



GLOBAL ENVIRONMENT FACILITY  
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Contributing to **GLOBAL  
SECURITY**

GEF Action on Water, Environment and Sustainable Livelihoods







*Plastic waste harming mangroves at the Indonesian Coast*

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An aerial photograph of the Dubrovnik archipelago in Croatia. The image shows several small, dark, rocky islands in the deep blue Adriatic Sea. The sky is filled with large, white, fluffy clouds. In the foreground, a large, rounded island is prominent, with a smaller, more elongated island just below it. The water transitions from a deep blue to a lighter turquoise near the shorelines of the islands.

# Foreword





**Monique Barbut**  
CEO and Chairperson  
Global Environment Facility

Water is the lifeblood of our planet; it is indispensable for life and critical for economic development. Yet the way we currently use water resources lies at the very heart of growing conflicts over our food, our energy supplies and protecting our livelihoods.

We are living in a period of rapid global change that is creating even more stress on water resources. Global economic policies, together with an increasing population, and frequent droughts and floods caused by the warming of our planet are all making the situation even worse. But, as we hear more and more about the growing global water crisis, it is all too easy to be baffled by its complexity. And, because the actions we must take are both expensive and politically challenging, delays in addressing water issues have now become the norm in most countries.

Today about 1 billion people lack access to safe drinking water, a similar number are undernourished and 2.6 billion people lack access to adequate sanitation. If we do not reform our wasteful use of water for growing food, 50% of global grain production will be at risk within a generation leading to massive political instability and conflict.

If we continue with a business-as-usual approach, in less than 20 years we will have 40% less freshwater than we need to ensure basic water, food and energy security for our communities. We can no longer stick our heads in the sand and simply hope that next year will bring timely rains rather than droughts or floods. We know that it is possible to achieve long-term water, food and energy security on our planet, but urgent action is needed now.

While some say that water will become the currency of the future we at the GEF believe this future is already upon us. For this reason, action must be taken in all sectors to incorporate water resource sustainability into policies and investments.

*We know that it is possible to achieve long-term water, food and energy security on our planet, but urgent action is needed now.*

Most of the water on our planet is transboundary in nature and the GEF has already played a catalytic role in helping 149 recipient countries work collectively on their shared water systems by leveraging \$1.3 billion in GEF grants with \$7.1 billion on co-financing. The GEF International Waters area has helped countries work together to secure a wide range of economic, political, and environmental benefits from shared surface water, groundwater, and marine systems.

But the GEF action on water does not stop there. Together with its many partner agencies the GEF is also helping to integrate sustainable water solutions into other areas such as sustainable land management, biodiversity, chemicals management, the energy sector, and climate change adaptation. These GEF operations also address the water crisis by integrating water considerations into other sectors. These projects have shown countries a path to achieve greater water use efficiencies and a more balanced approach to competing water uses.

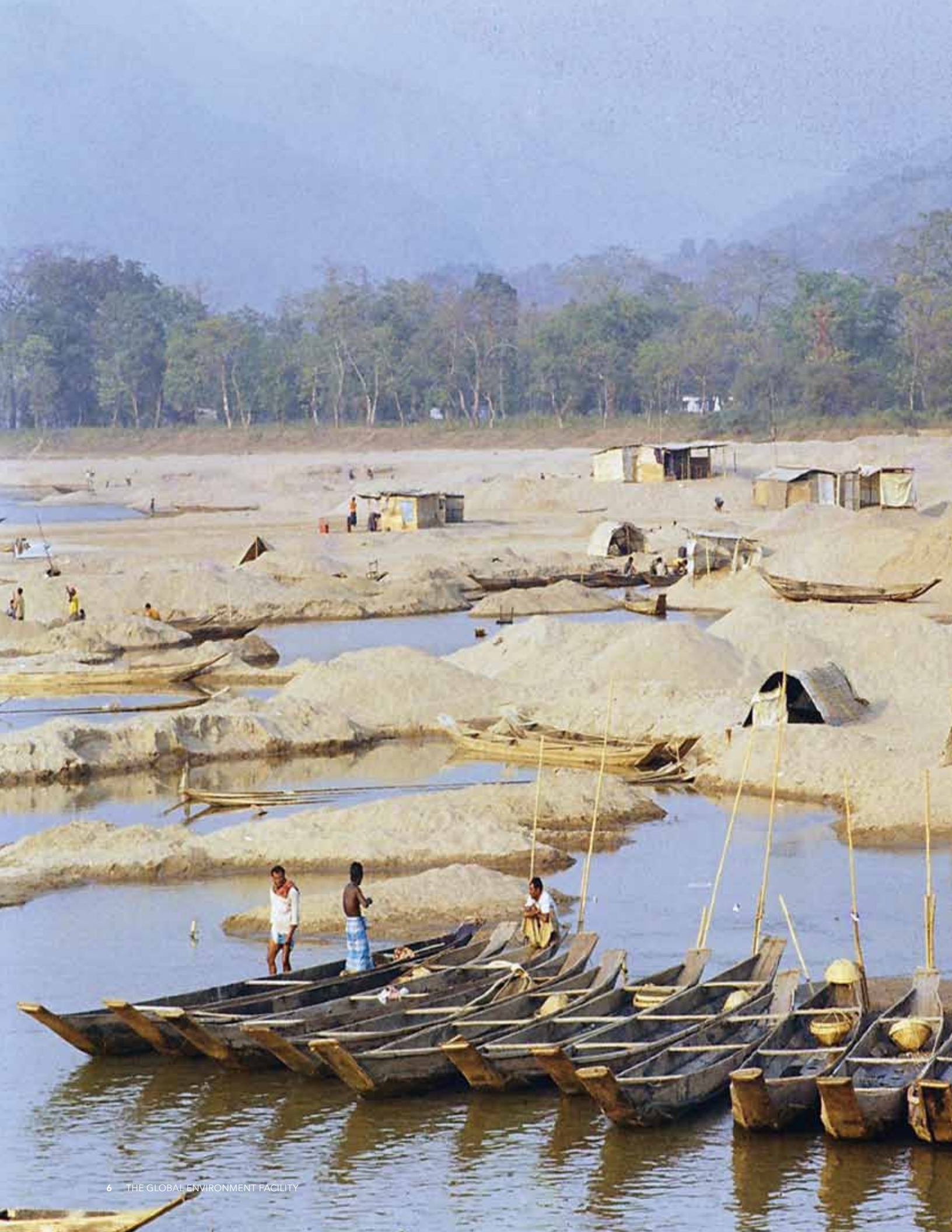
The GEF plays a unique role in leading the new imperative on securing the multiple benefits that are centred on water. The GEF is now poised to deliver more integrated approaches in multiple focal areas related to land management, agriculture, chemicals, and energy to complement our traditional work on transboundary waters.

Through GEF assistance, governments have made progress over the last 20 years to integrate water resources issues into the work of other sector ministries. We stand ready to support countries that are willing to scale-up their successful pilot experiences related to water and land resources before it is too late.













# The GEF's Contribution to Global Security

In recent decades, our planet's freshwater sources have been rapidly degraded by a range of global pressures such as population growth, food shortages and a changing climate. To give just one example, wasteful crop irrigation in basins and aquifers creates water degradation and depletion which impoverishes downstream communities.

The world's rivers, lakes, and groundwater systems do not respect political borders and competing uses of water for drinking, irrigation and bulk supply. Together with the pollution of common water bodies, are increasing cross border tensions are increasing. If large water systems continue to be managed in a unilateral and fragmented way the food supply and livelihoods of billions of people will be endangered.

Because of their transboundary nature these multi-country water bodies represent international public goods by providing national water and food security, regional conflict mitigation, and the protection of important international ecosystems. Collective, multi-country cooperation toward a shared vision of action is necessary to sustain the many benefits that these complex water systems generate.

In 1991 the Global Environment Facility (GEF) was created as a pilot grant facility, becoming the largest financial institution with the mandate, ability, and experience to address current and future challenges found in shared freshwater systems. The GEF International Waters focal area was established to help countries work together to resolve growing tensions over large water systems. The International Waters focal area helps countries collectively manage and share the benefits from their transboundary surface water and groundwater basins.

In its first two decades, the GEF has supported over 250 projects in International Waters with ten partner agencies<sup>1</sup>. These projects have helped 149 GEF recipient countries and 24 non-GEF recipient countries build the trust and confidence to work together on their shared freshwater and marine systems.

