



Enhancing

WATER SECURITY

in Shared Freshwater Ecosystems

GEF IW:LEARN

Produced by the GEF IW:LEARN project, which is funded by the Global Environment Facility (GEF), managed by the Intergovernmental Oceanographic Commission United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO), and implemented by the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP).

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March 2021

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Foreword

Freshwater—an essential ingredient for human life and biodiversity conservation on our planet, and the foundation for the provision of ecosystem goods and services that enable societies to thrive socioeconomically—is experiencing tremendous stress. With current anthropogenic pressures, estimates show the world will face a 40 percent shortfall between forecast demand and available supply of freshwater by 2030. About 1.2 billion people already live in freshwater basins where human water use has surpassed sustainable limits.

Many of the freshwater ecosystems around the world, such as rivers, lakes and aquifers, which support the incomes and livelihoods of billions of people, are shared, cutting across political boundaries. Countries are relying more and more on these transboundary water resources to meet their growing water demands. Yet, since transboundary freshwater systems create inevitable linkages and hydrological interdependencies between countries, actions to this end may have cross-border impacts. To deal with the complex and interlinked water challenges that come from transboundary water situations, countries will need to cooperate to improve the way they manage their shared water resources and associated services.

Transboundary water cooperation has, among other indicators, been captured in the UN Sustainable Development Goal (SDG) 6 targets as an essential element for effective integrated water resources management. Beyond that, however, continued and constant water flow and availability plays an essential role in the world's ability to deliver on many of the SDGs.

Global Environment Facility (GEF) support has been securing international cooperation and stronger, more resilient transboundary freshwater ecosystems for more than 30 years. This support has increased capacity in countries to address water use conflicts as well as help freshwater ecosystems to withstand climate-induced variations in water flow to provide essential ecosystem services and conserve biodiversity.



The GEF offers a unique funding modality to catalyze the application of integrated approaches to the governance and management of shared freshwater resources at the local, national, and transboundary levels. GEF support has catalyzed increased cooperation in more than thirty transboundary freshwater ecosystems globally.

This publication consists of an inter-related series of briefing notes that can either be read as a full publication, or individually, highlighting GEF International Waters investments as case studies illustrating the challenges associated to topics such as biodiversity and ecosystem services, agriculture and land use, industrial and municipal consumption, livelihoods and social welfare, and human health and safety.

The publication signifies the importance that science-based policymaking across political boundaries needs to have if we are to secure resilience in shared freshwater systems. This is especially crucial in a world where the strain on natural resources, and water in particular, continues to increase.

I am hopeful that we can build strong partnerships that will push to raise the bar high enough for current and future generations to sustainably enjoy the biodiversity and ecosystem services that a water-secure world would provide.

Christian Severin
Coordinator, GEF International Waters



Water Security and the Planetary Boundaries

The ecosystems, biomes and processes that regulate the stability and resilience of the Earth system are the very foundation of our global economy and modern society.

Today, they are facing the tragedy of over-exploitation and rapid degradation, causing the limits of Earth's carrying capacity—or the “planetary boundaries” that ensure the stable conditions for life and civilization to form and prosper—to be nearly reached and in some cases breached.

The Covid-19 pandemic is a vivid example of how human pressure on nature and natural systems is exposing humans to grave health risks, with wide-ranging and lasting consequences for society and for the stability of national and global economies. With the understanding that the fundamental root cause of emerging zoonotic diseases resides in the weakening of the services that ecosystems have provided for humanity over thousands of years, the only lasting solution to the pandemic and other diseases is to promote transformational change to human systems so that a balance between natural systems and human systems can be restored within the planetary boundaries.

Water security is achieved when water's productive potential is leveraged and its destructive potential is managed.

Healthy rivers, wetlands, aquifers and lakes are a necessary precondition to conserving biodiversity and sustaining human health. They underpin and connect ecosystems. And they are the foundation for the provision of ecosystem goods and services that enable human societies to thrive.

With water so woven into our economic and societal fabric—and flowing through each of the United Nations Sustainable Development Goals—staying within the planetary boundaries largely depends on achieving a water-secure world.

Development is thirsty business.

- Estimates suggest that within the next three decades, the global food system will require between 40 and 50 percent more water; municipal and industrial water demand will increase by 50 to 70 percent; and the energy sector will see water demand go up by 85 percent.
- Forty percent of the world's population is projected to live under severe water stress by 2050.
- Human-induced hydrological alterations, including from land-based activities, and changes to environmental flows and direct exploitation, are causing rapid decline of the biodiversity of freshwater and coastal zone ecosystems.
- Climate change, which is already altering hydrological cycles at an unprecedented rate, will make water availability more unpredictable and increase the frequency and intensity of floods and droughts.
- Chronic water scarcity, hydrological uncertainty, and extreme weather events hold the potential to act as risk multipliers, contributing to destabilization, violence and migration.

Countries are relying more and more on transboundary water resources to meet their growing water demands.

There are 286 water basins and 166 identified aquifers (larger than 5,000 km²) that are shared by two or more countries. While it is widely acknowledged that these international waters have created opportunities for fostering regional economic and political integration through cooperative development, the complex web of environmental, political, economic and security-related interdependencies linking countries in these transboundary water systems can also lead to tension and less-than-optimal development of common resources.

To strengthen water security against the backdrop of increasing water demand, expanding water scarcity, growing uncertainty, greater frequency of water extremes and water resource fragmentation challenges (which also occur at the national level), governments will need to continually invest in institutional strengthening, information management at the national and regional level, innovative technologies, and natural and human-made infrastructure, and cooperate to improve the way they manage their shared water resources and associated services.

