Beyond the Source

The environmental, economic and community benefits of source water protection

EXECUTIVE SUMMARY

The Nature Conservancy

Healthy source watersheds are vital natural infrastructure for cities around the world

Photo: © Mark Godfrey

Executive Summary

Healthy source watersheds are vital infrastructure

Healthy source watersheds are vital natural infrastructure for nearly all cities around the world. They collect, store and filter water and provide benefits for biodiversity conservation, climate change adaptation and mitigation, food security, and human health and well-being. Today, an estimated 1.7 billion people living in the world's largest cities depend on water flowing from source watersheds sometimes located hundreds, if not thousands, of kilometers away. By 2050, those urban source watersheds will be tapped by up to two-thirds of the global population though they represent one-third of the Earth's land surface. Cities—as hubs for employment, services and investment—will clearly be the drivers of economic growth. To grow sustainably, cities will need to play an active role in protecting the water sources on which people and nature depend, but they can't do it on their own. Source watersheds are a nexus for action for those working to build resilient cities, improve water security, drive sustainable development and create a stable climate.

Current and potential urban source watersheds

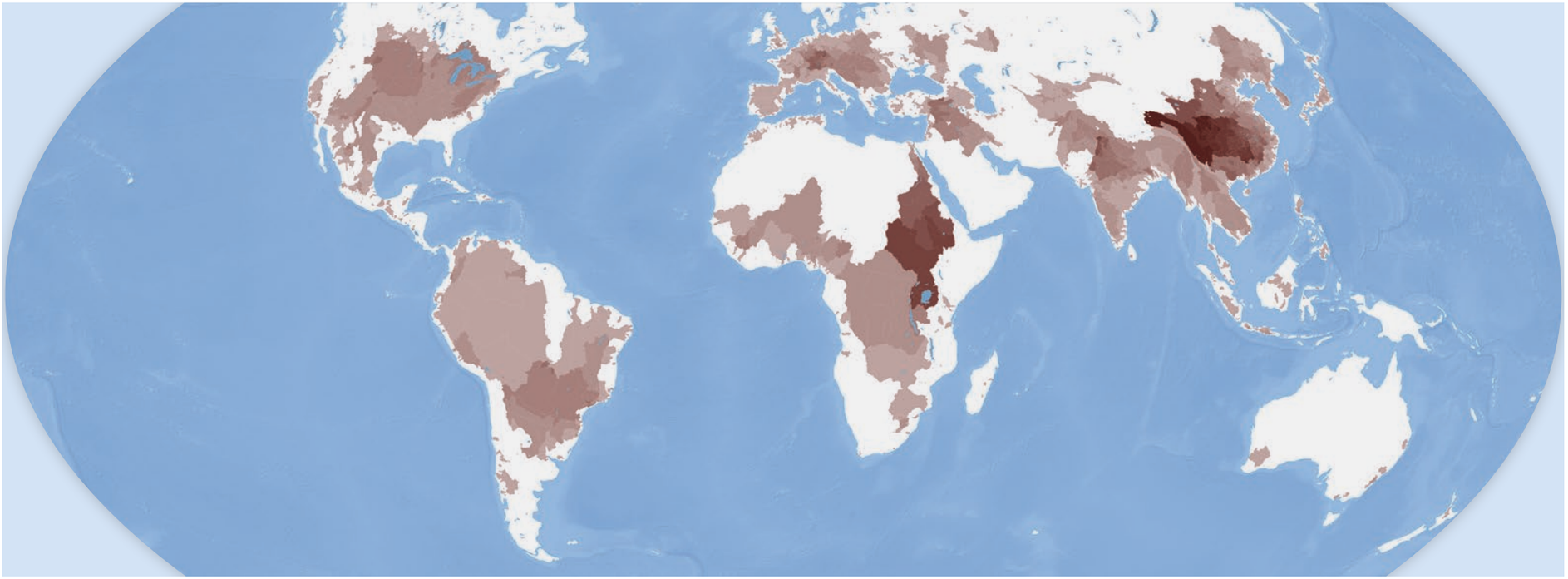


Figure ES.1. Watershed areas that currently or could potentially provide surface water supply to cities with populations greater than 100,000 people. Darker colors indicate overlapping watershed areas, where multiple withdrawal points collect surface runoff from the same upstream land areas. (Source: The Nature Conservancy)