For countries seeking to make commitments on joint action for shared water systems, the GEF helps fund regional collaboration as well as agreed incremental costs of national sector reform and investments to address the transboundary concerns and opportunities they have identified. An integral part of the GEF's approach is also to support local demonstration projects to clearly show how communities can balance the competing uses of their water systems.

These actions improve the food, water, and health security of communities, while sustaining goods and services from the water and related land environment. They also promote regional integration, economic development, and stability among cooperating states.

This booklet highlights some of the key results from two decades of the GEF's work to enable countries to collaborate on the management of the world's transboundary freshwater basins and aquifers. The featured case studies show how the GEF's support for innovative approaches has enabled participating countries to cooperate across different sectors and national borders to balance the competing uses of water resources. Indeed, with the GEF's support, many of these countries have seen that the benefits of collaboration can be far greater than those from unilateral action and that local food and energy security conflicts can be resolved.

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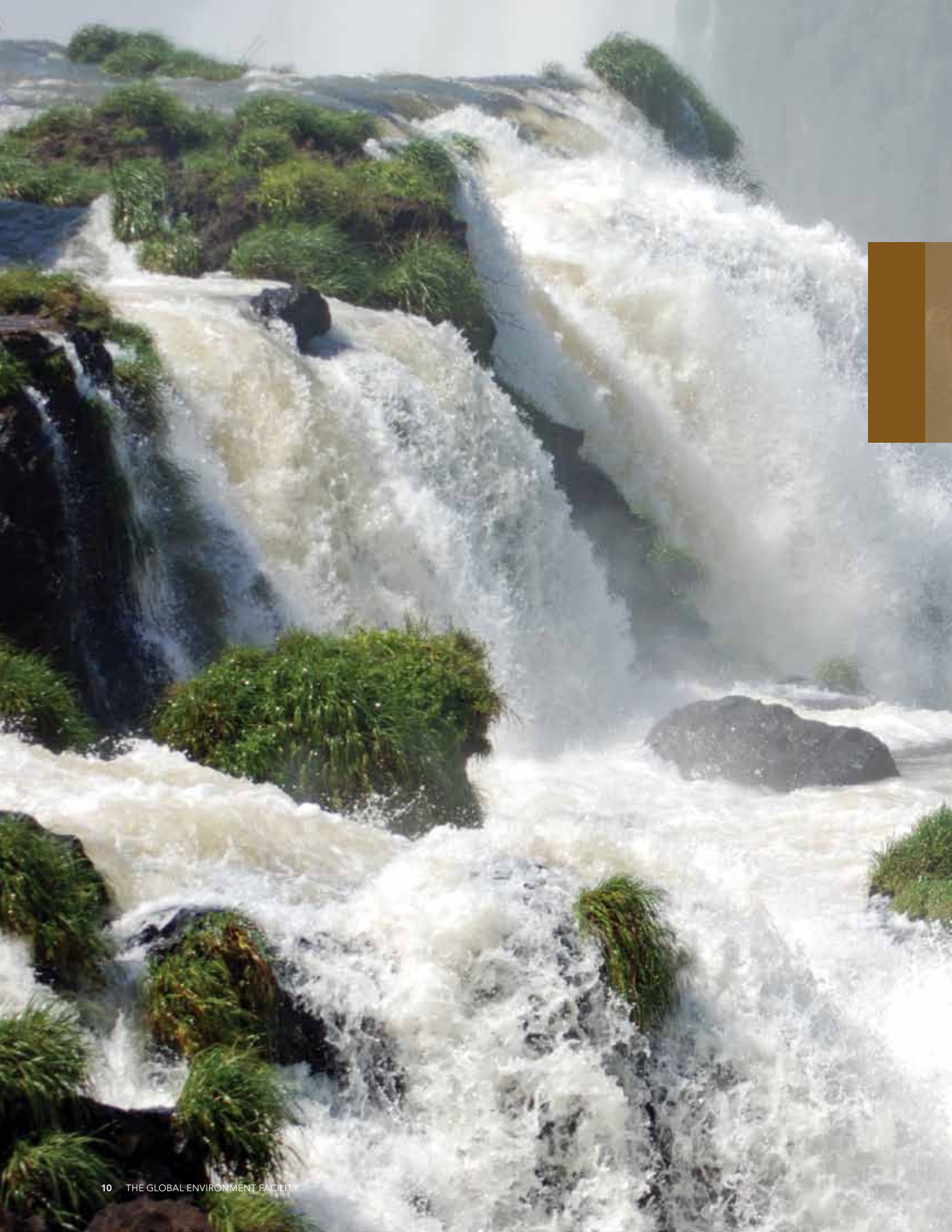
1 The UN Development Program; The UN Environment Program; The World Bank; The UN Food and Agriculture Organization; The UN Industrial Development Organization; The African Development Bank; The Asian Development Bank; The European Bank for Reconstruction and Development; The Inter-American Development Bank; and The International Fund for Agricultural Development
















# Contributing to Regional Security and Stability in Transboundary Lake and River Basins



The incomes and livelihoods of billions of people depend on transboundary lake and river basins. These shared water systems hold the potential to be either a source of conflict or a catalyst for regional cooperation, socioeconomic development, security and peace. In its International Waters focal area, GEF assistance has contributed to improvements in regional stability, improved security, and the creation of cooperative management institutions amongst countries previously competing over shared rivers and basins or fragile states emerging from regional conflict.



## The Danube River Basin: Enhancing regional security and post conflict reconstruction

In supporting the recovery of Danube and Black Sea, the GEF has played a central role in the one of the most

remarkable success stories in water quality improvement and regional cooperation the world has ever witnessed. The Danube represents only one case among many in which GEF's timely assistance has helped to contribute to regional stability and a cooperative management framework to a river basin shared by countries experiencing post-conflict reconstruction.

Growing levels of nutrient and organic pollution from agriculture fertilizer, livestock waste, and human sewage discharged to the Danube basin reached a peak in 1990 when about 40,000 km<sup>2</sup> of the Black Sea was considered "dead", where a lack of dissolved oxygen resulted in a massive loss of aquatic life.

Starting in 1991, the UNDP/GEF Danube Basin Environment Management Program helped Danube countries generate \$3.5 billion worth of investments to improve agricultural practices, municipal wastewater treatment and the management of important wetland areas. Thanks to this program, the Black Sea dead zone has been virtually eliminated, nitrogen emissions have fallen by 20%, phosphorus by 50%, and the number of species has almost doubled from 1980 levels.

Where there was once distrust and conflict, the GEF has enabled Danube countries to use their river basin as a platform for increased regional cooperation and the sustainable management of shared water resources.

Katherina Reiche, Parliamentary State Secretary for Germany's Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, believes the support provided by the GEF played a significant role in strengthening both the environment and the political stability of the entire Danube region.

"Building on the political momentum of the fall of the Iron Curtain, the GEF Danube Regional Project played a catalytic role in helping the countries to make full use of policy, legal and institutional reforms and to increase their capacities for the protection and sustainable use of shared water resources.

"In the field of water management, the GEF project and its cooperation with the ICPDR (International Commission for the Protection of the Danube River) paved the way for the EU accession of the Danube countries," she says.

The GEF's work to develop institutional capacity and harmonize EU laws continued even as two wars were being fought between countries from the former Yugoslavia. During this conflict, the GEF's work to foster greater technical cooperation also helped to facilitate

increased political dialogue among the Balkan countries.

The Danube River Protection Convention was jointly signed and ratified by Danube countries and the EU in 1994 and the ICPDR was established as its main implementing body in 1998. State Secretary Reiche says the GEF helped the ICPDR to implement the EU's Water Framework Directive (WFD) and develop a truly integrated approach to the management of the river basin and its resources.

"The GEF project — working in close cooperation with the ICPDR — enabled monitoring and assessment of data, generated cross-sector dialogue, changed habits, induced investments, promoted public participation and stakeholder involvement and created ownership by people and governments. The most important aspect may be that all these activities not only turned the Danube into a classic example of Integrated River Basin Management, but also reinforced the political stability of the whole Danube region." she says.

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*Katherina Reiche, Parliamentary State Secretary for Germany's Federal Ministry for the Environment, Nature Conservation and Nuclear Safety*

In order to build effective Integrated Water Resource Management (IWRM) throughout the Danube river basin, the GEF realised it would also need to support countries to encourage far greater public involvement in the environmental decision-making process. In many of the former communist countries along the lower Danube, public participation in environmental decision-making had been virtually non-existent before 1990. The GEF was one of the first organisations to help





*Children fetching water from an open pond at Lake Victoria*

government officials and NGOs find practical ways to build greater access to information required by the EU and the Aarhus Convention.

