

Water in the green economy. Opportunities and actions

UN-Water Programme on Advocacy and Communication (UNW-DPAC)

The debate about the possible alternatives to progress towards the green economy is discussed in the Zaragoza Conference on Water and the Green Economy in Practice: Towards Rio +20 of October 2011. The transition toward a green economy demands coordinated efforts of all economic sectors with the triple objective of improving economic welfare, reduce poverty and contribute to harmonize the economy with the improvement in the environmental status of water resources. This requires an effort to adapt simultaneously the productive activities, especially industry and agriculture, and at the same time progress in water management in cities and in the integrated management of river basins and aquifer to maintain and improve ecosystem services.

There are different alternatives that have been proposed by different organisations and stakeholders on what would contribute to the Green Economy. These include proposals for industry, agriculture, cities and watersheds.

1. Industry in the transition to a green economy

Industry can play a leading role in making water practices more sustainable by addressing overexploitation and contamination and improving water infrastructure and management. To reach these goals, industry must do *'more with less'*, ideally moving toward a goal of zero discharge, for example by utilising a closed-loop production system.

UNIDO launched the *Green Industry Initiative*, which is a two-pronged strategy for decoupling resource use and pollution from industrial development and promoting the growth of sustainable productive sectors and entrepreneurship in developing and transitioning countries. According to UNIDO, this will lead to the creation of new green jobs, new business ventures, and will drive technology development and innovation. The initiative is especially designed to support developing countries and transition economies, enabling them to benefit from the opportunities associated with sustainable industrial development and the growing global demand for greener products and services.

Industry, as the prime manufacturer of the goods and services that societies consume, has a critical role to play in creating more sustainable production and consumption patterns. In the transition to a green economy, the environmental services sector offers opportunities for industries, as it can assist them in assessing, measuring and managing their environmental impacts, as well in the management and safe disposal of pollution and waste. Examples are cleaner production services and waste recycling. Recent statistics suggest that this industry is worth around USD 300 billion annually in the developed countries alone.

Many types of products with an environmental 'brand' offer opportunities for entrepreneurs. For example, in the renewable energy sector there are potential markets for solar water-heaters for commercial or residential use, or for solar cookers for use in rural areas. Through environmentally sound product design, enterprises can assist in bringing about a broader decoupling throughout societies. At one level, enterprises can redesign their products so that they contain fewer materials (dematerialization). At another level, they can redesign them to consume less (e.g. energy, water, detergents) during their use.

The current economic and financial crises can also provide an opportunity for industries to become more sustainable. The large public spending programs being touted as a means to revive economies are an opportunity to place our economies on more sustainable pathways of growth. The much needed green public investments, as well as the necessary policy changes to encourage green private investments, could well 'jump-start' our economies and place them on more sustainable paths of economic growth.

ZINNAE (Urban cluster for water efficiency), Zaragoza, Spain

In 2010 the main water actors in Zaragoza created ZINNAE (Urban cluster for water efficiency) to promote efficient and sustainable use of water and associated energy consumption in Zaragoza.

Main challenges: Global demand for water is increasing continuously, largely due to urban population growth.

Focus and objectives

- Boost efficiency and sustainability in water use and management as well as in the associated energy consumption in Zaragoza. Reduce the discharge of contaminated wastewater.
- Showcase the cluster at a national and international level as an exemplar of using collaboration, knowledge and innovation for promoting efficient and sustainable water management and reducing energy consumption in urban areas.
- Turn water efficiency into a driver of quality employment for the city.

Approaches

- Facilitating the collaboration of different public and private actors through knowledge generation, demonstration projects and innovative solutions.
- The cluster's activities include: collaborative projects, thematic commissions, and dissemination of the activities and products of the cluster members.

¿What are the main approaches to improve the sustainability in Industry? The different proposals have been summarized below:

- Experts and international institutions emphasize the importance of closing gaps in the normative framework. Global trading will increasingly require enterprises in the developing countries to comply with environmental product or process standards and certify that they do so. A normative framework is required allowing enterprises to obtain certifications of compliance with local environmental standards. A normative framework to encourage the growth of the recycling industry. Establishment of new environmental laws and regulations and enforcement of existing ones.
- They also refer to awareness-raising amongst entrepreneurs to promote opportunities for new green businesses responding to demands for technologies; infrastructure; or specialized consulting, laboratory or other services. Access to training, knowledge and technology, so that water-friendly industry in the green economy generates opportunities that benefit all. Enhancement of technical and managerial knowledge and skills throughout the industrial sector.
- Improvements in water use and energy efficiency along the value chain of industrial processes (production, transformation, marketing, consumption, recycling) via government and market incentives and regulations/standards and consumer campaigns. Measurement and assessment of water footprints and water risks in operations and supply-chains.