GEF IW in Action

Preserving the Guarani Aquifer System

The Guarani Aquifer System (GAS) is one of the largest freshwater reserves in the world, and represents the main source of freshwater for about 90 million people in the four countries that share it: Argentina, Brazil, Paraguay and Uruguay. With rapid increases in water consumption, the uncertainty posed by the impacts of climate change, and the lack of a regional framework to manage the aquifer, the countries agreed to take preventative action to protect the Guarani. To this end, the four countries approached the GEF to develop an integrated plan to protect and sustainably manage the aquifer.

Through the GEF's innovative Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP) process, implemented under the GEF-World Bank GAS project (2003-2009), the four countries determined a shared vision and formulated and adopted strategic actions to manage the aquifer long-term. In parallel, the project built aquifer conservation awareness among stakeholders and contributed to the development of national intra-ministry committees and national reforms to promote cross-sector action to preserve the GAS.

This momentum helped catalyze the completion of the Guarani Aquifer Agreement in 2010—which is the first shared-management agreement for a transboundary aquifer in Latin America, and one of the few agreements on transboundary aquifers worldwide.

The new GEF-CAF SAP Implementation Project will put in place the technical coordination frameworks and regional management tools foreseen in the SAP, which will enable the coordinated and harmonized implementation of the national-level priority actions that will ensure the long-term sustainability of this precious resource. The project will also support the countries in their compliance with the Guarani Agreement, which entered into force in November 2020.

Solutions to achieving water security are largely about balancing water needs in and across different sectors, such as food and energy production, trade and transport, manufacturing, land use, urban planning, industrial processes, and forest management.



The GEF Approach Toward Achieving Water Security

GEF International Waters (IW) focal area programming addresses a number of the planetary boundaries relating to water security, including the boundaries for global freshwater use, the nitrogen and phosphorous cycles, climate change, chemical pollution, biodiversity loss, change in land use, and ocean acidification.

The GEF is the largest funding mechanism for multi-country collaboration on water and the ocean, with 156 GEF recipient countries and 24 non-recipient countries working together to manage their transboundary water resources.

The GEF IW portfolio of projects fills a critical gap and attends to a unique demand in the global water management agenda: providing incremental cost financing to aid developing countries and countries in transition to build trust and foster transboundary cooperation in situations where there are complex and often long-lasting tensions over water use.

To this end, it seeks to create a common understanding on competing water needs on one hand, through joint fact finding, and the gains from cooperation for each country on the other, through joint analysis of cross-sectoral opportunities and trade-offs. Together, participating countries then invest in strengthening regional and national policy, legal and institutional reforms, and joint projects.

GEF IW's work is grounded in partnership. Investments facilitate integrated, cross-sectoral approaches that engage the public sector, business community, civil society, non-governmental organizations, bilateral and multilateral institutions, and other stakeholders interested in using science-based approaches to water resources management. Together with its implementing and executing partners, the GEF IW focal area has financed freshwater projects related to 60 rivers, 14 aquifers and 16 lakes around the world. These investments total US\$960 million in grant financing, while leveraging US\$5 billion in co-financing.

GEF IW projects work at multiple scales—from community to cabinet—and across entire watersheds, from source-to-sea and ridge-to-reef.

Each GEF IW project supports direct community action to address a priority transboundary concern or opportunity that has been identified by the participating countries. At the same time, GEF IW supports top-down multi-country collaboration so that vertical linkages can be developed among the three scales of focal area programming: multi-country, national sector and community.

GEF IW foundational projects support high-visibility local investments in parallel to longer-term regional processes for cooperation.

Partnering with local government counterparts, the business community and civil society organizations often will be key when conducting pilots as part of GEF IW projects. Pilots can be essential to building and maintaining momentum for regional cooperation and they are a means to test and validate a project-promoted technical tool or policy approach for establishing “proof of concept”, to strengthen national and regional confidence and encourage replication or up-scaling.

GEF IW plays an important role in unlocking private capital.

Systems change and reversal of unsustainable global trends cannot take place without the business community. The GEF engages private sector entities that vary in their industry focus, size and approach to environmental issues, from industry sectoral roundtables and groups to multinational corporations to large domestic firms and financial institutions to micro, small and medium enterprises and smallholders and individuals. While entry-points vary, GEF IW may seek business community participation to stimulate engagement along the different supply chains toward reducing impacts on transboundary water systems; to de-risk innovative investments; and to extend investment horizons to provide the foundation for durable partnerships.

GEF IW harnesses the scientific community in its global and targeted research and knowledge investments.

GEF IW investments include the development of specific management tools, from addressing and coping with floods and droughts to valuation of ecosystem services to the development of replicable good practices for nutrient reduction. The scientific community has been instrumental in providing technical expertise on a number of global water assessments, with projects such as the GEF Transboundary Waters Assessment Programme.

GEF IW strategically supports foundational capacity building and portfolio learning for ecosystem-based joint management and governance of transboundary waters.

GEF IW in Action

Strengthening Transboundary Water Management Globally Through IW:LEARN

Ensuring that GEF IW project experiences and lessons learned are shared for global replication has been the responsibility of GEF IW:LEARN for more than two decades. GEF IW:LEARN aims to serve all GEF IW stakeholders, including project managers, international and local project staff, government officials, implementing agency staff, non-governmental organizations, and others. The project also operates as a central hub for storing and sharing data and documents from past GEF IW projects—making it the focal area's sole repository for archived information.

GEF IW:LEARN has transformed into a large partnership working with a community of public and private sector organizations. Through its work, GEF IW:LEARN demonstrates commitment to strengthening the implementation of GEF IW projects focused on transboundary cooperation in shared water bodies (rivers, lakes, aquifers, and Large Marine Ecosystems). The last four phases of the project have produced a number of noteworthy results across multiple service lines. These services foster this community by coordinating information management through the GEF IW:LEARN website and its applications, and via virtual and face-to-face training events, which provide networking and idea building opportunities.



The TDA-SAP Process

International waters are complex, naturally fluctuating and politically charged.