In 1999, the GEF helped to establish the Danube Environmental Forum (DEF) as a platform for NGOs to develop a shared approach to the environmental protection of the Danube river. The DEF now provides 174 member organisations from 13 Danube countries with an opportunity to directly influence the work of the ICPDR. GEF's Small Grants Program also provided funding for NGOs to work together on a range of cross border projects. For example, one grant helped to support combined efforts by NGOs from Croatia, Bosnia & Herzegovina, Slovenia, and Serbia to protect the Sava river basin.

After 15 years of GEF support, the Danube countries now benefit from a strong Danube Commission, solid environmental regulation and growing levels of national investment into the cross-sector management of their water resources. The GEF experience demonstrates how the needs of fragile states of in post-conflict reconstruction can greatly benefit through increased collaboration on shared water resources with more stable neighbours.

The Danube river basin is now widely viewed as a successful model of IWRM that can be applied to other transboundary

water systems around the world. In 2005, the European Union highlighted the Danube program as a model for transboundary water governance in its report to the United Nations Commission on Sustainable Development. And in 2007, the ICPDR was awarded the International Theiss River Prize for excellence in the management, preservation, and restoration of the Danube river basin.

## Reducing the Potential for Conflict in the Lake Victoria Basin

In recent years, the ecosystem of the Lake Victoria basin has been put under considerable threat from a variety of sources including: unsustainable fishing practices; untreated sewage discharge the clearing of shoreline wetlands; over abstraction of water; land degradation; and the introduction of invasive weeds and fish species.

The cumulative impact of these threats is the severe deterioration of the Lake Victoria basin ecosystem, and the millions of livelihoods that depend on its large export fishery. In the face of such pressures, Lake Victoria could become the catalyst for regional insecurity caused by competition and conflict over the use of dwindling shared natural resources.

To make matters worse, civil war in Rwanda and Burundi casted a shadow over the upper basin during the early 1990s. This is just the type of situation where the GEF's focus on collaborative transboundary water resource management can provide most benefit. Prior to 1995, the three main riparian countries (Kenya, Tanzania and Uganda) had been unable to find an effective way to work together to manage the lake and its resources. There was very limited information about the entire lake ecosystem and there was no agreement on what the countries needed to do to protect it.

The GEF's work to foster collective action at community, national and regional levels has helped the countries around Lake Victoria take important steps towards the effective transboundary management of the lake while building more stable relations and lessening the likelihood of conflict. As a result of the GEF's long-term commitment, other international partners such as the World Bank and the Swedish International Development Co-operation Agency (SIDA) are now supporting the region to maximise the benefits of this collaboration.

In its first project, the GEF supported the creation of important regional management mechanisms. For example The Lake Victoria Fisheries Organization (LVFO) was established by treaty to provide a regional framework to ensure that decisions on fishery management are made with reference to the wider lake environment.

The GEF also supported a co-ordinated, region-wide data collection effort to fully understand what was causing the degradation of the lake. This developed the confidence and shared understanding required for the countries to commit to working collaboratively to manage the lake. In turn, this trust led to the signing and ratification of a Protocol on Sustainable Development of the Lake Victoria basin by the riparian states laying down the principle that "partner states shall utilize water resources of the basin in their respective territories in an equitable and reasonable manner".

Experience from the Lake Victoria Fisheries Organization contributed to the establishment of the Lake Victoria Basin Commission under the new Protocol. According to the Hon. Maria Mutagamba, the Ugandan Minister for Environment, this permanent regional institution of the East African Community now provides "a cooperative management framework for the collaborating countries and institutions to sustainably manage Lake Victoria and its respective catchment".

Originally the Lake Victoria Basin Commission involved the three main riparian countries but the GEF project

identified that the involvement of the upstream countries of Rwanda and Burundi was needed to ensure the successful environmental management of the lake. Now that the Commission has been expanded to include all five countries, they can collaborate more effectively to address problems such as the water hyacinth infestation that flows down the Kagera River from these upstream countries.

A regional Transboundary Diagnostic Analysis (TDA) has been vital in gaining agreement between the five countries on how to address the priority environmental issues facing the lake. This has resulted in a Strategic Action Programme (SAP) for the lake basin that has been approved at ministerial level by all five countries and endorsed by the East African Community.

The GEF also supports a Regional Policy Steering Committee which brings together the ten permanent secretaries from the five countries to discuss the co-ordinated management of national resources and the harmonization of policies, legislation and regulatory standards. Minister Mutagamba believes GEF's work in this area has "provided the necessary ingredients for the revision of the water policy and legislation to reflect the required transboundary dimension, emphasizing co-operative arrangements".

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*Irrigation channels in Croatia*

## The Orange-Senqu River Basin: Balancing Competing Water Uses

The Orange-Senqu river basin, with its many Ramsar-designated wetlands, is the largest river basin in southern Africa. With a catchment of over one million km<sup>2</sup>, approximately 60% of the basin lies within South Africa, with the remainder in Lesotho, Botswana and Namibia.

The basin is home to approximately 19 million people who depend on the river system for their industrial production, agriculture and economic growth. The river supplies more than 80% of South Africa's electricity requirements — approximately 50% of all the electricity generated in Africa — and it is estimated that activity within the basin generates 50% of South Africa's GDP.

Unfortunately, the natural flow of the river has been reduced by half due to large dams and extensive water utilization for urban, industrial and agricultural purposes. As increasing demands outstrip the rivers' resources, the impacts of climate change and pollution are compounding supply problems. As a result, important coastal wetlands are being negatively impacted by serious water shortages.

In 2004 a UNDP/GEF International Waters project was requested by basin countries to address these problems.

The GEF project enabled countries to take a joint basin-wide approach to protecting their shared water resources. With this support the Orange-Senqu River Commission (ORASECOM) is now developing an Integrated Water Resources Management Plan for the basin that includes a TDA and a SAP.

In Lesotho the project has enabled communities to rehabilitate 0.28 km<sup>2</sup> of mountain rangeland, clearing bush encroachment and invasive plants, reseeding grasses, and constructing stonewalls to combat erosion. In Botswana, communities have established dune stabilization works, rainwater harvesting, and initiated efforts to eradicate invasive species. A water use efficiency pilot in Namibia and South Africa has also led to best management practices for irrigation that utilize metering, scheduling, tariffs and water trading. As ORASECOM's success spreads across the basin, it is hoped that a multitude of users, from small communities to large infrastructure providers, will benefit from these sustainable approaches.

The on-going project continues to address key priority transboundary problems and is supporting the establishment of a wider Orange-Senqu Water Resources and Environmental Program (OSWREP), and developing guidelines for water allocation and climate change scenarios to be applied in water resource planning to look ahead at a water short future that must be addressed now before conflicts over water use escalate.

## The Senegal River Basin: International Harmonization of Water Legislation

Spread over the countries of Guinea, Mali, Senegal and Mauritania, the Senegal river basin in West Africa includes a combined population of over 3.5 million people.

The upper basin has largely remained an area of subsistence agriculture. In the valley and the delta, traditional production systems, such as flood-recession cropping, exist side by side with modern irrigation practices using water pumped from the river. Current threats to the river's ecology stem from existing and proposed irrigation and hydropower developments. The construction of dams has helped to make the ecosystem more uniform, providing an attractive habitat for aquatic weeds and diseases.

The call for integrated approaches to managing of the Senegal river basin date back to the early 1970s when Mali, Mauritania, and Senegal agreed to create the river basin organization, L'Organisation pour la Mise en Valeur du Fleuve Sénégal (OMVS).

Despite the formation of this organization, conflicts over water uses persisted and Guinea, the country that provides most of the basin water, was still not part of the agreement.

A \$7.25 million GEF-funded project has been jointly implemented by UNDP, the World Bank, and the OMVS. The project provides a participatory and strategic environmental framework to enable the environmentally sustainable development of the basin and to launch a basin-wide cooperative program for transboundary land and water management.

The project has had many successes at the institutional level. These include the OMVS and Government of Guinea harmonizing their water legislation in accordance with the existing legislation in the other participating countries. With the ratification of OMVS's Water Charter by the Guinean Parliament, the project has helped to accelerate Guinea's full integration into OMVS – a crucial factor for alignment of the national legislation and for better land and water resources management across the basin.

*Floods in the Senegal River Basin*















# Strengthening Food Security

In order to provide food security for a growing global population, more and more water is being used to irrigate crops. Irrigation and food production already use almost 80% of total water resources. In China alone, irrigated areas have increased by 160% to 580,000 km<sup>2</sup> in the last 30 years. Floods and droughts caused by climate change are combining with bad farming and planning practices to create disastrous situations for many communities.