- Cleaner production and sustainability practices contribute to the transition toward zero effluent discharges. Industries should work to convert wastewater streams into useful inputs for other processes, industries and industrial clusters. Improved management of chemicals (storage and handling) to prevent accidental spills and leakages that negatively impact surface water and groundwater.
- Support to the development of small and medium enterprises (SMEs) and local green industry (goods and services) in the transition to a water-friendly economy. Promotion of good practices of corporate social responsibility around water, including for SMEs in developing countries. Proper siting of enterprises. For example, locating small and medium enterprises (SMEs) of similar industrial sectors in industrial zones allows for common wastewater treatment and waste-management operations, which individual enterprises might not be able to afford. It can also enable groups of enterprises to practice industrial ecology, whereby wastes from one enterprise are fed to another enterprise as raw materials.
- Improvements to the financial support structure. It is important that the banking sector in the position of being willing and able to support green investments by the private sector, or to invest directly in required infrastructure such as wastewater treatment plants and waste-management plants (these can be the green investments in stimulus packages). A different price structure for industrial water use which requires industry to pay more per unit of water than the public and increases the unit price with increasing water use. This promotes increased water use efficiency, since industries aim to keep costs low. Currently, many developing countries' industries pay a fix 'tax' for water which is unrelated to the amount used. Establishment of loan markets for small and medium enterprises (SMEs), municipalities, water users associations and domestic consumers.
- An integrated and strategic science and technology system that encourages green innovation as well as the transfer, development and adaptation of cleaner process technologies, recycling technologies, renewable-energy technologies, and other environmentally sound technologies. This makes it easier for enterprises to green themselves. Eco-industrial clusters and technological parks can increase efficiency and generate environmental benefits at the regional level.

2. Cities in the transition to a green economy

With the majority of the world's economic activity and now over 50% of its population concentrated in urban areas, cities have a central role to play in the realization of a green economy. How cities develop has far-reaching effects on economies, energy use and climate change. Furthermore, a green economy thrives on innovation and many of the more ambitious and sustainability-oriented innovations have emerged within cities; in the density of institutions, people and infrastructure.

As centers of social interaction and economic activity, cities are the critical spatial platform for the formulation and implementation of policies across sectors. It is in cities that economic growth and decent jobs can feasibly be balanced with an environment liberated from the risks of climate change and ecosystem degradation. Cities can catalyze an efficiency shift by targeting investment at well-planned greener transport infrastructure. Along with integrated transport planning, low-carbon fuels and electrification of transport, these innovations will help meet sustainability targets.

Urban densification – when sensitively planned and supported by sustainable infrastructure – allows for more efficient and sustainable patterns of development. Compact cities reduce the spatial footprint of development and shared infrastructure reduces emissions and resource use. By harnessing the advantages of concentrated populations, cities can reduce dependency on transportation and infrastructure and provide basic services with greater efficiency. Creative planning for compact and

dense urban development that incorporates parks and green spaces can reduce commuting distance and energy consumption in buildings, while contributing to climate stabilization and biodiversity.

The transition of cities to a green economy requires a combination of sustainable urban development, protection of urban ecosystems, effective management of waste water and pollution, efficient water use and improved governance.

Sustainable urban development

A key principle is the promotion of compact cities and planned extension of urban areas.

Land mosaic patterns that provide for large green patches and more sustainable urban development. Two urban patterns, the 'compact concentric zone' and 'satellite cities' models, can best provide for both human and ecological systems. These patterns preserve a greater number of large patches of land within which nature can thrive, whereby flooding and landslides can be prevented, while at the same time allowing for population and economic growth.