Addressing multiple stresses across large-scale water systems and the complex history and processes of multi-country dialogue can be a long-term proposition. In many cases, it takes years for countries—supported via an initial foundational GEF project—to reach a common understanding of water and related natural assets, pressures, and opportunities and agree to work together. It can then take another GEF investment to undertake local demonstration projects and start the process of building stronger institutions and undertaking sector reforms.

The GEF's IW strategy therefore allows both for projects that facilitate building these foundations for shared understanding and for the adoption and implementation of agreed action plans. This Transboundary Diagnostic Analysis-Strategic Action Programme (TDA-SAP) consensus-building approach is a highly collaborative process that has proved to be a major strategic planning tool for GEF IW projects and is typical for GEF stepwise support.

Grounded in science, the TDA-SAP process takes an ecosystem-based management approach—shifting from siloed, single-sector thinking to entire ecosystem management, and recognizing that people, with their cultural and varied social needs, are an integral part of ecosystems.

The TDA-SAP approach also provides countries with the framework needed to direct part of their investments of GEF System for Transparent Allocation of Resources (STAR) funds to where they are most needed to balance transboundary water uses.

The TDA-SAP process is a tool for ensuring science-based transboundary water body assessment and management, and offers a sound methodology for linking science to policy.

The TDA is a mechanism to help the participating countries ‘agree on the facts’—establishing the scientific basis for which decisions and priorities are to be made.

A TDA is a scientific and technical assessment to: (1) identify and prioritize the transboundary problems; (2) gather and interpret information on the environmental impacts and socioeconomic consequences of each problem; and (3) analyze the immediate, underlying and root causes for each problem and, in particular, identify specific practices, sources, locations and human activity sectors from which environmental degradation arises or threatens to arise.

A SAP is a negotiated policy document that includes a strategic set of targeted and costed policy, legal and institutional changes that the basin countries agree to implement to jointly address the transboundary concerns identified by the TDA.

Once a TDA has been established and mutually agreed upon, it is followed by a SAP. The SAP, which is typically endorsed at the highest level of all relevant sectors of government, translates shared commitments and vision into policy actions and institutional mechanisms at the national, regional and international level for implementation of those actions.

The effective implementation of the agreed SAP often requires the countries to develop corresponding National Action Programs (NAPs), aligned with national development plans and policies and, where necessary, to transform policies and institutions to deliver the expectations of the SAP. The NAPs present a roadmap for the implementation of key legal and institutional reforms at the national level, identified within the SAP, while ensuring regional compatibility between countries.

At the core of most SAP implementations are national Inter-Ministry Committees, which ensure national-level agreement with the interventions and actions under the SAP, and coordinate corresponding activities among respective national ministries and institutions.

Full implementation of SAPs for transformational change almost without exception require interventions across the GEF focal areas.

GEF IW in Action

Enabling Transboundary Cooperation and Integrated Water Resources Management in the Extended Drin Basin

Located in the Southeastern part of the Balkan Peninsula, and shared among Albania, Greece, Kosovo, North Macedonia and Montenegro, the Drin River Basin is a complex water system of rivers, lakes, wetlands, reservoirs and groundwater used for drinking, fishing, agriculture, tourism, electricity and industry.

A GEF project, implemented by UNDP and executed by GWP-Med, in partnership with UNECE, is helping the basin countries and supporting the associated Drin CORDA process—through extensive scientific analysis, institutional capacity building, stakeholder engagement and testing of new approaches for basin management—to realize a 2011 memorandum of understanding to safeguard and restore ecosystems and their services and promote sustainable development throughout the basin.

Under the project, and based on an extensive stakeholder and technical expert consultation process, a TDA was carried out and identified five major transboundary issues: deterioration of water quality; variability of the hydrological regime; biodiversity degradation; sediment transport; and cross-cutting issues of climate variability and change. The follow-on SAP, which was formulated and negotiated involving government representatives from each country, sets out more than 100 agreed-upon policy and technical actions to address the five TDA issues. Endorsed by each riparian government in 2020, joint implementation of the SAP will provide the main reference point to inform the coordinated management of the Drin Basin for years to come—to improve water governance, preserve livelihoods, ensure food security and alleviate poverty within the region, as well as assist the basin countries in implementing water and environment-related European Union Directives.



Biodiversity and Ecosystem Services

Healthy freshwater ecosystems underpin a water-secure world. They are the foundation for the provision of ecosystem goods and services that enable human societies to thrive.

Ecosystem services are the many and varied benefits that humans obtain from biodiversity and properly functioning ecosystems. Ecosystem services include provisioning services, such as food, water, raw materials, navigation, energy and medicinal resources; regulating services for water flows, climate, erosion prevention, and maintenance of soil fertility; habitat services, such as maintenance of genetic diversity and life cycles of migratory species; and cultural services, such as recreation and tourism and spiritual experience.

Ecosystem services are central in the nexus paradigm. The agriculture sector profits from ecosystems but influences them heavily through changes in land use and water consumption and pollution. All means of energy production are linked to ecosystems, either as sources of energy (bioenergy), sinks for pollution (cooling water) or locales for structural changes to the landscape (hydropower). The water sector exploits ecosystems as sources for freshwater and as sinks for pollution from domestic and industrial use.

The contributions of ecosystem services are often difficult to quantify in monetary terms, however. Since some ecosystem services are not quantified (traded in the market), they are often given little weight (or no weight at all) in decision making (e.g., in the course of the development of infrastructure projects). Thus, final decisions may favor outcomes that do have a commercial value, making unsustainable use of ecosystems more profitable in the short term while having considerable economic long-term costs. GEF IW utilizes economic valuation, including in the TDA-SAP process, as a tool to bridge the gap between science and policymaking by communicating the importance of “wet” ecosystems in terms of their economic value to a variety of sectors.