The GEF International Waters area has invested almost \$400 million in grants, and leveraged an additional \$2.7 billion, in 75 food security-related water projects around the globe, enabling greater collaboration to help communities to sustainably balance the competing uses of water resources. A wide range of GEF projects have already demonstrated the benefits of fostering collaboration among national ministries, enabling the participation of local communities, and harnessing innovative technology to reduce wasteful and damaging agricultural practices.

## The Hai River Basin: New Irrigation Technology Strengthens Food Security

A successful GEF/World Bank International Waters project in the Hai River basin on the North China Plain could represent a solution for the growing water problems caused by over-irrigation in many places around the world.

The Hai basin is home to 134 million people. Before the GEF project, wasteful irrigation in the basin had resulted in serious environmental degradation, putting the region's food security at risk. Groundwater was being extracted at a rate far beyond rechargeable quantities with water tables falling by 3 meters every year. Rapid industrial growth had also created a serious pollution problem with contaminated water flowing from the Hai River to the Bohai and Yellow seas.

To address this concern, the country requested a project in which the GEF brought together the Ministry of Water Resources and Ministry of Environment Protection to work on integrated water management at the local level for the very first time.

The project was the first large scale initiative in the world to combine remote sensing satellite technology and a new water allocation system with economic incentives together with the involvement of hundreds of local farmer-led associations, to ensure participation and compliance. The method, known as ET (evapotranspiration) Management, produced real water savings without crop loss and generated substantial gains in farm income.

New criteria for water allocation were developed including the amount of water consumed and the amount to be returned to the local water system (with the water quality stipulated). The key to this approach was using satellite technology to measure evapotranspiration (the sum of water lost through evaporation and plant transpiration) and therefore the actual water consumed in different irrigated areas.

This enabled a water usage quota to be set for each farmer-led water user association. The association in turn distributed the quotas to 360,000 farmers along with a pre-paid pump card for accessing water. Once a farmer used up their allocation, the pump was shut down.

As a direct result of this new approach farmers changed their agronomic practices. Mulches and plastic were used to reduce evaporation from the soil, irrigation technology was adapted to drip systems, and cropping patterns changed from lower to higher value crops. The changes supported by the GEF project led to 40% reductions in water use and up to five-fold increases in farm incomes.

As well as improving food security and farmers' livelihoods, the project has also delivered excellent environmental outcomes. The 16 pilot counties have saved over 266 million m<sup>3</sup> of water. Pollution loading into the Bohai Sea has also been reduced by 38,615 tons/year for Chemical Oxygen Demand and 4,665 tons/year for ammonia-nitrogen.

*The changes supported by the GEF project led to 40% reductions in water use and up to five-fold increases in farm incomes.*

As the Government of China prepares a package of financing to scale up the results of the project in the Hai basin, these GEF-supported measures and technologies also need to be applied globally to produce real water savings so that food, water, and environmental security needs can be balanced.

## Lake Victoria: Supporting Community Based Co-Management of Fisheries

Fish from Lake Victoria make a significant contribution both to regional food security, feeding 22 million people and providing critical support for livelihoods through an export fishery worth at least \$400 million each year. As well as fostering collaboration at a regional and national level, the GEF has also provided direct support for local communities around Lake Victoria to play an active role in securing their fish stocks (a main source of protein) through the establishment of over 1,000 Beach Management Units (BMUs).

BMUs are community-based organizations that bring together everyone involved in fisheries at a beach level – including boat owners, boat crew, traders, processors, boat builders and repairers, net repairers and others – to plan and manage fishing in their local area and work with government and other stakeholders in managing fisheries resources to improve the livelihoods of the community members.

This co-management approach has accrued a number of benefits for food security. 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. As Mr. Dick Nyeko, the Executive Secretary of the Lake Victoria Fisheries Organisation explains “we





*Fishermen at the shores of Lake Victoria*

can now demonstrate to the authorities in Europe that small scale fishermen can comply fully with the standards of international markets.”

BMUs were also vital in the fight against the invasive water hyacinth (*Eichhornia crassipes*) which threatens lakeshore communities. In addition to fouling nets, clogging up motors and obstructing landings, the weed also uses up the available oxygen and destroys breeding grounds for fish.

The GEF’s Lake Victoria Environmental Management Project succeeded in clearing the water hyacinth more cost-effectively than mechanical harvesters or aquatic herbicides by harnessing two natural enemies of the water hyacinth - the weed weevils *Neochetina bruchi* and *Neochetina eichhorniae*.

The network of BMUs was used to help local people establish 15 weevil rearing units and conduct highly co-ordinated field releases which introduced 502 million weevils into the lake.

As a result of these efforts between 1997 and 2005, the water hyacinth infestation was reduced by 85 % and at only one hundredth of the cost of mechanical removal, restoring the livelihoods of the affected communities.

According to Mr. Nyeko, BMUs are also a great example of the catalytic impact of the GEF’s involvement and support.

“Because they have been effective at delivering community based, collaborative fisheries management in Lake Victoria, BMUs have been given legal status in all





*Polluting the White Nile with a car wash*

the partner states of the East African Community and mainstreamed by ministers into national fishery policies. So now we don't just have BMUs in Lake Victoria, they have been established on the Indian Ocean coast and other on lakes such as Tanganyika, Nyasa, Turkana and Nakuru. In Lake Albert, the Ugandan BMUs have been copied by fishing communities in neighbouring DR Congo. So The GEF's legacy is all over the territories of East Africa, and beyond!"

*"The GEF's legacy is all over the territories of East Africa, and beyond!"*

*Mr. Dick Nyeko, the Executive Secretary of the Lake Victoria Fisheries Organisation*

## Lake Manzala: Improving Livelihoods through Improving Water Quality

Lake Manzala in Egypt is a long, shallow lake on the northeastern edge of the Nile delta between the two port cities of Dormietta and Port Said. Much of the heavily polluted drain water crossing the delta enters large coastal lakes, such as Lake Manzala, before flowing into the Mediterranean Sea. Contaminated water and tainted fish stocks in the lake represent huge risks the ecosystem and the region's food security.

In a GEF supported project, 0.24 km<sup>2</sup> of constructed wetland were established. These constructed wetlands imitate the role of natural wetlands by working as a bio-filter to remove nutrients, heavy metals and toxins from wastewater; treating up to 50,000 m<sup>3</sup> of water per day, removing 90% of traditional pollutants and 75% of toxins. The cleaner water is then used in ponds where local fishermen can farm fish that are fit for human consumption and that can also be used to restock the lake. The benefits are summed up by Project Director Dr. Diaa el-Quosy.





"This technology costs only 10% of other technologies, it is environmentally friendly as no chemicals are used and the maintenance of this technology is very simple. The community knows about this new technology, by breeding fish we are creating a stock that can be used to produce more fish," he says.

*"By breeding fish we are creating a stock that can be used to produce more fish"*

Lake Manzala Project Director, Dr. Diaa el-Quosy.



The Nile Delta seen from space







# Securing the Future of Shared Groundwater Resources through Transboundary Legal Frameworks

More than 97% of the Earth's readily accessible freshwater supplies come from underground aquifers. These aquifers are a critical resource in dealing with the impacts of climate change. However, many are coming under pressure from contamination and overpumping. The GEF is receiving increasing requests for assistance as more and more countries realize the future economic value of these aquifers, particularly during periods of drought.

Despite the fact that almost 300 transboundary aquifers already provide water to millions of people, there are only a handful of international agreements in place to help guide the shared management of these important resources.

The GEF has demonstrated success in fostering multi-state cooperation and building regional capacity for sustainably managing shared groundwater resources. Its support has been vital in helping both to reduce the potential for future conflict over access to water and to secure the supply of freshwater for generations to come.

## The Guaraní Agreement: An Historic Precedent for Managing Shared Groundwater Resources

The Guaraní aquifer is the largest freshwater aquifer in South America, supplying drinking water to over 15 million people in Argentina, Brazil, Paraguay and Uruguay.

Prior to the GEF's involvement, there was no regional framework to support the management of the aquifer, increasing the risk of sensitive recharge areas being contaminated by agricultural chemicals and making it harder to resolve escalating tensions over pumping in border areas.

With rapid increases in water consumption and the uncertainty posed by the impacts of climate change, the countries agreed to work with the GEF to discuss the joint management of this important shared resource.

The GEF's support resulted in the historic Guaraní Agreement, which is the first joint aquifer management agreement that is consistent with the 2010 United Nations Resolution on the Law of Transboundary Aquifers. It also provides a precedent for other countries on how to work together to improve the management of shared groundwater resources.