Another key principle refers to a balance of strategic facilities with diversified local economic opportunities. As an urban centre grows, the range and number of the functions that it supports generally increases. Facilities such as good harbors, an international airport, universities and a financial centre strengthen the competitiveness of a city-region and support value chains throughout the area. At the same time, diversifying local economic opportunities diminishes the demand for mobility, hence reducing energy use.

Moreover, the following concrete alternatives can contribute to sustainable urban development:

- Expansion of network infrastructure while getting the most out of existing networks.
- Construction of 'greener' built environments that use water and energy efficiently. Both regulatory approaches (e.g. strengthened building codes) and incentive-based strategies (e.g. green building rating tools, green mortgages) can promote green buildings.
- Technologies such as 'green roofs' can reduce runoff, reduce the heat island effect in cities and so reduce cooling demand, and remove pollutants from the air.
- Clusters of green industries and jobs. Decision-makers can support the growth of clusters of green industries and green jobs, e.g. through three-way linkages between universities, business and local authorities.
- More efficient intra-urban resource flows, for example by establishing urban growth boundaries to limit urban sprawl, incentives for car-free developments, and density bonuses for developments that support city-wide sustainability.

Ecosystem services

Protection of valuable ecosystem services and biodiversity hotspots in urban areas while increasing resilience to natural disasters. Safeguarding ecosystems involves conserving blue-green patches and corridors accordingly.

Implementation of an integrated project of water supply and sanitation services for the urban poor in Kagugube parish, Kampala (Uganda)

Main challenges: The urban poor lack access to water and sanitation services.

Focus and objectives

- Extend access to water supply and sanitation to the urban poor using innovative sanitation technologies, improved water distribution infrastructure and approaches.

Approaches

- Establishing sanitation services tailored to the needs of the urban poor in the low-income community, with a special focus on Ecological Sanitation.
- Expanding and rehabilitating the water supply network.
- Installing pre-paid stand pipes in order to ensure access to water for the urban poor at the official tariffs.
- Strengthening the National Water and Sewerage Corporation (NWSC) Unit charged with developing pro-poor infrastructure and operational mechanisms.

Governance

- Strong and consistent political leadership to ensure that cities and their green economies are successful. This leadership is needed to enable structured progress and a coordinated approach.
- Generation of political will to realize green initiatives and implement green policies.
- Partnerships between government, industry and communities to create and implement green policies and regulatory reforms.

Sustainable urban water management

- Integrated urban water management (IUWM) to facilitate the multi-functional nature of urban water services in order to optimize the outcomes of the system as a whole. This involves managing freshwater, wastewater, and stormwater as linked within the resource management structure, using an urban area as the unit of management.
- Integration of land and water management. Land use planning and building regulations have proved in some areas to be highly effective ways of promoting sustainable urban water management.
- Simple solutions, such as water loss reduction and regular operation and maintenance, can give big results that often surpass heavy investment in hard infrastructure.
- The 'Cities of the Future' programme of the International Water Association (IWA) focuses on water security for the world's cities. Cities – and the water management, treatment and delivery systems that serve them – could be harmonized and re-engineered to minimize the use of scarce natural resources and increase the coverage of water and sanitation in lower- and middle-income countries.
- Provision of water and sanitation to informal settlements.
- Use of techniques for domestic water reuse for toilet flushing, garden watering, etc.
- Technological development for urban water production: nanotechnologies to reduce pollution and accelerate filtration.

Management of wastewater and pollution

- Separation of pollution streams at source.
- Use of grey water.
- Making water conservation and reuse possible and affordable.
- Campaigns for pollution abatement.
- Techniques for establishing **sustainable drainage systems (SUDS)** in high density cities (>15,000 people per km²).
- Protection of infrastructure used to treat and transport water (including sources, treatment plants and distribution systems) to ensure safety for public health and the environment.

Improved sanitation and water supply service delivery to the urban poor in Ghana through tripartite partnerships

Main challenges: The urban poor lack access to improved sanitation and water supply services.

Focus and objectives

- Increase access to sanitation and water supply in three urban pilot areas.
- Strengthen sector capacity for planning and delivery of pro-poor WASH services in urban areas through tripartite partnerships approaches involving the public, private and NGO sectors.

Approaches

- Test a range of different innovative management models, approaches and technologies for providing WASH services to the urban poor.
- Provide infrastructure in three pilot areas (two small towns and one urban slum) under the new management models.
- Support the development of a more enabling environment by undertaking awareness-raising and advocacy activities.