To conserve aquatic biodiversity in freshwater systems, GEF IW invests in projects to establish minimum flows (including through source water protection); to harness the power of nature to buffer climate change and water extreme events and protect against erosion and saline intrusion (nature-based solutions); to prevent and control invasive alien species; to reduce pressures on coral reefs and other vulnerable coastal and marine ecosystems; to enhance the effectiveness of protected area systems; and to combat illegal and unregulated fishing and overfishing practices.

GEF IW in Action

Protecting Water at the Source

The world's largest cities depend on water flowing from source watersheds sometimes located hundreds of kilometers away. Rural land stewards are making decisions that affect urban water users (with higher water treatment costs and low water quantity) but have little to no incentive to reduce their impacts. Urban water users, such as municipalities, urban water managers or industries, have limited jurisdiction and cannot easily reach beyond jurisdictional borders to address changes in water flow patterns and non-point source pollution caused upstream.

To help solve this issue, the GEF has partnered with IADB, TNC and other organizations under the Latin American Water Funds Partnership (LAWFP) to contribute to water security in Latin America and the Caribbean through the creation and strengthening of Water Funds. Water Funds bring downstream users, like cities, businesses and utilities together to collectively invest in upstream habitat protection and land management to improve water quality and quantity, and generate long-term benefits for people and nature upstream. These Funds attract capital contributions from large water users, such as hydropower plants and irrigation districts, in an organized and transparent manner, and funds are invested in the financial market through trust funds. The financial returns are invested to leverage public and private funds to conserve watersheds, create or strengthen protected areas, and develop community initiatives.

The Santiago-Maipo Water Fund, supported by the GEF under the LAWFP, works in the Maipo River Basin, which, with no formal watershed governance or management structure, supplies water to more than one-third of the Chilean population. Due to climate change, a 40 percent reduction in its flow (largely due to glacial recession) is projected by 2050. The Fund is working with stakeholders to restore and conserve the upper Andean wetlands, forests and riverside vegetation through tourism regulation and better livestock management, as an alternative and sustained flow source to the city of Santiago and its 7 million inhabitants. The Fund will demonstrate how nature-based solutions can improve the quality and availability of water for people while helping preserve biodiversity, capturing and storing carbon, building more climate-resilient communities, and reducing water treatment costs.

GEF IW in Action

Supporting Community-Based Co-Management of Lake Victoria

Lake Victoria, the headwater of the White Nile, is the world's second largest lake. The lake provides domestic, industrial and agricultural water supply, waterway transportation, hydropower generation, and vast potential for tourism activities to its five riparians: Burundi, Kenya, Tanzania, Rwanda and Uganda. The lake also hosts a significant commercial fishery, employing about 800,000 fishers and fish traders and providing product exports worth more than US\$400 million annually.

Despite historical tension and fragility, the five countries have worked together since 1997 through the GEF-World Bank Lake Victoria Environmental Management Projects. In the first phase, the project supported the creation of important regional lake management mechanisms, including the Lake Victoria Fisheries Organization (to provide a regional framework to ensure that decisions on fishery management are made with reference to the wider lake environment) and the Lake Victoria Basin Commission.

The project also provided direct support for local communities around Lake Victoria to play an active role in securing their fish stocks through the establishment of over 1,000 Beach Management Units (BMUs). BMUs are community-based organizations that bring together everyone involved in fisheries at the beach level—including boat owners and crew, traders, processors, boat builders, and net repairers—to plan and manage fishing in their local area and improve the livelihoods of community members. The BMUs monitor fish stocks, protect breeding grounds, combat illegal fishing gears that catch juvenile fish, improve beach hygiene and ensure fish are of sufficient quality for the important export market.

BMUs are also vital in the fight against the invasive water hyacinth. These weeds use up the available oxygen and impair biodiversity, fish shelter, breeding and nursing grounds, inshore feeding zones; obstruct access to landing beaches, fishing grounds, and transport routes; and contaminate watering points. In 1998, water hyacinth weed was estimated to cover approximately 17,000 hectares (ha) of waters of Lake Victoria. In 2017 the extent of water hyacinth was reduced to 106 ha regionally. Although attribution at the larger scale is challenging, the projects have helped maintain water hyacinth at tolerable levels to maintain ecosystem services within the hotspot areas where the projects were most active.



Agriculture and Land Use

A source-to-sea system includes the land area that is drained by a river system, its lakes and tributaries, connected aquifers and downstream recipients, including deltas and estuaries, coastlines and near-shore waters, and the adjoining sea and continental shelf, as well as the open ocean.

Key flows in the form of water, sediment, pollutants, biota, materials and ecosystem services connect the sub-systems in the source-to-sea continuum at different scales. Such source-to-sea linkages are ingrained in the GEF IW portfolio, as surface water eventually will affect the integrity of coastal habitats, including spawning grounds, fisheries, local livelihoods of coastal populations, and ultimately the wider ocean that captures all the impacts from land-based activities.

The accelerated use of nitrogen and phosphorous are at the centre of a complex web of development benefits and environmental problems: the so-called “Nutrient Challenge”. They are key for crop production, and half of the world’s food security is dependent on nitrogen and phosphorous fertilizer use. But excess nutrients from fertilizers, fossil fuel burning, and wastewater from humans, livestock, aquaculture and industry lead to air, water, soil and marine pollution.

This excess can lead to a serious problem known as eutrophication, whereby excess nutrients stimulate high levels of plankton growth. When these plankton die, their decomposition by aerobic bacteria consumes so much oxygen in the water that major areas can experience very low oxygen conditions, or hypoxia.

The threat from nutrient pollution to coastal zones historically has been one of the priorities within the GEF IW focal area.