Central to the process was the GEF's support for local pilot projects which provided opportunities for participating countries to find pragmatic solutions to specific problems they had identified. One project looked at the shared geothermal tourism areas between Uruguay and Argentina and identified where new sites could be developed without jeopardising the aquifer — thus securing the economic benefits of tourism and improving the relationship between the countries.

Mr. Jorge Rucks, the Director of Uruguay's Environment Ministry, believes that the main outcome from GEF's support has been the increased confidence and trust in the region.

"If the Guaraní Project didn't exist, these discussions would be impossible. I think it was a key factor in developing the understanding between the four countries of the need for more sustainable management of the aquifer," he says.

As a result of the Guaraní Agreement, national and regional institutions have mainstreamed the conservation and protection of the groundwater supply into their activities. Furthermore, the process that helped the countries collaborate to manage the Guaraní is now enabling on-going cooperation to resolve the numerous water conflicts in the shared La Plata river basin.

*"If the Guaraní Project didn't exist, these discussions would be impossible. I think it was a key factor in developing the understanding between the four countries of the need for more sustainable management of the aquifer."*

*Mr. Jorge Rucks, the Director of Uruguay's  
Environment Ministry*

## The North West Sahara: International Collaboration to Reduce the Potential for Conflict

The North West Sahara Aquifer System (NWSAS) is shared by Algeria, Tunisia and Libya and covers an area of over one million km<sup>2</sup>. There is increasing demand on the aquifer's water resources from a rapidly growing population and the associated need to irrigate crops. The last two decades have seen a four-fold increase in pumping of water from the aquifer to the point that the water table is now falling. This has led to increasing water costs, the loss of artesian wells and salinization.

In order to address these threats, the three countries approached the GEF for support to develop the UNEP/UNESCO/GEF Protection of the North West Sahara Aquifer System and Related Humid Zones and Ecosystems





*Ground water pump in the Guarani Aquifer region.*

Project. The project enabled the countries to develop hydrogeological models of the aquifer, establish monitoring systems and identify the priority issues that they needed to address.

Crucially, the project also developed an international agreement among the respective Ministers of Water for a Tripartite Mechanism of Joint Action. This commitment provided a firm foundation for cooperation among the three countries to address the transboundary risks affecting the NWSAS.

## The Nubian Sandstone Aquifer: Planning Co-ordinated Strategic Action

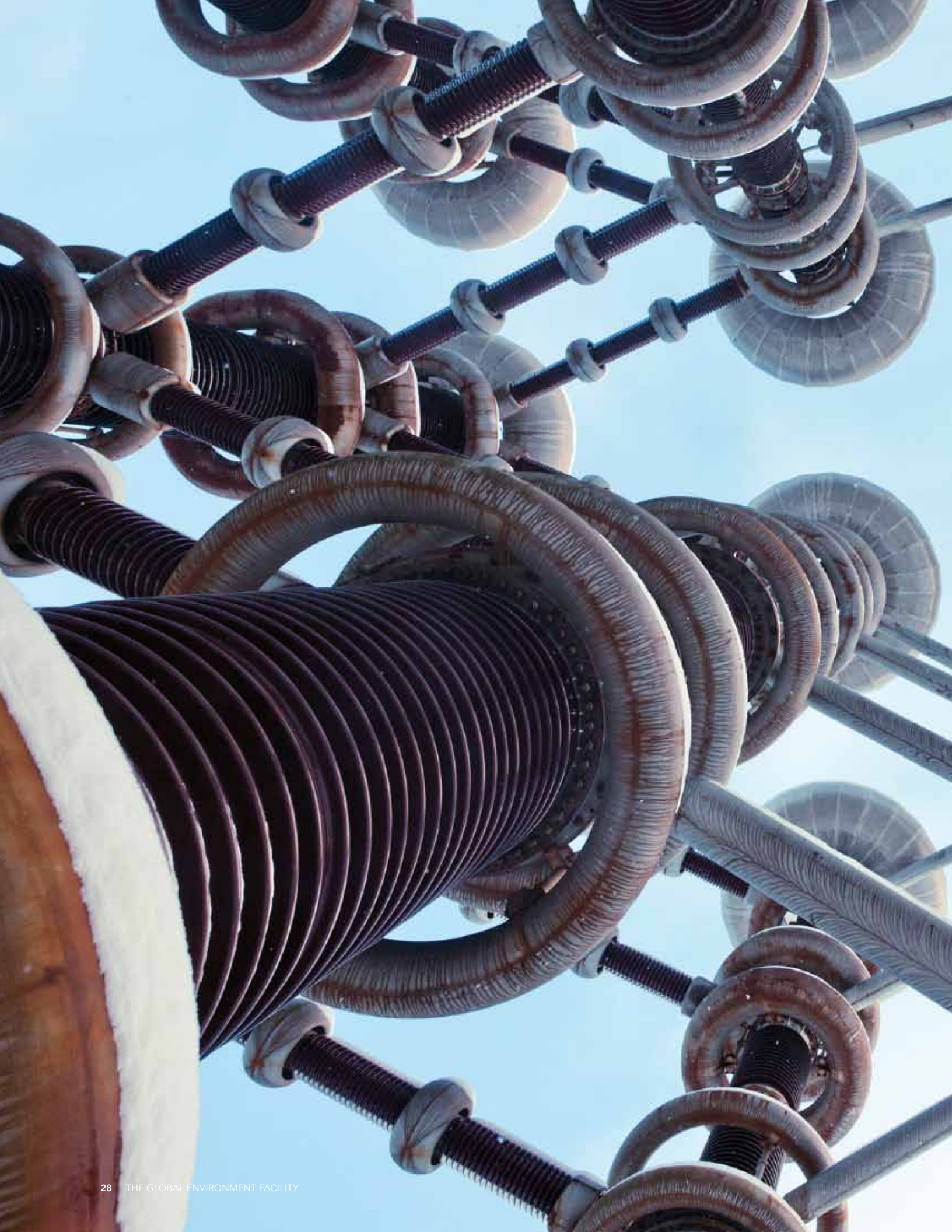
With an estimated volume of water of about 500,000 km<sup>3</sup>, the Nubian Sandstone aquifer system is one of the largest

shared aquifers in the world, occupying a surface area of about two million km<sup>2</sup> in Chad, Egypt, Libya and Sudan.

There is an increasing demand for this water resource as it is the only significant water available for a growing population, and the region's industry and agriculture sectors. A GEF-funded grant of \$1 million supplemented approximately another \$1 million in co-financing from the International Atomic Energy Agency (IAEA), UNDP and UNESCO for a joint project designed to address the pumping pressure on the aquifer and the transboundary impacts that could result from further water quantity or quality degradation.

This project was carried out using the GEF's TDA approach and has led to a Shared Aquifer Diagnostic Analysis (SADA). With the full cooperation of all countries, the SADA has formed the basis for developing a SAP addressing the key shared problems. This will be implemented under the auspices of a joint authority established by the four countries as a means of regional coordination.









# Securing Energy Supplies

Over the past 20 years, the GEF has demonstrated unique leadership in promoting renewable energy and energy efficiency by investing more than \$2.5 billion in almost 500 projects in developing countries and economies in transition. This GEF funding has leveraged more than \$17 billion of co-financing making the GEF one of the largest public funders of energy efficiency and renewable energy in the world.

Around the world, thermal power plants are one of the largest users of water. As a typical 1 billion W thermal plant uses about 75 million L per day (the equivalent of 25 Olympic-sized swimming pools), the GEF's contribution therefore promotes energy security and helps to limit the use of scarce water resources.

Most developing countries and economies in transition are energy importers, making them highly vulnerable to price fluctuations. The commercial exploitation of their own decentralized renewable resources, together with energy efficiency measures that limit demand, can improve energy security, enhance economic competitiveness, and reduce pollution.



Small scale manure in Turkey

*The GEF is one of the largest public funders of energy efficiency and renewable energy in the world.*

## Indonesia: Increasing Microhydro Power Capacity

In Indonesia, a GEF-supported project has helped to increase the country's small-scale hydro capacity from almost 20 million W to more than 70 million W and created the conditions for hydroelectricity to be competitive in the domestic energy market.

Indonesia is the world's largest archipelago with more than 17,500 islands, of which about 6,000 are inhabited. It is estimated that Indonesia is endowed with large hydro-power potential of up to 62.2 billion W, including micro-hydro energy of 458 million W. However, because these energy resources are located in remote rural areas, only a very small percentage of this potential has so far been utilized.