Economic instruments

- Price regulation for water suppliers and wastewater managers that promotes sustainable water use.
- Practical tariff systems for consumers whose income is low as well as variable.
- Incentives and regulations in the building and construction sector offer opportunities for cities and local governments to leverage their authority through the promotion of green building materials and construction technologies, mandatory investments in energy efficiency and the installation of renewable energy technologies in buildings.
- Remittances for investment in water services.

Raising awareness

- Involvement of end users, particularly women, in water management to optimize benefits from water projects. Water managers can work with the users of water and sanitation services to find out their needs and identify appropriate solutions.
- Effective household demand management campaigns (e.g. Copenhagen, Denmark; Zaragoza, Spain).
- Education can raise awareness of the need for sustainable water use. Water, sanitation and hygiene education is also important for ensuring the integrity of both human and environmental health.

3. Agriculture in the transition to a green economy

Agriculture can play an essential role in achieving a green economy since it accounts for **70%** of global water withdrawals and provides employment for 40% of the global population. Furthermore, GDP growth generated by agriculture is up to four times more effective in reducing poverty than growth generated by other sectors. Green growth requires that in the coming decades enough food is provided for an expanding population (mostly in the least developed countries and especially in Sub-Saharan Africa), of which a proportion will be increasingly affluent in Least Developed Countries (LDCs) and Developed Countries (DCs).

A green economy requires the achievement of food security, but by using less natural resources. This could be achieved through improved resource efficiency, substantial investments and innovations. It implies increasing crops that ensure a higher efficiency in terms of nutrition per drop of water.

Smallholder farms are essential in the transition towards a green economy. They can contribute to economic growth, poverty reduction and food security. However, without the means to control and effectively manage water, poor farmers are unable to turn agriculture from a subsistence activity into an income-generating enterprise. Water is not the only constraint to improving crop production and nutrition, but if farmers do not have reliable access to water, interventions to address the other constraints will fail. For example, reliable access to water gives farmers the security to invest in inputs,

Innovative initiatives for conserving and managing forests as sources of water for Fukuoka City, Japan

Main challenges

- Fukuoka relies on the Chikugogawa River for one-third of its water and on the cooperation of neighboring local governments in developing dams to provide the remainder of its drinking water.
- Forest degradation surrounding the dams which provide water supply to Fukuoka City is impairing the forests' recharge functions, jeopardizing the city's water supply

Focus and objectives

- Forest conservation in water source areas to improve water recharge.

Approaches

- Collaborative projects with headwater areas and cooperation among local governments.
- The municipality funds forest management in water source areas, local exchange programs, and contributions to a river basin based partnership fund comprised of neighboring municipalities.
- Forest management plans are drafted to effectively maintain forests even on private lands.
- Forests in catchment areas are purchased in order to enhance water recharge capacities and prevent water contamination from excessive development.
- Citizens are invited to take part in silvicultural management activities, rice planting and catching trout upstream.
- The municipality offers grants that support civil activities to plant trees and clear underbrush as well as other interactive programs.

such as fertilizers and improved seeds, and enables them to grow higher-value crops, such as fruits and vegetables.

The following approaches for transitioning to the green economy are highlighted by the organizations participating in the conference.

Agricultural practices

- Efficiency of smallholders can be achieved by both push (access to techniques) and pull mechanisms (access to markets).
- Agroecosystem approach. This approach views agriculture as a set of human practices embedded and part of its own ecosystem that has certain ecosystem needs, functions and services and that interacts with other ecosystems. Agroecosystem management is then the management of natural resources and other inputs for the production of food and other provisioning, cultural, regulatory and supporting ecosystem services.
- Layered agricultural systems, such as the rice and fish culture in China, where fish are raised in rice fields, either concurrently with the rice crop or in rotation with rice.
- At farm and larger landscape level, the integration of crop, tree and livestock production can lead to resource recovery in the form of manure for soil fertility and crop residues and tree fodder for feed. For instance, in savannah woodlands, farmer-managed natural regeneration helps increase tree cover.
- Cultivation of local plants, desert-adapted plants, silvopastures and perennial grasses have the potential to capture benefits from infrequent and erratic rainfall and control erosion in areas too dry to support traditional field crops.
- Use of innovative technologies that improve crop yields and drought tolerance; more efficient ways of using fertilizer and water, as well as new pesticides and non-chemical approaches to crop protection; and technologies that reduce post-harvest losses and more sustainable livestock and marine production.
- Upscaling of successful local solutions (from small-holders).
- Promotion of urban agriculture, since it has the advantage of reducing the transmission chain between soil and mouth.
- Capture and reuse of phosphorus. In both urban areas and in livestock farming, the phosphorus content of human and animal wastes must be recovered for return to the soil.