Land degradation is one of the world’s most pressing environmental problems and it will worsen without rapid remedial action. When land is degraded, soil carbon and nitrous oxide is released into the atmosphere, making land degradation one of the most important contributors to climate change. From a source-to-sea perspective, land use transformation and sedimentation in coastal and upland areas caused by expansion of agriculture and deforestation are important drivers of ecosystem decline in freshwater and coastal water systems. GEF IW investments to arrest and reverse desertification and deforestation include introducing innovative solutions for erosion control, land stabilization, runoff and flood control, and reduction of wasteful and damaging agricultural practices.

GEF IW in Action

Restoring the Danube and Bringing the Black Sea Back to Life

The Danube River stretches from the Black Forest in Germany to the Danube Delta in Romania, where it discharges into the Black Sea. Sparked by the “green revolution” in the 1960s, the Danube and Black Sea countries dramatically increased their application of artificially prepared fertilizers and manure to agricultural land, causing increased nutrient pollution to these waters through farm runoff. In parallel, industrialization and population growth led to significant increases in point sources of pollution through untreated wastewater and wetland destruction. The net result was a four-fold increase in the burden of nutrients reaching the Danube and Black Sea. By the 1980s, much of the northwest shelf of the Black Sea was hypoxic—a number of species and benthic ecosystems had disappeared, and the resulting economic losses from fisheries, tourism and other sectors was estimated at US\$500 million per year.

A series of GEF-financed projects in the Danube and Black Sea over 20 years (in partnership with UNDP, World Bank, ICPDR and UNIDO) delivered policy, legal and institutional reforms and capacity-building activities and catalyzed more than US\$3 billion in nutrient-reduction investments across the basin countries, which significantly reduced nutrient loads to the Black Sea.

These investments have contributed towards the elimination of the “dead” zone in the northwest shelf of the Black Sea, a marked decrease in the frequency of algal blooms, and the return of many species that had become locally extinct. Associated with these changes, there has been a significant recovery in revenues from tourism and fisheries and local livelihoods in the Black Sea region.

GEF IW in Action

Integrating Water, Land and Wastewater Management in the Caribbean SIDS

Many small island nations share similar sustainable development challenges, such as rapidly growing populations, limited resources and fragile environments. The GEF helps Small Island Developing States (SIDS) develop practical and cost-effective solutions to sustain the natural resource bases that underpin their socioeconomic development. The GEF/UNEP IWCAM project introduced and promoted the ridge-to-reef management approach in 13 Caribbean SIDS. Through local demonstration projects and regional capacity-building activities that equipped countries with tools to support policy, legislative and institutional reforms, the project helped participating countries meet commitments required to ratify the Cartagena Convention, and subsequently led to the Protocol Concerning Pollution from Land-Based Sources—which requires its parties to use integrated approaches to prevent, reduce and control marine pollution from land-based sources and activities—to enter into force.

The GEF/UNEP IWECO Project, which builds on the IWCAM project, is using targeted, innovative and climate-resilient approaches to mitigate poor biophysical conditions to address water, land and biodiversity resource management in ten participating Caribbean SIDS. National sub-project sites include the upper reaches of the Soufriere Watershed in Saint Lucia, where deteriorating economic conditions and resultant unsustainable land use and farming practices are significantly contributing to watershed erosion and increasing incidence of floods and poor water quality in the Soufriere River—which leads to the downstream tourism centre of Saint Lucia. Working in collaboration with small-scale farmers on these privately held lands, the project is demonstrating sustainable land management techniques and developing alternative livelihoods to combat erosion and flood control.



Industry and Municipal Consumption

Water is a key ingredient in nearly every industrial product.

Water is used for cleaning, rinsing and cooling in industrial processes. It is also a conduit for the transportation of waste and chemicals, such as persistent organic pollutants and mercury—which, with unsafe disposal, pose significant risks to the environment and human health. To prevent the discharge of industrial effluents into international waters from the various industry sub-sectors, such as mining, tanning and dyeing, manufacturing, and beverage production, GEF IW has implemented projects to support industrial entities in their efforts to become more competitive while reducing their ecological footprints.

The global economy today is largely based on a linear, take-waste model in which more than 60 billion tons of natural resources are extracted each year, and more than 13 billion tons of waste are disposed into landfills, incinerators and waterways. This process of mass extraction, industrial production, consumption and waste is accelerating and resulting in natural resource depletion, ecosystem degradation, GHG emissions and marine debris (including plastics).

Tackling this challenge requires a circular economy model that emphasizes public-private partnerships to catalyze a closed-loop approach to production and consumption through improved material use, product design, industrial process change, waste management, and material recovery and recycling. GEF IW has invested in projects that focus on actions that can help move global supply chains and regional and national economic development strategies from take-make-waste to redesign-reduce-reuse-repair-recycle approaches.

Most human activities that use water produce wastewater.

As the overall demand for water grows, the quantity of sewage produced and its overall pollution load are continuously increasing worldwide. In all but the most highly developed countries, the vast majority of sewage is released directly to the environment without adequate treatment, with detrimental impacts on human health, economic productivity, and the biological diversity of aquatic ecosystems and loss of ecosystem services. GEF IW programming focuses on demonstrating and improving access to appropriate wastewater management technologies; upgrading and rehabilitating wastewater treatment facilities; improving local and national capacity in support of wastewater management; and improving stakeholder awareness about environmentally acceptable and cost-effective wastewater management solutions.

GEF IW in Action

Helping Water-Intensive Small and Medium Enterprises and Industries Improve Resource Efficiency

To assist industry in responding to stakeholder demand along the value chain for more efficient use of resources and production on inputs, compliance with national environmental regulations, and adoption of international standards, UNIDO designed the Transfer of Environmentally Sound Technology (TEST) methodology—which was piloted in 2000 through a GEF project at industrial hotspots in the Danube Basin. The TEST approach applies measures for improved resource efficiency and waste minimization, as well as water recycling and water reuse, in water-intensive industrial facilities. One of TEST's contributions has been to prevent the discharge of industrial effluents into international waters.