The UNDP/GEF Integrated Microhydro Development and

Application Program (IMIDAP) offers Indonesia a potential solution to the challenge of rural electrification.

The project has removed key barriers to microhydro development and complements the on-going renewable energy and rural electrification initiatives of Indonesia's government and private sector. The project has helped to increase the number of community-based microhydro projects and build local knowledge about the technology. It has also helped make microhydro technology more attractive to the private sector.

## Thailand: Promoting Efficient Use of Biomass

Between 2009 and 2011, GEF funding of \$6.8 million has helped to leverage more than \$92 million in co-financing to implement a biomass cogeneration project in Thailand. The GEF project helped to facilitate the implementation of two biomass power pilot plants with a total capacity of 32 million W. They have already helped to generate over 358 billion Wh of electricity annually avoiding 194,722 tonnes CO<sub>2</sub> per year.

GEF support for commercial guarantees has reduced the technical risks associated with the deployment of this new technology and the two pilot power plants now serve as valuable demonstration plants for rural





communities. The project has also had a significant impact on influencing government policy and in helping to make biomass power generation more commercially viable in Thailand by improving the regulatory framework and providing financial incentives for future biomass cogeneration and power projects.

## Reducing Livestock Pollution and Generating Energy in East Asia

East Asia accounts for more than half of the world's stock of pigs and more than a third of the world's stock of poultry. China, Thailand and Vietnam approached GEF in its International Waters area to support a regional project to reduce water pollution by converting animal waste into biogas for farmers to use as cooking fuel. In one example, a 2400 m<sup>3</sup> covered lagoon system for slurry has helped to create energy while simultaneously improving air quality and protecting groundwater resources in Hanoi, Vietnam. After these successful demonstration projects were scaled-up and replicated, it is estimated the project achieved total nutrient reductions to the South China Sea and Gulf of Thailand of more than 10,000 tons of nitrogen and 4,500 tons of phosphorous per year.









# Protecting Water Supplies and Community Health in Small Islands

Water security is of critical concern for Small Island States in terms of maintaining the supply of safe drinking water, preventing public health problems associated with contamination, and ensuring public safety in storms and floods. The GEF International Waters area has assisted three groups of islands (Pacific, Caribbean, and African) with separate projects designed to protect water supplies and minimize health and safety risks.

## The Pacific Integrated Water Resources Management Program

Tuiloma Neroni Slade, the Secretary General of the Pacific Islands Forum Secretariat believes the GEF International Waters area has played an important role in efforts to strengthen the resilience of island nations to the impacts of climate change and extreme weather events.

“For most island nations even small variations in water supply can have a significant impact on the security of their communities with direct impacts on health, food production and economic development. In this light it is not surprising that a number of Pacific Island countries have sought support from the GEF to develop practical solutions needed to protect our fragile water supplies and the natural coastal defences upon which we depend.



"A number of GEF demonstration projects have highlighted the need to mitigate damage caused through ineffective management of our wastewater and some damaging land use and coastal management practices. It is extremely important to limit and, where ever possible, prevent further damage to our natural coastal defences including our fragile coral reefs and mangroves ecosystems," he says.

*"The GEF demonstration projects in the Pacific region clearly demonstrate that international funding can work in supporting our communities to take effective and sustainable action."*

*Tuiloma Neroni Slade, Secretary General of the Pacific Islands Forum Secretariat*

Secretary General Slade believes the cornerstone of the GEF's success lies in finding effective ways to help communities identify and understand their challenges and to take charge of implementing effective solutions.

"This approach of community ownership and empowerment is critical for sustainable development particularly given the unique communal ownership and land tenure systems in our island communities. The GEF demonstration projects in the Pacific region clearly demonstrate that international funding can work in supporting our communities to take effective and sustainable action," he says.

The GEF/UNDP/UNEP/GEF, with executing assistance by the Pacific Islands Forum's Applied Geoscience



Commission (SOPAC) , Pacific Integrated Water Resources Management Program (Pacific IWRM) includes a network of 13 surface and groundwater supply and community protection demonstration projects. Two projects from Fiji and Tuvalu illustrate the direct impact the GEF has made in protecting the health and resilience of Pacific Island communities.

## Fiji: Minimizing the Impacts of Flooding in Nadi

In January 2009, a slow moving tropical depression passed over Fiji releasing almost four times the average monthly rainfall on the north-west of the country in just three days. Nadi, on Viti Levu, Fiji's largest island, is the country's economic hub and the centre of its tourism industry. The periods of intense rain saturated its catchment areas; rivers swelled and eventually flooded claiming 11 lives.

The Pacific region is incredibly vulnerable to natural disasters but cyclones are by far the most common, accounting for nearly 80% of all reported disasters. These are frequently accompanied by floods which cause major social and economic upheaval. The 2009 floods in Fiji caused an estimated F\$330 million in damage and lost earnings, equivalent to approximately 7% of the country's GDP. Climate change and variability is predicted to intensify and increase the frequency of high rainfall and cyclone events.

Pacific Island countries have traditionally been reactive rather than proactive in dealing with flood preparedness and response. The Fiji GEF demonstration project commenced in March 2009, just two months after flood waters receded. Its objective was to improve flood preparedness by introducing an integrated flood risk management approach within the Nadi basin.

*"The integrated approach is very much working for Nadi. It's a success in terms of the decision making.... I think we need to do the same for the other bigger rivers in Fiji."*

*Joeli Cawaki, Commissioner for Fiji's Western Division*

The project installed a network of hydrological monitoring stations and worked with communities to build grass roots capacity to coordinate an early response. Communities were assisted in developing and practicing their own disaster response plans.

The impact of the project was clearly demonstrated when Nadi experienced serious flooding again in January 2012. The availability of real time hydrological data helped communities and disaster response agencies to implement their response plans and minimize losses.

According to Joeli Cawaki, Commissioner for Fiji's Western Division, "minimal integrated approach is very much working for Nadi. It's a success in terms of the decision making. When to vacate the town, when to stop people from moving in and out, and also to make people aware when the Nadi River will burst its banks. The system is a success story for us. I think we need to do the same for the other bigger rivers in Fiji."

The Fijian Government recognises that the GEF demonstration project will serve as the management model for other catchments in Fiji and legislation.

## Tuvalu: Providing Safe Sanitation

Some 1,000 kilometers north of Fiji, the nation of Tuvalu consists of eight small coral islands with a total population of just 12,000. Over 4,000 people live on the capital island of Funafuti and this community is regularly affected by long droughts. Rainwater is the only cheap and reliable source of potable water and the increasing cost of fuel means that the country relies on its desalination plant as an option of last resort.

As a direct result of the Tuvalu Integrated Water Resources Management Program (IWRM) demonstration project there has been a remarkable increase in community demand for composting toilets. Tuvalu's Prime Minister, Willy Telavi, believes the GEF demonstration project will help reduce water use and protect the health of his community. "We are very supportive of the initiative for people to have access to composting toilets so we can reduce the use of water and the adverse impact of wastewater to our groundwater table," he says.

Because flush toilets use up to 30% of household water, the widespread conversion to dry sanitation could have a massive impact on water conservation – especially for small island states. Furthermore, flush toilets and septic tank systems are inappropriate for an atoll environment where pollutants can move easily between the groundwater system and the lagoon.

Many of the existing septic tanks in Funafuti have been leaking into the groundwater system putting people at risk from hepatitis, typhoid, gastroenteritis and diarrhea, especially during the flooding caused by king tides. The contamination also causes algal blooms that kill the reefs surrounding Funafuti and destroy the fish habitats the island population relies on for food.

*"We are very supportive of the initiative for people to have access to composting toilets so we can reduce the use of water and the adverse impact of wastewater to our groundwater table."*

*Prime Minister of Tuvalu, Willy Telavi*

The Tuvalu IWRM Project Team has worked successfully to build community demand for new composting toilets. In order to overcome public misgivings about the new technology, the team devised a plan to involve the entire community in the design and implementation of the demonstration trial. A national competition was used to generate the name "Falevatie", which essentially means "a toilet which saves water and is good for you and the environment" and a road show took a demonstration model around the island. As a result of this community interaction, more than 60 families volunteered to have the new composting toilets for their homes.

Based on the breakthrough success of the Tuvalu project, other island countries such as Tonga and Nauru are also exploring if they replicate the same sort of demand for composting toilets within their own communities.





Polluted waters in the Caribbean Seas

## Supporting Integrated Watershed and Coastal Management in the Caribbean

The watersheds and coastal areas of the Caribbean contain some of the most diverse and productive habitats, including 13% of the world's coral reefs. Some 30% of these reefs are now considered dead or at extreme risk because of human impacts such as untreated wastewater.