Source watershed areas by percent overlap

Low overlap — High overlap

Source watersheds are under threat

We find that 40 percent of source watershed areas show high to moderate levels of degradation. The impacts of these changes on water security can be severe. Nutrients and sediment from agricultural and other sources raise the cost of water treatment for municipal and industrial users. Loss of natural vegetation and land degradation can change water flow patterns across the landscape and lead to unreliable water supplies, with implications for both upstream and downstream users. According to the World Bank, some regions could see their growth rates decline by as much as 6 percent of GDP by 2050 as a result of water-related losses in agriculture, health, income and property—sending them into sustained negative growth. Aspirational goals to see livelihoods improve, like those set in the Sustainable Development Goals (SDGs), are beyond reach without a more water-secure world.

Nature-based solutions can improve water quality and quantity

Protecting and restoring the natural infrastructure of source watersheds can directly enhance water quality and quantity. There are many effective source water protection activities (Table ES.1). In this report, we model forest protection, reforestation and cover crops as one example of agricultural best management practices (BMPs).

Specifically, in this report we show that:

- Four out of five cities in our analysis (81 percent) can reduce sediment or nutrient pollution by a meaningful amount (at least 10 percent) through forest protection, pastureland reforestation and agricultural BMPs as cover crops.
- Globally, 32 percent of the world's river basins experience seasonal, annual or dry-year water depletion. Source water protection activities could help improve infiltration and increase critical base flows in streams. For example, an analysis of the watersheds supplying water to six of Colombia's largest cities shows that source water protection activities could increase potential base flow up to 11 percent. Activities like these will be especially important in the 26 percent of source watershed areas predicted to experience decreases in annual precipitation by mid-century.
- Source water protection can maintain or improve groundwater resources by targeting aquifer recharge zones or other sensitive areas of the landscape. For example, early results in San Antonio, Texas, suggest that land-based programs that have protected 21 percent of aquifer recharge areas may have already avoided pollution impacts.

Source water protection activity	Description
	Targeted land protection. Protecting targeted ecosystems, such as forests, grasslands or wetlands.
	Revegetation. Restoring natural forest, grassland or other habitat through planting (direct seeding) or by enabling natural regeneration; includes pastureland reforestation.
	Riparian restoration. Restoring natural habitat that is at the interface between land and water along the banks of a river or stream. These strips are sometimes referred to as riparian buffers.
	Agricultural best management practices (BMPs). Changing agricultural land management to achieve multiple positive environmental outcomes.
	Ranching best management practices (BMPs). Changing land management practices on ranchlands to achieve multiple positive environmental outcomes.
	Fire risk management. Deploying management activities that reduce forest fuels and thereby reduce the risk of catastrophic fire.
	Wetland restoration and creation. Re-establishing the hydrology, plants and soils of former or degraded wetlands that have been drained, farmed or otherwise modified, or installing a new wetland to offset wetland losses or mimic natural wetland functions.
	Road management. Deploying a range of avoidance and mitigation techniques that aim to reduce the environmental impacts of roads, including those impacts related to negative effects on soils, water, species and habitats.

Table ES.1. Major categories of source water protection activities considered in this report.