The GEF/UNIDO MED-TEST project was designed to address pollution activities on land identified as industrial pollution hotspots (food, textile, chemical, ceramic, paper and leather industries) in one of the Mediterranean Sea SAPs. Egypt, Morocco and Tunisia hosted applications of the TEST integrated approach in 43 participating companies. Over the course of the project, the TEST approach achieved an operational cost reduction of US\$17 million per year in these companies, through water savings of 9.7 million m³ per year and annual energy savings of 263 GWh.

The TEST approach has proved an efficient tool in helping small and medium enterprises gain resource efficiency and environmental benefits within their operations, thus contributing to better compliance and an enforced competitiveness for business. It has been replicated in several industrial hotspots worldwide. In an ongoing example, through implementation of an action delineated in the Niger Basin SAP, the GEF/UNDP Niger Basin and Illumedden-Taoudeno/Tanezrouft Aquifer System project is supporting the introduction and rollout of the TEST approach to reduce wastewater discharges and pollution loads in the Niger River from industrial activities.

GEF IW in Action

Implementing Integrated Water Resources Management in Atlantic and Indian Ocean SIDS

Cabo Verde, São Tomé and Príncipe, Comoros, Seychelles, Maldives and Mauritius—SIDS located in the Atlantic and Indian Oceans (AIO)—differ profoundly in size and level of economic development but share problems relating to the scarcity and contamination of freshwater supplies; overexploitation and poor management of groundwater resources; increasing pressure on agricultural production; and rapidly disappearing biodiversity. These SIDS also face serious difficulties providing their people access to clean drinking water, sanitation services, and liquid and solid waste management facilities. In response to these challenges, the GEF/UNDP Integrated Water Resources Management (IWRM) AIO SIDS project implemented country-driven and designed demonstration activities focusing on utilizing ridge-to-reef approaches to bring real and tangible on-the-ground environmental stress reduction solutions to common water resource and sanitation services challenges in each of the beneficiary SIDS.

In the tourist destination of Tarrafal in Cabo Verde—which has limited water availability for agricultural use, coastal water quality and sanitation services for its residents—the demo project connected nearly 400 households to the main municipal sewerage system. This connection increased the volume of water inflow to the local wastewater treatment plan by more than 50 percent. Left unconnected and untreated, the wastewater would have otherwise leaked into the aquifer or directly into the marine system. These new connections to the sewerage system, for which water can be repurposed, have improved the livelihoods of the local small-scale farmers by providing a cheaper water source for irrigation, leading to more arable land.

These demonstrations acted as catalysts for replication and scaling up to improve sustainable water resources management at the national level. The demo project in Comoros, for example, provided proof of concept leading to the adoption of an IWRM Plan at the national level.



Livelihoods and Social Welfare

The incomes and livelihoods of billions of people depend on transboundary basins and aquifers. Water security is job security.

The Member States of the United Nations have explicitly acknowledged that access to clean drinking water and sanitation are fundamental to the realization of all human rights, underlining the importance of water and sanitation for a dignified life and peaceful development, especially for populations in the most vulnerable situations. Access to water for productive uses is critical to realizing livelihood opportunities, generating income and contributing to economic productivity. About half of the world's workers—approximately 1.5 billion people—work in water-related sectors.

GEF IW projects follow the approach that global environmental problems can best be addressed through actions that are designed, implemented, and owned by communities, and with benefits that accrue to them **directly**. Through demonstrations and pilots, GEF IW projects facilitate shifts in water-related sectors toward greater socioeconomic realization and ecosystem integrity, by opening up economic opportunities, correcting course on unsustainable industry practices, and reducing dependencies on income from environmentally damaging activities by promoting lower-impact livelihood activities that provide at least equivalent benefits.

As primary caretakers of households and communities, women have highly specialized and valuable knowledge for the conservation and management of natural resources. At the same time, they are often the most affected by environmental degradation and climate-related events. Every GEF project is expected to design gender-responsive approaches and incorporate gender mainstreaming. GEF projects support women's improved access, use and control of resources; enhance women's participation and role in natural resources decision-making processes, with women as agents of change at all levels; target women as specific beneficiaries; and create opportunities from sustainable livelihoods.

GEF IW projects aim to transform marginal and vulnerable sectors into active actors for sustainable development.

Engaging youth in environmental protection can not only change youth behaviors and attitudes but possibly influence parents and other relatives. A number of GEF IW projects empower youth through environmental education and awareness campaigns to enhance water security in their communities. In the GEF/UNDP Advancing IWRM in the Kura River Basin project, for example, the project built an innovative awareness-raising toolkit, the "Kura Box", to engage youth on the importance of sustaining the basin's water resources.

GEF IW in Action

Piloting Environmentally Conscious Livelihood Initiatives in the Cubango-Okavango

The Cubango-Okavango River Basin (CORB) is a transboundary basin with a network of river systems traversing Angola, Botswana and Namibia. To facilitate coordinated management of the CORB, the three riparians are advised by the Permanent Okavango River Basin Water Commission (OKACOM) on matters relating to the conservation, development and utilization of water resources. The GEF/UNDP SAP Implementation Project has significantly contributed to enhancing OKACOM's governing instruments and improving OKACOM's technical capabilities toward joint management of the CORB.

Generally, the basin is inhabited by poor rural communities who depend entirely on natural resources for livelihoods. In recognition of the importance of natural-resources-based livelihood activities and their potential to degrade the environment, the GEF project is supporting OKACOM in demonstrating environmentally conscious livelihoods and socio-economic development in the CORB—guided by the basic principles of IWRM.