In the Caribbean, the GEF-funded UNDP/UNEP Integrating Watershed and Coastal Areas Management (IWCAM) project has helped to strengthen institutional frameworks across 13 island countries. A major component of the IWCAM was the development of nine demonstration projects carefully designed to ensure that new management approaches could also be applied to meet the needs of other communities around the Caribbean.

### St. Kitts-Nevis: Protecting the Basseterre Valley Aquifer

The GEF-IWCAM demonstration project for St. Kitts-Nevis was instrumental in designing a new National Park to protect the Basseterre Valley aquifer that provides 40% of the island's freshwater supply.

In June 2011, the Prime Minister of St. Kitts-Nevis, Hon. Dr. Denzil Douglas and other senior members of government gathered at the ceremony to mark the official designation of the St. Kitts National Capitol Park. This park covers approximately 2 km<sup>2</sup>, including seven of the ten wells that withdraw water from the aquifer.

The aquifer produces about 9,500 m<sup>3</sup> of water a day, but it is highly vulnerable to contamination. For many years sugar cane cultivation dominated the recharge area and now residential and commercial development is rapidly expanding up the valley. As a result, increasing levels of nitrates and other pollutants have been found in water samples taken from the area.

*The GEF-IWCAM demonstration project for St. Kitts-Nevis was instrumental in designing a new National Park to protect the Basseterre Valley aquifer that provides 40% of the island's fresh-water supply.*

To ensure the aquifer continues to be a safe and reliable source of drinking water, the GEF-IWCAM demonstration project was designed to help government and communities take practical actions to protect the aquifer. The aquifer was mapped using Multi-Electrode Electrical Resistivity (MER), a non-invasive technique that accurately records variations in sediment distribution, porosity, and gross water quality.

The project also partnered with the St. Kitts Electricity Department to install an oil/water separator at the Needsmust Power Plant. This activity has reduced the threat to the aquifer and the adjacent coastal area by intercepting oily waste before it is discharged. In the first few months over 3 m<sup>3</sup> of waste had been intercepted and pumped from the separator for safe disposal.

treats wastewater from four households to advanced secondary water quality levels, with plants playing a significant role in the process. In the demonstration project four wetland systems were constructed within Au Leon including one which services the public toilet. The early results from these systems show a reduction in both the fecal coliform bacteria and Biochemical Oxygen Demand (BOD) in the local rivers.

The GEF supported Au Leon project has demonstrated that constructed wetlands offer an innovative solution to the problems of treating and disposing of domestic wastewater in communities built on hard rock overlaid by shallow soils, a common situation in St Lucia. As a result, the Ministry of Agriculture Forestry and Fisheries has supported the introduction of this technology to other rural areas on the island with similar geological constraints.

## St Lucia: Community Involvement to Build a Constructed Wetland

The Fond d'Or watershed in the Caribbean island of St Lucia faces serious water quality problems exacerbated by the lack of adequate waste storage and treatment facilities for, occasionally unplanned, residential developments. Due to the topography and geology of the area, many houses have been built directly on exposed bedrock and shallow and fragile soils. This means that soakaway pits are not effective and untreated domestic waste enters gutters and gullies, and contaminates river water with fecal matter.

As people living in the watershed have no option but to use the rivers for bathing and washing, there is real concern about the threat to public health, so the GEF (IWCAM) project used constructed wetlands address the domestic waste problem for the Au Leon community.

The project designed a Wastewater Wetland Treatment System specifically for Au Leon. The system, which costs around \$1,600 to build from locally accessible materials,











# Supporting Climate Change Adaptation in Developing States

Climate change has a profound impact on national and community security. In many developing countries, climate change can render access to water and arable land less secure whilst leaving people more exposed to droughts, floods and other natural disasters.

The GEF has helped countries pilot adaptation measures in their main water use sectors. It has also helped communities to minimize risks from storms, droughts, floods, and rising sea levels. Many of these successful initiatives now need to be scaled up to reduce vulnerability and to prevent possible economic losses associated with more extreme weather events.

As the financial mechanism of the United Nations Framework Convention on Climate Change (UNFCCC), the GEF has a longstanding mandate to finance adaptation to climate change. To date, the GEF Trust Fund through the Strategic Priority on Adaptation (SPA), the Least Developed Countries Fund (LDCF), and the Special Climate Change Fund (SCCF) have allocated \$428 million to 119 adaptation projects and enabling activities. These initiatives are designed to address the root causes of insecurity and conflict.

The LDCF and the SCCF have financed climate change adaptation activities in 27 fragile states. These fragile states are the least equipped to prevent or resolve climate-induced insecurity and conflict. They are generally characterized by weak governance, limited administrative capacity, chronic humanitarian crises, persistent social tensions, violence or the legacy of civil war.

As of January 2012, the LDCF and the SCCF have allocated a total of \$137 million towards 33 projects in fragile states. In addition, through the LDCF, the GEF has supported the preparation of National Adaptation Programs of Action (NAPAs) in 28 fragile and least developed countries (LDCs).

Relying heavily on climate-sensitive sectors, such as agriculture, all LDCs are greatly at risk of climate-induced insecurity and even armed conflict. By supporting concrete measures to address the most urgent and immediate effects of climate change the LDCF has allowed these countries to pursue their development priorities while safeguarding the underpinnings of human and national security.

## Afghanistan: Building Adaptive Capacity and Resilience to Climate Change

In Afghanistan, rainfall is decreasing by approximately 90-100 mm a year and droughts are becoming more extreme and intense. At the same time, floods are exacerbated by heavy and unpredictable rainfall and the increased melting of permanent snow and ice from the Hindu-Kush mountain range.

A new GEF project aims to increase Afghanistan's resilience and adaptive capacity to water related risks by improving its capacity to integrate climate change risks into relevant policies and plans including the areas of water, agriculture, and disaster and conflict prevention.

The project is also designed to improve land and watershed management, strengthen Integrated Water Resource Management (IWRM) and develop national climate change assessments and monitoring systems. At selected sites, the project is piloting a range of approaches including: climate risk assessments, forecasting, and information; adaptation planning and response strategies; practices for water resource and watershed management.

## Ecuador: Adaptation to Climate Change through Effective Water Governance

In recent country studies, water governance has emerged as a growing public concern in Ecuador. The impact of climate change has been defined as a critical cross-cutting issue affecting the most vulnerable sectors of the economy, particularly the disruption of adequate water supplies in highland areas.

To improve planning and policy formulation for water resources, this project is designed to make climate change adaptation considerations part of normal practice for planners and other stakeholders. The project uses a bottom-up approach by training governmental agencies, grassroots organizations and NGOs in how to mainstream climate change adaptation to their water management practices. A local innovation fund for adaptation has also been established to help generate creative local solutions to Ecuador's water resource management problems.

## China: Mainstreaming Climate Change Adaptation into Irrigation-based Agriculture

China ranks at the bottom 25% of countries for water availability per capita. Within China, the per capita availability of water in Huang-Huai-Hai basin (3H basin) is only about one-third of the national average. Water resources are fully allocated and often overexploited. Climate change is already exacerbating these problems and remedial measures need to be taken to ameliorate the negative effects of irrigation-based agriculture in the basin.

The overall purpose of this GEF project is to help mainstream climate change adaptation measures into the national Comprehensive Agricultural Development Program, which is China's largest national investment program in irrigated agriculture. Pilot measures include awareness-raising activities, institutional and capacity strengthening, and community demonstration activities in the 3H basin.













# Safeguarding Community Health

## The Global Mercury Project: Promoting Cleaner Artisanal Gold Mining

Although artisanal and small-scale gold mining supports the livelihoods of many people, it is one of the main global sources of mercury contamination. These mining activities are frequently accompanied by extensive environmental degradation and deplorable health conditions.

As part of the Global Mercury Project, a partnership between the GEF, UNDP, and UNIDO, demonstration activities were located in key transboundary river and lake basins in six countries: Brazil, Indonesia, Laos, Sudan, Tanzania and Zimbabwe. In total, these target areas artisanal gold mining involves nearly two million workers directly and supports the livelihoods of approximately ten million people.

Each year, the process of amalgamation used to recover gold from ores resulting in the emission of approximately 800-1,000 tonnes of mercury into the environment. When mercury enters streams, it transforms into its highly poisonous methyl mercury form, contaminating rivers, lakes and poisoning fish stocks. The health of the miners and other people living within mining areas is affected through inhalation of mercury vapour, direct contact with metal, and the consumption of contaminated fish. For instance, women in the Ingessana Hills district of Sudan have reported a range of ailments including respiratory problems, depression, and various eye conditions.