Potential for pollution reduction in urban source watersheds

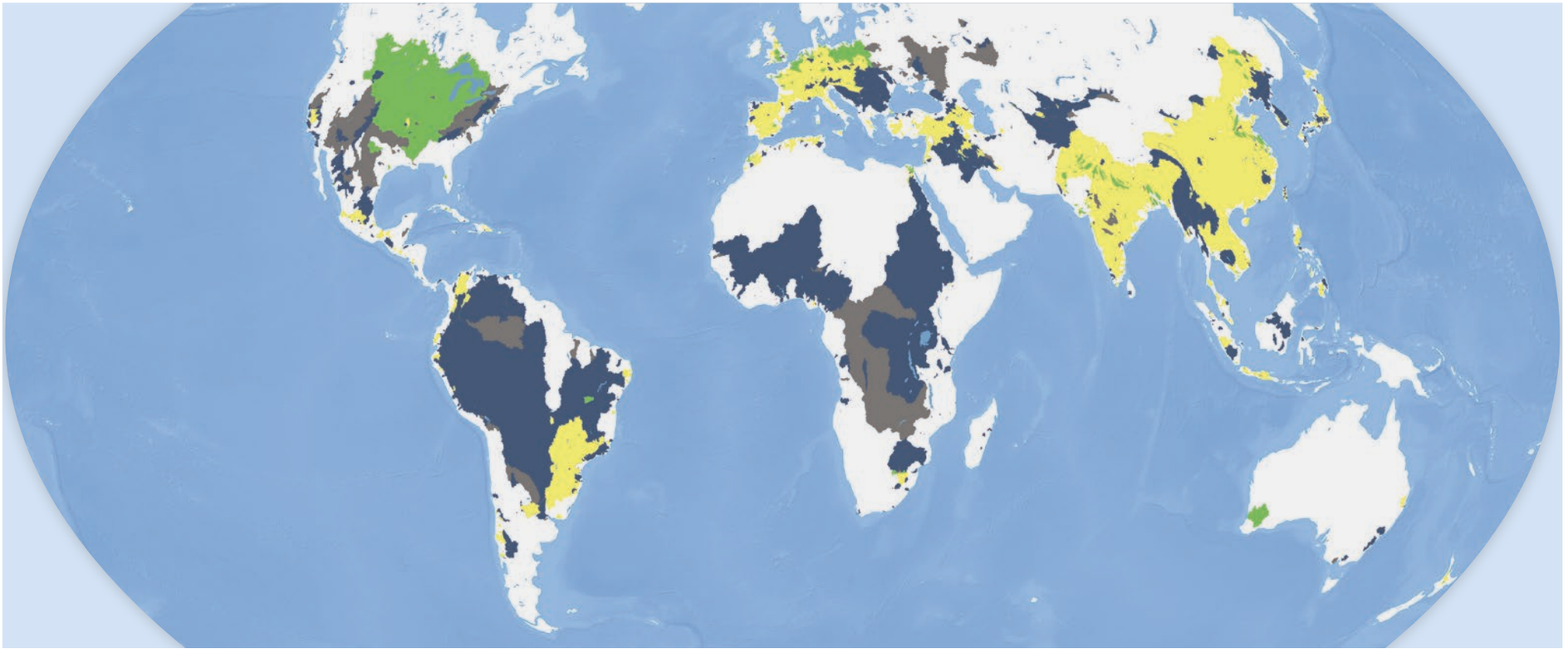


Figure ES.2. Modeled potential for achieving a 10 percent reduction in sediment or nutrient (phosphorus) pollution through conservation activities (forest protection, pastureland reforestation and agricultural BMPs as cover crops). Legend colors indicate where a 10 percent reduction is possible for one, both or no pollutants. For many watersheds, pollution reduction greater than 10 percent is possible through source water protection activities. (Source: The Nature Conservancy)

Scope of 10 percent reduction

- None
- Sediment only
- Nutrients only
- Both pollutants

Four out of five cities can reduce sediment and nutrient pollution by a meaningful amount through forest protection, pastureland reforestation and improved agricultural practices.

Nature-based solutions used to improve water quality and quantity can also help us reduce our carbon footprint, maintain critical ecosystems and build healthier, more resilient communities in the face of climate change.

Source watersheds are a nexus of value and action

The value of source water protection goes well beyond water security. For the first time, we provide an in-depth exploration of the co-benefits—including climate change mitigation and adaptation, biodiversity, and human health and well-being—that can result from source water protection investment (Table ES.2). To understand the scale of opportunity, we present the ceiling of what could be achieved if all the source water protection activities we model were implemented.