The Okavango Delta is Botswana's premium tourism destination. However, the participation of local communities in the tourism value chain is limited to unskilled labour, cultural tourism and royalties to communities. Local farmers in the district contribute less than 15 percent of the total horticulture produce consumed within the Delta, with the bulk imported from elsewhere.

The GEF demo project helped address the key challenges hindering local horticulture production—high temperatures and erratic rainfall coupled with insufficient technical skill to produce high-value crops—by introducing better farming techniques and coordinated cropping schedules; facilitating coordination and collaboration among local farmers to access existing markets; and supporting farmers with climate-resilient infrastructure, enabling them to produce higher-value crops all year to sustain market demand.

GEF IW in Action

Scaling Up Community Actions for International Waters Management

The GEF Small Grants Programme (SGP), implemented by UNDP, provides grants in more than 125 countries to financially and technically support communities and civil society organizations in carrying out projects to promote community-based innovation, capacity development, livelihoods and empowerment, with special consideration for indigenous peoples, women and youth.

SGP has supported more than 1,000 regionally connected projects dedicated to the protection and sustainable management of international waters, with activities focusing on conservation and rehabilitation of coastal ecosystems; prevention and reduction of land-based pollution; freshwater resources management; fisheries, land and forest management; and capacity development, networking, knowledge sharing and learning.

Due to its nature and in line with its mandate, SGP not only contributes to actions that result in direct local environmental benefits but also promotes innovation, testing and demonstration approaches, modalities, and management processes that, through upscaling, replication and mainstreaming, will eventually lead to direct global environmental benefits. The latter aspect is particularly relevant in the international waters focal area because of the vast coverage of a waterbody in comparison to the small scope of individual community projects.

For community work to effectively address transboundary challenges and contribute to overall governance of shared international waterbodies, SGP works in close coordination with multiple actors at different levels. SGP has also established close partnerships with several GEF full-size international waters projects to support the community implementation of regional SAPs. To support these linkages, SGP develops guidance notes specific to different waterbodies, which inform SGP grantees and country teams on downscaled local actions that can contribute to SAP implementation.



Human Health and Safety

Strong economies require healthy, skilled and knowledgeable people. A lack of safe water, sanitation and hygiene not only harms economic potential; it harms people's dignity, safety, health and educational achievements. Three out of ten people do not have access to safe drinking water, and six out of ten people do not have access to safely managed sanitation services. Addressing water and human health issues (such as vector-borne diseases transmitted through improper sewage waste treatment), is inherent in all GEF IW projects. Specifically, because groundwater provides for all the daily water needs for one-third of humanity and is the only source of freshwater for all human needs in many parts of the world, GEF IW investments manage surface water and groundwater conjunctively, to increase resilience and counteract critical depletion.

About 90 percent of all natural disasters are water-related. Floods and other water extreme events account for 70 percent of all deaths related to natural disasters. Extreme events also lead to food shortages and undernutrition, and the presence of water- and vector-borne diseases. Mental health impacts associated with illness, injury, economic losses and displacement may also be substantial, although difficult to quantify. Disaster risk management is often an early entry point for cooperation among countries. GEF IW invests in advancing information exchange and early warning systems for disaster risk reduction.

At its core, Covid-19 is a result of a direct collision between natural systems and human systems. The remarkable economic growth experienced during the last half century has disrupted ecosystems through unplanned urbanization and expansion of human settlements at rates higher than population growth, through rampant deforestation and widespread land degradation. With this disruption, people can more closely interact with wildlife, with zoonosis hotbeds erupting as a consequence.

Human health stands at the centre of sustainable development. The Covid-19 pandemic has laid bare the urgent need for global action on water security.

While governments worldwide try to deal with the ongoing Covid-19 pandemic and look for solutions to get their economies back on track, work on maintaining and restoring the health of the global environment has never been more important. The water security mandate of GEF IW, combined with its global vision and reach, places the portfolio in a critical position to work with the community of nations to ensure that the pandemic evolves from a global threat to an opportunity for transformative and lasting change—to make sure human systems are in harmony with natural ones.

GEF IW in Action

Demonstrating Practical Solutions to Groundwater Supply Access in the SADC

Groundwater is a fundamental resource for social, economic and environmental sustainability in the 16 Member States of the Southern African Development Community (SADC). It is estimated that more than 70 percent of the 280 million people living in the region rely on groundwater as their primary source of water. Forty percent, however, use informal or unimproved sources of water, which are often unsafe and prone to the effects of drought.

Much of Southern Africa's groundwater is stored in 30 vast transboundary aquifers. This means that large-scale and sustained utilization of Southern Africa's groundwater requires a regional approach and a shared understanding of groundwater dynamics. To this end, the GEF-World Bank SADC Groundwater project supported the establishment of the SADC-Groundwater Management Institute (GMI) as a regional center of excellence to promote equitable and sustainable groundwater management. The GMI has since been developing strategies for every one of Southern Africa's transboundary aquifers and implementing several initiatives to address the region's groundwater challenges.

One of the 12 sub-grant small pilots is in the Chimbiya Trading Centre, Malawi, where scant rainfall aggravated by climate change has hindered community access to safe drinking water and vital water resources to sustain livelihoods. In partnership with the Government of Malawi and the Water Commission Malawi, a borehole was drilled into a deep aquifer and equipped with a motorized electric pump, and the water was reticulated to ten communal-style distribution points around the community. The borehole is estimated to produce 35,000 litres of clean and safe drinking water per day and supply the daily water needs of 15,000 Chimbiya inhabitants. The installation has also effectively freed up time for women and girls—who previously walked long distances to fetch water each morning—to pursue economic and social improvement activities.