Water harvesting project for water supply and agriculture in rural districts of the Republic of Djibouti

Main challenges: Lack of access to sufficient water for multiple purposes, such as for drinking and agriculture.

Focus and objectives

- Improve access to water for multipurpose uses for the rural nomad populations (2,400 people).
- Improve knowledge of the hydro-geologic conditions in the project zone.
- Increase investments through scaling-up of the new technologies in water harvesting at the country level.

Approaches

- Piloting of innovative run-off water harvesting technologies for drinking water, irrigation and livestock uses in two rural districts.
- Construction of hydraulic structures including underground storage tanks, surface reservoirs and diversion works.
- Capacity building of government water resource engineering departments.
- Sector assessment and preparation of bankable projects for funding.

Food production chain

- Efficiency improvements throughout the value food chain: from the resources used and

recycled during production, through waste minimization during post-harvest handling, processing, retailing and consumption, to distributional equity and fair trading.

- Food loss reduction. Food waste in industrialized countries can be reduced by raising awareness among food industries, retailers and consumers. There is a need to find a beneficial use for safe food that is presently thrown away.
- Attention to the interdependencies between water, food, energy and climate. There is a need to align plans, strategies and programs dealing with elements of that nexus and recognize potential tradeoffs between land and water use, biodiversity, green house gas emission reduction, soil, etc.

Markets

- Farmers in developing countries (mostly smallholder) need better access to markets to make their small business more profitable. Generating more income enables greater investment in improving productivity.
- Use of soft technologies such as mobile phones to get information on market prices may help improve the profitability of farmers.
- Ensure that well-functioning markets provide the right signals:
 - Prices reflect the scarcity value of natural resources as well as the positive and negative environmental impacts of the food and agriculture system will contribute to resource use efficiency.
 - Further integration of domestic and global markets, bearing in mind the impacts of production trade on the environment and of environmental policies on production and trade.
 - Application of the polluter pays principle through charges and regulations.
 - Provision of incentives for the supply of environmental goods and services.

Land management

- Improvement of land use efficiency. Awareness-raising of challenges and available options, and leadership to adapt the best practices at all levels.
- Joint assessment of land and water productivities for optimization of natural resources use.
- Establishment and enforcement of well defined property rights. Property rights help ensure optimal resource use, in particular for marine resources, land and forests, greenhouse gas emissions, and air and water quality. When resources are essentially free to private participants it can encourage over-exploitation, resulting in environmentally and socially sub-optimal outcomes.

Integrated Water Harvesting Project in Mpumalanga, South-Africa

Main challenges: Lack of water and food security.

Focus and objectives

- Assist communities in the Ehlanzeni District of Mpumalanga Province of South Africa to improve output from their communal food gardens.
- Improve food security and income generation in the communities.
- Demonstrate and stimulate interest in rainwater harvesting technologies and related approaches to secure water for food and income.

Approaches

- Collection and management of surface run-off from precipitation and better management of soil moisture.
- Community capacity building to strengthen food security and income generation.
- Development of learning resources.
- Construction of rainwater harvesting infrastructure and related technologies.
- Outreach and institutional capacity strengthening.