	Water security. Maintaining or improving water quality and dry season flows.
	Climate change mitigation. Avoiding greenhouse gas emissions and increasing carbon sequestration.
	Climate change adaptation. Using nature to mitigate climate change impacts and build resilient communities.
	Human health and well-being. Supporting and improving physical and mental health, food security, livelihoods and social cohesion.
	Biodiversity conservation. Protecting and improving the status of terrestrial and freshwater species and the ecosystems in which they live.

Table ES.2. Benefit categories of source water protection explored in this report.

Photo: © Nick Hall

A young woman picking tea leaves on a tea plantation in the Upper Tana Watershed, Kenya. The Nature Conservancy is working to protect the Upper Tana Watershed in Kenya and provide cleaner, more reliable water for Nairobi.

Climate change mitigation benefits

In December 2015, the Paris COP 21 committed to avoiding further loss of carbon stored in forests, as well as capturing carbon through land-based practices. Article 5 of the Paris Agreement recommends Parties conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases. According to the Food and Agriculture Organization of the United Nations (FAO), agriculture and land use, land-use change and forestry are among the most referenced sectors in mitigation contributions with 86 percent of countries referring to these land-based activities—second only to the energy sector.

- **Carbon storage:** We find that 64 percent (143 gigatonnes) of the total carbon stored in above-ground biomass in all tropical woody vegetation globally was held within urban source watersheds. From 2001 to 2014, more than 6.6 gigatonnes of carbon (24.3 gigatonnes of CO_2) were emitted as a result of tropical forest loss in the source watersheds, equivalent to 76 percent of all carbon emitted as a result of tropical forest loss over that same time.

- **Climate change mitigation potential:** If reforestation, forest protection and agricultural BMPs were fully implemented across all source watersheds, an additional 10 gigatonnes of CO_2 in climate change mitigation potential could be achieved per year, or 16 percent of the 2050 emissions reduction goal. Between 4 and 11 percent of this ceiling of potential could be realized via city investments in source water protection activities at a level required to achieve meaningful sediment or nutrient reductions. The remaining potential points to opportunities for cities or other actors to capture additional climate change mitigation potential through programs motivated by water security or other co-benefits.

Climate change adaptation benefits

Climate change impacts will be felt most acutely by vulnerable people. Functioning ecosystems can support resilient communities, consistent with the Sustainable Development Goal 13, Target 1 to: "Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries." While catastrophic climatic events will still bring flood risks, source water protection activities can reduce the impacts of increased rainfall and other climate-related hazards.

- **Regulating fire frequency:** The combination of fire suppression and a drier, hotter climate in some geographies can lead to catastrophic fires, with impacts to communities and downstream water quality. Forest fuel reduction, a source water protection activity, may be an appropriate activity to address this challenge in the 24 percent of urban source watershed areas where fire frequency is predicted to increase by mid-century.

- **Better soil retention:** Source water protection activities, including but not limited to agricultural BMPs and restoration, can help to mitigate soil erosion. These activities will have almost universal relevance, as 83 percent of source watershed areas are predicted to increase in erosivity by mid-century due to climate change. Erosion not only leads to water pollution, but reduces soil productivity and thereby reduces the resiliency of farming communities.

Source water protection activities can reduce the impacts of increased rainfall and other climate-related hazards.

