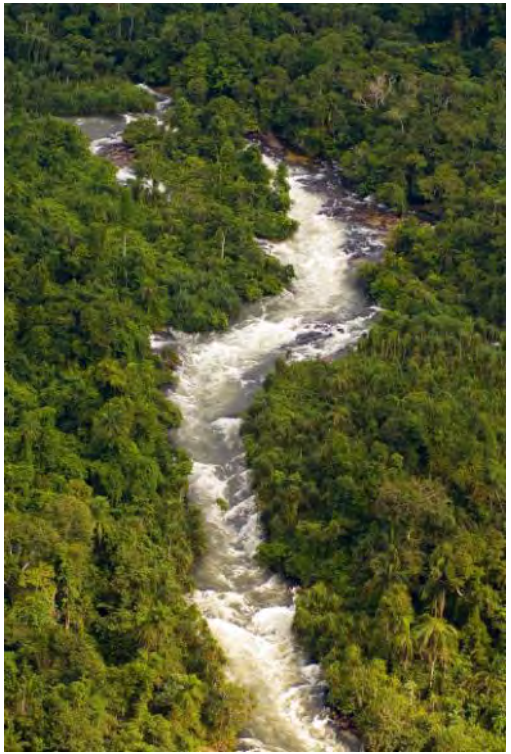
Measurements / baseline information

- Do you know how much water you have, where it comes from, its quality and how it is used?
- Do you have programmes to improve information at national, regional and local levels?
- Do you know the root causes of your drinking water supply problems?

Economics/finances/markets

- When assessing costs and benefits of investments in drinking water supply do you consider the multiple benefits that protecting or restoring ecosystems (nature) offers – including sustainability, long-term risk reduction, tourism / amenity values, sustainable fisheries, conservation, etc.?
- Do you have adequate oversight of the potential for corruption in investments in water sector infrastructure?
- The supply of drinking water usually costs money — have you identified where that money comes from (taxes, government revenue, user fees?) and therefore how much is available for both capital investments and long-term maintenance costs?
- Do you have mechanisms in place to provide incentives for behavioural change, by re-allocating existing resources, or financing investment through water users (schemes for payments for ecosystem services)?

- Have you looked for innovative financing approaches that lead to long-term sustainability whilst also reducing investment costs?
- Have you considered traditional physical engineering approaches (dam construction, water treatment facilities etc.) only when alternatives have been properly evaluated and discounted?



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Capacity building

- Do you have regular / ongoing capacity building initiatives (e.g. training programmes, networks etc.) for key stakeholder groups in your country / region / locality?
- Have you explored, and implemented, capacity / awareness building by integrating this into ongoing activities in other areas (e.g., building on existing capacity programmes for agriculture, industry, urban planning etc.)?

Communication / awareness

- Do your educational programmes and media include adequate attention, at the appropriate technical / language level, to the role of nature in water supply?
- Are there support systems (e.g. clearinghouses, information bases, training materials, networks) in place to help the public and private sectors raise awareness amongst their own target audiences?
- Have you worked with stakeholders in relevant fields to develop communication materials in the technical language / style that they are familiar with?
- Is your communication style proactive, e.g. explaining to stakeholders how better management of nature leads to better outcomes for them?

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Sources for further information, tools, and guidance:

At the global level **UN-Water** provides a collaborative platform for all the UN agencies with a mandate in water and further links to each of the specialised agencies; see: http://www.unwater.org. It also oversees several relevant programmes including the World Water Assessment Programme, the WHO/UNICEF Joint Monitoring Programme on Water Supply and Sanitation (JMP), The UN-Water Decade Programme on Capacity Development and the Water for Life Decade; accessed at: http://www.unwater.org/programmes.html.

A key resource for guidelines for drinking water quality criteria, providing recommended limits for various pollutants and other parameters for drinking water, is the Guidelines on Drinking Water Quality published by the WHO, accessed at: http://www.who.int/water_sanitation_health/dwq/gdwq2v1/en/index1.html.

Key and very substantial resources and guidance for the wise use of wetlands are provided by the **Ramsar Convention on Wetlands**; see http://www.ramsar.org . In addition, most countries have national focal points for the Ramsar Convention and many have access to local experts in many fields (see the aforementioned link for contact details).

Very many NGOs are active in the field of water supply. Some international NGOs particularly active and experienced in the field of using nature better for sustainable solutions to drinking water supply are listed below. All of these have experience implementing relevant programmes or projects, in collaboration with national agencies, at local and regional levels:

The World Wildlife Fund (WWF): http://www.panda.org/
The International Union for Conservation of Nature (IUCN): http://www.iucn.org/
The Nature Conservancy: http://www.tnc.org
Conservation International: http://www.conservation.org
Wetlands International: http://www.wetlands.org/

Contents of the CD Rom

Power Point Presentation:
This presentation summarises the content of this booklet and has been included as a tool for planners in the drinking water sector to share this information in training sessions, workshops, strategic planning meetings, etc.. The slide show can be customized for presentation to a particular audience through the following steps: 1) On the Slide Show menu, click Custom Shows; 2) click New; 3) Add the slides that you wish to present.

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Ramsar logo

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