Water management practices

- Improvement of irrigation efficiency in agriculture. Consider rain fed agriculture including small dams and water harvesting.
- Small scale irrigation technologies (e.g. treadle pumps, drip irrigation techniques). Investments in 'green' irrigation models (drip irrigation) can help address the increasingly unsustainable water withdrawals for irrigation.
- Measures to increase water productivity in agriculture and reduce the gap in water productivity between farms in different areas (supply).
- Account for volumes of water in the food supply chain. Currently the food supply chain is water value blind.
- Shift in focus from supply-side to demand-side approaches to agricultural water management. The current focus on physical infrastructure-based 'supply-side' solutions should shift towards a greater emphasis on the sustainable use of water and 'demand-side' economic solutions.
- Combination of new technologies and improved land and water management practices, such as efficient collection of runoff and soil-based storage of moisture, to increase water productivity in cropped areas and restore degraded rangelands.
- Decisions based on impact assessments to ensure water management is sustainable.
- Separation of pollution streams at source.
- Promotion of localized wastewater treatment techniques.
- Energy can be saved by optimizing the use of gravity water supply, while reducing the need for pumping and conserving water quality across the basin.
- Adoption of new filtration technologies (such as nano-technology) to reuse grey-water (waste water from the urban sector) for agriculture.

Improving knowledge, building capacity

- Consumer education and public awareness on water efficiency, water quality concepts and certification in order to change consumer behaviour and build a green society.
- Learning and knowledge-sharing on management practices such as conservation agriculture, nutrient management, integrated pest management, groundwater management and irrigation scheduling.
- Involvement of local people – both men and women- and creation of local economic opportunities. Building of local capacity for planning, implementation and management of forestry and replanting programs. There is a need for education and information on how to make best use of forests and how to cultivate crops sustainably.

Water governance

Community water management improvement project for traditional farmers in Mkushi, Kapiri Mposhi, Masaiti and Chingola districts (Zambia)

Main challenges: Food insecurity and poverty.

Focus and objectives

- Improve food security and reduce poverty.
- Improve production and income generation.
- Create enabling environment for smallholder self-supply investments.
- Increase availability of affordable irrigation equipment.
- Improve knowledge on low-cost irrigation options among farmers and major stakeholders.

Approaches

- Promotion and use of improved on-farm water resources management methods and low-cost irrigation technologies by smallholder farmers through access to micro credits.
- 1000 smallholder farmers investing in self-supply solutions.
- Institutional capacity-building and empowerment of farmers.
- Improving water access for enhanced productivity.
- Credit access and investment facilitation.
- Knowledge dissemination.

- A dialogue between water managers, agricultural planners and stakeholders is needed to identify and properly implement solutions.
- A holistic water governance framework is required whereby water is managed across sectors, with appropriate institutions that have the authority to take this holistic approach.

4. Watersheds in the transition to a green economy

There is a recognized link between poverty alleviation and the benefits that people derive from ecosystem services – especially those provided by freshwater ecosystems. The protection and sustainable management of these ecosystems can therefore play a critical role in poverty reduction strategies, by securing the continued cost-effective delivery of the water, food and other services that poor people rely on.

Recognizing the valuable, less visible and non-monetized benefits of conserving ecosystems represents an opportunity to recover sustainable growth, fairness and poverty reduction paths while improving and protecting natural assets.

Sustaining or restoring the water-related services provided by ecosystems is at the heart of achieving water security for both people and nature. There is already solid evidence that ecosystem-based solutions to water-related problems are not only viable but can be very attractive in terms of investment returns. Water-related economic interests are already driving major shifts towards the wiser use of nature and biodiversity in the business, public and national policy agendas in many countries, including major developing nations.

Biodiversity conservation

- Biodiversity conservation can be a useful tool for managing nutrient uptake and storage; in certain freshwater ecosystems rapid vegetation growth can be used to remove excess nutrients from water, reducing the need for conventional water treatment plants. Maintaining both the physical and biological diversity of watercourses helps to buffer ecosystems against nutrient pollution.
- One of the key ways that water managers and those interested in conserving biodiversity have collaborated is through the setting up of investments and fiscal measures that provide incentives for the sustainable management of ecosystems. One of the most widely implemented approaches during the last 5 to 10 year is Payments for Ecosystem Services.

Ecosystem services

- Environmental flow assessment is becoming an influential decision-support tool. Environmental flows describe the quantity and timing of water needed to sustain freshwater ecosystems and the services they provide. The implementation of policies to restore and

Fund for the Protection of Water in Ecuador (FONAG)

FONAG was established in 2000 as a trust fund into which water users in Quito Metropolitan District could contribute to support watershed conservation and management activities to protect the supply of water.

Main challenge: Rehabilitation and protection of basins that supply water to the Quito Metropolitan District and surrounding areas.