Excess nitrogen in upstream urban source watersheds linked to downstream eutrophication areas

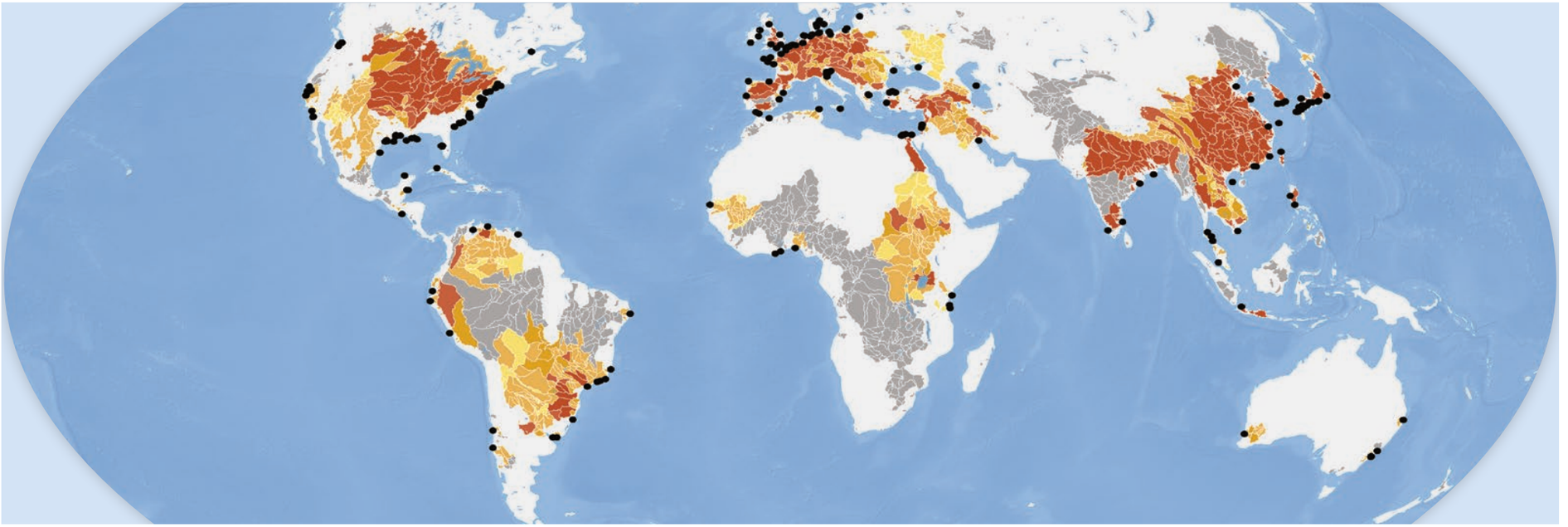


Figure ES.3. Excess nitrogen in urban source watersheds upstream of reported downstream eutrophication problems, including dead zones. Urban source watersheds displayed in gray are not linked to any reported eutrophication problems. HydroBASINS with negative values indicate a deficit balance of nitrogen. (Source data: World Resources Institute eutrophication database 2013 ; EarthStat total fertilizer balance data 2014)

Total excess nitrogen (tonnes)

- < 0
- 0 - 10,000
- 10,000 - 20,000
- 20,000 - 40,000
- > 40,000

Non-contributing watersheds

Downstream eutrophication

Human health and well-being benefits

Source water protection activities are important pathways to meeting human health and well-being goals, including food security. Up to 780 million people living in urban source watersheds within countries in the bottom tenth percentile of the Human Development Index could receive direct or indirect health benefits. Up to 28 million farming households could implement agricultural BMPs that aim to reduce sediment runoff by 10 percent globally. In doing so, they are likely to see related benefits, including improvements in crop production and health and well-being. Our findings include:

- **Reduced risks to fisheries:** Excess nutrients in source watersheds can make their way via runoff into streams, down river courses and ultimately into coastal zones, where fisheries are often critical resources for local communities. The impacts may be particularly important to the 10 to 12 percent of the global population that depends on fisheries and aquaculture for their livelihoods, 90 percent of whom are small, artisanal fishers, according to the FAO. Source water protection activities could help mitigate nutrient inputs for over 200 of the 762 globally reported coastal eutrophication and dead zones (Figure ES.3).
- **Avert micronutrient deficiency:** According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), over 75 percent of the world's crop species depend on pollination by bees, butterflies and other species to produce the foods we consume. The annual value of global crops directly affected by pollinators is US$235 billion to US$577 billion. Pollination is vital for fruit and vegetable crops that serve as the source of essential micronutrients (e.g., vitamin A, iron, folate). Approximately 2.6 billion people live in source watershed areas where greater than 10 percent of micronutrient supply would be lost without the benefits of pollination. By avoiding the loss of important pollinator habitat close to agricultural lands, source water protection could avert the loss of 5 percent of agricultural production's economic value globally from pollinator loss alone.