GEF IW in Action

Demonstrating Livestock Management Practices to Reduce Major Negative Health Impacts in East Asia

The population growth and increasing wealth and urbanization taking place in East Asia are driving one of the world's fastest growing demands for animal products. The livestock sector in China, Thailand and Vietnam has responded effectively to this demand surge, mostly through the emergence of large-scale intensive pig and poultry production. Supply growth is causing significant organic and chemical pollution to enter water systems and reach the South China Sea—an international water body that harbors the world's most biologically diverse Large Marine Ecosystem—threatening habitats such as mangroves, coral reefs and seagrasses.

The GEF/World Bank/FAO Livestock Waste Management in East Asia project demonstrated technical solutions to address the problem of nutrient imbalance associated with industrial and concentrated livestock production on selected farms in the three countries. This included focus on recycling the nutrients present in pig manure for other agricultural activities, such as cropping and fish farming, as well as on reducing excess nutrients in manure through a combination of settling and storage or incorporation into biomass. The project also supported the setting up of policy and regulatory frameworks for environmentally sustainable development of livestock production in each country to encourage farmers to adopt improved manure management practices.

An analysis of treated waste discharge in farms using project-supported waste management technologies showed significant reduction in pollutants and biological waste—removing, on average, more than 85 percent of phosphorous, nitrogen and biological oxygen demand from treated waste in participating farms. The project also achieved significant reduction of health risks supported by anecdotal evidence from surveys and data from participating countries. E. coli was reduced by 90 percent in participating farms in China and Thailand. Vietnam saw a significant reduction in swine-related infections, as well as intestinal disease, surface water-caused allergy and respiratory infections.



International Waters: A Catalyst for Integration

The UN Sustainable Development Goals are integrated and indivisible.

To be truly transformative, the interlinked SDGs must be implemented in a holistic, multisectoral and multidimensional fashion. This integration enables any potential conflict within and between the Goals to be managed and mitigated.

The GEF's IW portfolio is reinforcing the urgent need for more integration across sectors to support transformational change in key economic systems that continue to erode the health of the global environment. To this end, the GEF is increasingly engaging in approaches across focal areas and cross-cutting dimensions, making innovative, catalytic and integrated investments in international waters, food security, energy, infrastructure, cities, climate change, sustainable consumption and production, biodiversity, forests, and land use, among others. The GEF is also helping to revitalize the global partnership for sustainable development and strengthen the means of implementation of the SDGs.

As one of the seventeen goals, SDG 6 focuses on ensuring access to water and sanitation and on achieving sustainable management of water. Its Target 6.5 calls for integrated water resources management at all levels, "including through transboundary cooperation as appropriate."

There is a dynamic, two-way interdependence between Goal 6 targets and every other Goal.

Making significant progress toward a water-secure world for all is crucial to realizing the 2030 Agenda for Sustainable Development. With three decades of experience, GEF IW's programmatic funding modalities, stepwise and holistic approach grounded in science, and wide network of partners and communities of practice places the focal area in a unique position to catalyze transformational change across sectors to support the vision embodied in the SDGs and provide a return to stable conditions on Earth.

GEF IW programming toward achieving water security includes taking the nexus approach to better understand the complex and dynamic interrelationships among water, energy, food and ecosystems, so that limited resources can be used and managed sustainably. This approach requires thinking about the impacts a decision in one sector can have not only on that sector but also on other sectors. Anticipating potential trade-offs and synergies, viable response options can then be designed, appraised and prioritized across different sectors. In this sense, GEF IW support aims to change the vicious cycle of increasing competing demands to a virtuous cycle of dialogue, trust and cooperative development, leaving all countries with greater benefits than they would accrue by pursuing unilateral action.

The nexus approach is about balancing different resource user goals and interests—while maintaining the integrity of ecosystems.

Every transboundary river basin and aquifer presents specific management-related challenges. Flooding and sedimentation, water scarcity and pollution, unsustainable land use and agricultural practices, impacts from infrastructure, inefficient use of resources, and degradation of ecosystems and their services are just some of the water-related issues that cross borders and sectors.

GEF IW projects demonstrate that enhancing water security in freshwater basins requires working across administrative, political and sectoral boundaries.

GEF IW works across sectors to enhance water security in shared freshwater ecosystems



GEF IW in Action

Developing a Truly Integrated Nexus Approach to Support the Sustainable Management of Water, Energy and Land

Managing severely constrained resources without exceeding tipping points will require better understanding of the drivers of change that lead to demands for goods and services that generate environmental pressures, and the impacts of these various drivers on environmental and social systems. This requires a new approach to identifying scientific-evidence-based policy options and long-term inter-sectoral pathways that will inform decision making in an increasingly complex and rapidly changing world.

The GEF/IIASA/UNIDO Integrated Solutions for Water, Energy and Land (ISWEL) project has developed an integrated nexus assessment framework suitable for rigorous analysis of potential interactions, synergies and trade-offs between water, energy and land resources under different future climate and development scenarios in transboundary basins. The project also constructed a Global Hotspots Explorer tool, where users can explore how multi-sector risk changes with global temperature rise and to what extent socioeconomic development and poverty reduction can reduce risks. Likewise, it allows the user to explore the exposure of global and vulnerable populations to overlapping multi-sectoral hotspots across scenarios.

Using the set of transferrable nexus tools developed under the project, strategic advice was provided to regional institutions and country-based stakeholders in the Zambezi and Indus basins on nexus interactions, infrastructure investments and opportunities for transboundary cooperation.

-  Biodiversity and Ecosystem Services
-  Agriculture and Land Use
-  Industry and Municipal Consumption
-  Livelihoods and Social Welfare
-  Human Health and Safety



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IW:LEARN is the Global Environment Facility's (GEF) International Waters Learning Exchange and Resource Network. The IW:LEARN project was established to strengthen transboundary water management around the globe by collecting and sharing best practices, lessons learned, and innovative solutions to common problems across the GEF International Waters portfolio. It promotes learning among project managers, country officials, implementing agencies, and other partners.



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