The project used innovative techniques to increase understanding about the hazards of gold mining activities among the pilot communities. In the Brazilian project area, more than 1,000 educational posters and brochures were distributed and a local poet, Mr. Edmilson Santini, composed rhymes (locally known as “cordel”) entitled: “Don’t cry for the spilled mercury” to communicate key safety messages.

In addition, training programs demonstrated a number of crucial skills to participants on how to increase the recovery of gold, recycle mercury, protect water bodies, diversify sources of income, safely dispose of waste and reforest degraded areas. The project also supported the introduction of locally appropriate technologies. For example, a communal furnace was set up in Laos, and in Tanzania a processing centre helped to train local manufacturers produce appropriate technology to help reduce pollution.

In Tanzania, the project also launched a microcredit initiative to overcome financial barriers to the adoption of these alternative technologies. Following consultations with local banks and microcredit institutions, UNIDO held education workshops with miners on different financial options through micro-savings and loans, focusing on how village banking could support technology transfer to increase productivity and improve safety.

By raising awareness, introducing cleaner mining and extraction technologies and developing local capacity, the project has reduced the negative environmental impact and improved the health, safety and earnings of mining communities.

## Constructed Wetlands Provide Health Benefits for Vulnerable Communities

In some poorer countries, and in those facing rapid urbanisation and population growth, the lack of effective wastewater management systems means that domestic,



*Fisherman on Lake Victoria*



agricultural and industrial effluent can flow directly into fresh and marine water systems. This pollution can lead to serious public health problems and a reduction in the fish stocks on which many communities depend.

A number of GEF pilot projects have shown that constructed wetlands can provide a low-cost wastewater treatment option and improve water quality for a wide range of communities. Construction, operation and maintenance costs are lower than other treatment options and they can provide additional benefits such as the creation of wildlife habitats and the ability to re-use water for aquaculture.

## East Africa: Improving Public Health for Coastal Communities

As part of their Addressing Land-Based Activities in the Western Indian Ocean (WIO-LaB) initiative, the GEF has funded wetlands to address the challenge of wastewater management in the increasingly populated but still poorly developed coastal urban centres in East Africa.

The population of Chake-Chake, a town on Pemba Island in Tanzania, had frequently experienced health hazards caused by free-flowing sewage and flooding. A GEF funded project supported the construction of a 12 km long sewer system to collect wastewater from households, restaurants, mosques, and other sites and constructed a wetland to treat it. The site was covered to avoid mosquitoes and located next to a natural mangrove wetland area to help it blend in with the natural environment.

The resulting elimination of untreated wastewater discharge has enhanced environmental conditions in the nearby coastal waters and public health has improved for the 4,000 people living in the project areas.

The high level of local support for the project was confirmed when two communities of Msingini and

*The high level of local support for the project was confirmed when two communities of Msingini and Kichungwani chose to provide co-financing of \$60,000 from their annual contribution from the Tanzania Social Development Fund.*

Kichungwani chose to provide co-financing of \$60,000 from their annual contribution from the Tanzania Social Development Fund.

An inadequate wastewater system had also posed significant health risks for the 2,500 inmates and 1,500 staff at Shimo La Tewa prison in Mombasa, Kenya. Raw sewage was entering the Mtwapa Creek just 500 metres from the Indian Ocean. "The smell is very bad," said Sergeant Paul Cheruiyot, a worker at the prison. "It was hard to work near here. People passing on the road outside the fence complained too. There was public outcry". The situation was so bad that Kenya's National Environmental Management Authority sued the prison for polluting surface waters.

A new GEF supported project, the first of its kind in Kenya, helped to develop a constructed wetland that treated the water with a cost per person served of just \$25, and with less maintenance required than systems using pumps and chemical treatment.

As well as improving sanitary conditions and the ecosystem, the project also provided the added benefit of recycled wastewater for irrigation and aquaculture at the prison. In order to ensure sustainability staff training has enabled the prison to maintain the system as part of its

usual maintenance activities. It now serves as an example of best practice in sanitation in prisons in Kenya and has attracted a high level of interest from politicians and other stakeholders from throughout Kenya and beyond.

## Lake Victoria: Improving Health through Eco-San (Ecological Sanitation) Toilets

The GEF has supported a wide range of community-based demonstration projects that are being replicated by communities living on the shores of Lake Victoria. In Uganda, community consultations found that many people were increasingly concerned by negative impacts of untreated human waste on the coastal environment and public health. With support from the GEF's Small Grants Program, the Entebbe Women's Association built new Eco-San toilets at the Kigungu and Missoli landing sites. These demonstration toilets enabled more than 300 community members to receive direct training in the use and maintenance of Eco-San technology and helped generate demand for the toilets in other fishing villages right around the lake. Furthermore, cholera, which was present in the community before the sanitation was installed, has not returned.

*Cholera, which was present in the community before the sanitation was installed, has not returned.*

## Philippines: Innovative Destruction of PCBs

Before the Stockholm Convention was signed in 2004, the GEF International Waters focal area funded a number of projects to reduce human exposure to toxic substances. In the Batangas province of the Philippines, the GEF funded the initial work that resulted in the GEF chemicals focal area piloting the development of an innovative non-combustion PCB (polychlorinated biphenyl) destruction plant. This pilot plant is now operational and is showing the way how countries throughout Asia can safely deal with PCBs from old electrical equipment and compete with existing dirtier incineration methods that are often advocated as the solution.

*Polluted beach in Indonesia*















# Averting Future Conflicts

We all need food for our families, safe drinking water, and incomes sufficient to support us, energy, shelter, and protection from floods, droughts, and storms. These essentials of life are at risk in many countries as a result of poor water policies and programs, increasing severe weather events, and pressure from the globalization of national economies.

The water-related forecast is bleak for many countries, but this is not only because of climate shifts, population increases, and global economic pressures. The foremost reason is the fact that many countries have not yet integrated water resources considerations into their strategies for agriculture, energy, and other sectors.

Integrated water resources management is the subject of many conferences but few practical applications. During its first two decades, the GEF has filled this gap by helping developing countries create the practical experience needed to build a truly cross-sector and ecosystem-based approach to the management of their water resources.

*Developing countries know they can look to the GEF for practical and innovative solutions to water, food, and energy security issues*

In its International Waters focal area, the GEF has utilized practical demonstrations of new technologies, community-based approaches, and institutional/legal developments at different scales to illustrate the benefits of integrated land and water resources management. Those countries that choose to scale up these results and investments will make a much smoother transition to a globalized, than those that do not.

In these times of global change and multiple stresses on our rivers, lake, aquifers, and oceans, the GEF has responded to an overwhelming number of country requests for help in actions to address the global water crisis. Support has not only come from the International Waters focal area but also from GEF's other focal areas which, as illustrated by these stories, also contribute to water, and consequently to food and energy security by incorporating water considerations into the projects and policy reforms of other sectors.

As it commences its twenty-first year, the GEF has evolved to be a country-driven facility with ten implementing agencies networked to provide assistance according to national needs. This places the GEF at the center of development assistance efforts to balance competing water uses related to food, drinking water, energy, health, livelihoods, and environment. Developing countries know they can look to the GEF for investments in practical and innovative solutions to water, food, and energy security issues.

*There is no excuse. Inaction is no longer an option!*



## PHOTOGRAPHY

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## ABOUT THE GEF

The Global Environment Facility unites 182 member governments — in partnership with international institutions, nongovernmental organizations, and the private sector — to address global environmental issues. As an independent financial organization, the GEF provides grants to developing countries and countries with economies in transition for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. These projects benefit the global environment, linking local, national, and global environmental challenges and promoting sustainable livelihoods.

Established in 1991, the GEF is currently the largest funder of projects to improve the global environment. The GEF has allocated \$9 billion, supplemented by more than \$40 billion in co-financing, for more than 2,600 projects in more than 165 developing countries and countries with economies in transition. Through its Small Grants Programme, the GEF has also made more than 13,000 small grants directly to nongovernmental and community based organizations.

The GEF partnership includes 10 Agencies: the UN Development Programme, the UN Environment Programme, the World Bank, the UN Food and Agriculture Organization, the UN Industrial Development Organization, the African Development Bank, the Asian Development Bank, the European Bank of Reconstruction and Development, the Inter-American Development Bank, and the International Fund for Agricultural Development. The Scientific and Technical Advisory Panel provides technical and scientific advice on the GEF's policies and project

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