Photo: © Fábio Maffei

Biodiversity benefits

Natural ecosystems and biodiversity are fundamental to a sustainable planet, as recognized in the Aichi Biodiversity Targets and the SDGs. In freshwater ecosystems, the trend is negative. WWF's 2016 Global Living Planet Index shows that, on average, the abundance of populations monitored in freshwater systems has declined by 81 percent between 1970 and 2012. More than three-fourths of the urban source watersheds are within regions of high species diversity and endemism. In addition, nearly half of the vulnerable terrestrial mammals, amphibians and birds listed by the International Union for Conservation of Nature (IUCN), and more than half of the vulnerable freshwater fishes as assessed to date by the IUCN, occur within urban source watersheds. Source water protection has enormous potential for biodiversity conservation.

- **Avoided extinction:** The risk of regional extinctions—loss of a species within a given ecoregion—would be reduced for 5,408 terrestrial species, if reforestation opportunities were fully implemented within source watersheds. Forty percent of those regional risk reductions would occur in Africa, suggesting a huge opportunity for biodiversity gains in that region from this one practice.
- **Habitat protection:** Targeted land protection is critical for sustaining both aquatic and terrestrial biodiversity. We find that 44 countries that currently fall short of the Convention on Biodiversity's 17 percent target for protection of lands and inland waters could achieve that target through protection of natural habitat that sits outside existing protected areas. One-quarter of those could reach the target by protecting just 10 percent or less of remaining natural land cover outside protected areas.

For more than 15 years, water funds have successfully enabled downstream water users to invest in upstream habitat protection and land management to improve water quality and quantity.

Capturing the value of source watersheds through water funds

The water security benefits and co-benefits of source water protection are not being captured systematically today. Despite overwhelming benefits to cities, most exert little influence over how sources are managed. The barriers to implementation generally fall into three main areas:

- There is often a mismatch between the jurisdictions of the problem owners and problem solvers. Urban water users, such as municipalities, urban water managers or industries, have limited jurisdiction and cannot easily reach beyond those jurisdictional borders. Rural land stewards are making decisions that affect urban users but have little to no incentive to reduce their impacts.
- Knowledge transfer is lacking on how investments in source water protection can achieve specific water security outcomes or other benefits.
- Replicable mechanisms that allow for a diversity of funding flows, based both on a supportive policy environment and on specific financial structures, are lacking.

Defining a water fund

The water fund, an institutional platform developed by cities and conservation practitioners including The Nature Conservancy, can help resolve governance issues by bridging science, jurisdictional, financial and implementation gaps. For more than 15 years, water funds have helped communities improve water quality by bringing water users together to collectively invest in upstream habitat protection and land management, and mobilize innovative sources of funding. As a permanent governance, investment and source water protection implementation mechanism, water funds provide the framework for collective action, connecting land stewards in rural areas and water users in urban areas to share in the value of healthy watersheds (Figure ES.4). With a portfolio of 29 funds in operation as of the publication of this report and approximately 30 in design, The Nature Conservancy and its partners are building an understanding of how to reduce the risks associated with source water protection investments (Figure ES.5). Other actors are also developing similar models in a variety of contexts. Taken together, a body of work is emerging that provides solutions to the barriers on the ground.