Focus and objective

- Develop a market that channels economic demand for urban water supply (for 1.5 million people) to fund conservation in upstream protected areas.

Approach

- FONAG is an example of payment for the environmental services provided by ecosystems (commonly referred to as Payment for Ecosystem Services or PES), in which local water users, including hydropower and water supply companies contribute regularly under a self-taxing arrangement.

- Activities involve land purchase in critical areas to sustain ecosystem services and improvement of agricultural management practices, but no direct payments to farmers.

protect environmental flows ensures the maintenance of ecosystems services which people and economies rely upon.

- Sustainable provision of ecosystem services can be achieved through changes in land-use practices and incentives for farmers that are both equitable and targeted at maintaining or enhancing livelihoods.
- A program of public awareness can sensitize stakeholders to upstream – downstream environmental linkages and the economic significance of the ecosystem services management carried out by watershed owners/managers. This can enhance willingness to pay on the part of users, and willingness to adapt land/water management practices by service ‘suppliers’ – or at least willingness by both groups of stakeholders to engage in dialogue.
- It may be better to ‘start small’ and to ‘scale up’ rather than to try to implement a fully fledged financial mechanism from the beginning. This can be done, for example, by targeting a specific land/water management practice – and the drivers underlying it – that influences a specific ecosystem service (e.g. deforestation driven by the need for fuel wood, causing increased runoff, erosion and sedimentation of water courses).
- The way in which ecosystems are valued has to be reconsidered. Water is usually only priced at the point of consumption, but in order to improve decision making and protect ecosystems, valuing the multiple benefits of water is essential.

Aquifers

- Development of mechanisms to ensure that decision making of water users sharing an aquifer is based on the capacity of the aquifer to meet their long-term water demands. Cooperation and sharing the benefits of a well-protected aquifer is always better than the competitive the race to the bottom dynamics that have led to the depletion of aquifers.

Integrated management

- Shift in focus towards a systemic approach to water management which takes into account ecological considerations.
- Management of catchments as systems, considering water usage within the catchment as a whole.
- Shift from ‘fixing’ point challenges to systemic solutions. Individual action within a catchment can be promoted to enhance overall catchment performance, e.g. in the provision and maintenance of ecosystem services.
- Integration of land and water management instead of treating them as separate problems or allowing land management to drive water management.
- Reallocation of resources from low-value to higher-value uses.

Managing climate variability

- Build resilience, adaptiveness, and adaptability, learning from past mistakes.
- Managing variability as a whole instead of treating different stages in that variability (i.e. droughts, resource, and floods) as separate problems. Actions which reduce runoff do so in drought periods as well as during periods of heavy rainfall.
- Due to the inherent uncertainty of future climate change projections, water management needs to be flexible and able to cope under a range of possible futures.

Management of wastewater and pollution

- Reduction of pollution through catchment-based strategies and action plans for more sustainable land use – especially agriculture – and working with industry (public and private sectors) to reduce water use and pollution.
- Investments in wastewater treatment facilities to reduce pollution from organic chemicals, pesticides, nitrates, heavy metals and waterborne pathogens.
- Water reuse, such as making use of grey water in peri-urban agriculture.

Payment for Environmental Services pilot project in Lake Naivasha basin, Kenya

Main challenges

Lake Naivasha basin faces significant environmental threats from poor land-use practices, unregulated and excessive water abstraction, weak policy enforcement, water pollution and climate change. These pressures have resulted in degradation of ecosystem services, economic losses, worsening poverty and reduction of biodiversity.

Focus and objectives

To develop a viable financial mechanism for payments for watershed services that delivers sustainable natural resource management and improved livelihoods and serves as a pilot and learning model for further expansion and replication.

Approaches

- Payment for Environmental Services (PES) market-based mechanism whereby land owners are rewarded financially by service beneficiaries for undertaking land use transformations that provide agreed ecosystem services.
- The Lake Naivasha Water Resource Users Association—on behalf of ecosystem service beneficiaries, notably the major floricultural/horticultural industry based around the lake – agreed to compensate small-scale landowners/farmers represented by the Upper Turasha-Kinja and Wanjohi Water Resource Users Associations (WRUAs) for foregoing some potential income to manage their land to provide good quality water to downstream users.