The major elements and flows of a water fund

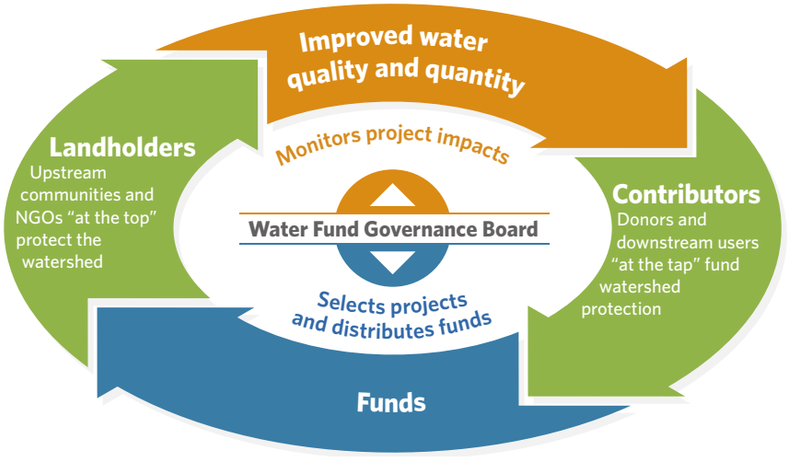


Figure ES.4. A water fund is designed to cost-effectively harness nature's ability to capture, filter, store and deliver clean and reliable water. Water funds have four common characteristics: science-based plans, a multi-stakeholder approach, a funding mechanism and implementation capacity.

Water Funds in Action

Quito, Ecuador

In response to growing water demands and concern over watershed degradation, the municipality of Quito, the water company of Quito and The Nature Conservancy helped create the Fund for the Protection of Water (FONAG) in 2000. FONAG works to mobilize critical watershed actors to exercise their civic responsibility on behalf of nature, especially related to water resources. The multi-stakeholder board—composed of public, private and NGO watershed actors—provides a mechanism for joint investment in watershed protection, including supporting the communities that live there.

FONAG conducts source water protection through a variety of mechanisms. First, it works to protect and restore high Andean grasslands (páramos) and Andean forest in critical areas for water provision to Quito, including areas owned by local communities, private landowners and the Quito water company. In addition to direct source water protection activities, FONAG focuses on strengthening watershed alliances, environmental education and communication to mobilize additional watershed actors in watershed protection. FONAG has also established a rigorous hydrologic monitoring program to communicate and improve outcomes of investments in collaboration with several academic institutions.

FONAG has an endowment of more than US$10 million and an annual budget of more than US$1.5 million. The largest source of funding (nearly 90 percent) comes from Quito's water company, which by a municipal ordinance is required to contribute 2 percent of the water company's annual budget. Since its inception, FONAG has worked to protect and/or restore more than 40,000 hectares of páramos and Andean forests through a variety of strategies, including working with more than 400 local families.

Nairobi, Kenya

The Upper Tana River Basin is of critical importance to the Kenyan economy. Covering an area of approximately 1.7 million hectares, the Upper Tana supplies 95 percent of Nairobi's drinking water, sustains important aquatic biodiversity, drives agricultural activities that feed millions of Kenyans and provides half of the country's hydropower output. The basin has experienced high population growth and declining sustainability of agriculture, resulting in the conversion of forest to cropland and decreasing land per capita.

Smallholder farms are the largest upstream water user in aggregate of Upper Tana Basin water. Hydropower generation is the second largest upstream user of water, though the water is returned to the river. The unchecked expansion of farming, quarrying and dirt road construction across the Upper Tana over the last 40 years has led to land degradation. Consequently, elevated sediment loads are entering the river system, impacting the delivery of water to Nairobi water users and reducing the storage capacity of reservoirs. In response to these challenges, the Upper Tana-Nairobi Water Fund was launched to implement a holistic set of source water protection activities with the objectives of increasing water yields, reducing sediment, and promoting sustainable food production and increased household incomes in farming communities across the project areas.

In order to mobilize funding, a comprehensive analysis integrated investment planning techniques with watershed modeling tools to prioritize where to work. Non-monetized benefits, including pollinator habitat and carbon storage, were identified and the overall cost-to-benefit analysis concluded that, even by conservative estimates, the selected watershed interventions could ultimately deliver a two-to-one return on investment over a 30-year timeframe. By recognizing the multiple embedded values of a healthy watershed, and involving the key stakeholder groups, the water fund was able to design a collective action program whereby investing together made the most financial sense. Many of these projected benefits are already being measured through demonstration interventions.

San Antonio, Texas, United States

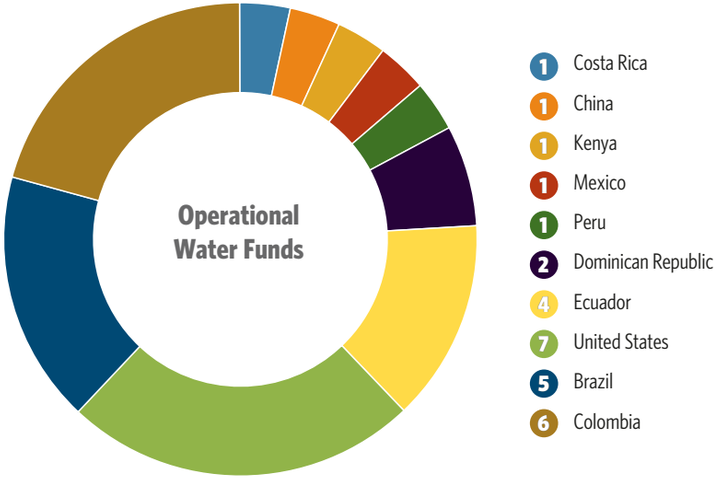
As one of the largest artesian aquifers in the world, the Edwards Aquifer serves as the primary source of drinking water for nearly 2 million central Texans, including every resident of San Antonio—the second largest city in Texas—and much of the surrounding Hill Country. Its waters feed springs, rivers and lakes and sustain diverse plant and animal life, including rare and endangered species. The aquifer supports agricultural, industrial and recreational activities that not only sustain the Texas economy, but also contribute immeasurably to the culture and heritage of the Lone Star State.

With careful land management, there is the potential to avoid additional impacts to the aquifer and reduce the need to expand water treatment for San Antonio. In 2000, voters approved the city's first publicly-financed water fund measure to protect the Edwards Aquifer. The proposition passed with enthusiastic support and authorized US$45 million to purchase properties within the aquifer's most sensitive area. San Antonians have since voted three more times not only to continue the program, but to greatly expand it. The ensuing Edwards Aquifer Protection Program raised a total of US$315 million to protect the Edwards Aquifer in Bexar County, where San Antonio lies, as well as throughout much of the surrounding regions.

Since 2000, The Nature Conservancy has worked alongside city officials in San Antonio and surrounding communities to ensure these water funds have the greatest impact. To date, the efforts have helped local governments invest more than US$500 million in water protection funds and protect more than 48,560 hectares above the Edwards Aquifer, including 21 percent of the aquifer's recharge zone, its most sensitive area.

Operational water funds within the portfolio of The Nature Conservancy and its partners

Figure ES.5. The water fund concept was born in Quito, Ecuador, and the track record of delivery pioneered in Latin America has led to replication in East Africa, China and the United States. There are 20 operating funds in Latin America, seven in the United States, one in Sub-Saharan Africa and one in China.



The Nature Conservancy is working on nearly 60 water funds around the world.

Scaling source water protection by bridging the gaps

The cost of source water protection could be covered by revealing benefits to diverse payers through the business case for water funds. Forest Trends reports that roughly US$24.6 billion is spent annually on payments for watershed services programs, an umbrella that includes water funds. We estimate that an increase of US$42 billion to US$48 billion annually would be required to achieve an additional 10 percent of sediment and nutrient reductions in 90 percent of our source watersheds. With this level of funding, we could improve water security for at least 1.4 billion people by first focusing on the most cost-effective watersheds for water security purposes.

For example, we estimate sediment reduction can be achieved with US$6.7 billion annually, improving water security for 1.2 billion people at an average per capita cost of under US$6 annually (Figure ES.6). For half of cities, source water protection costs could be just US$2 or less per person per year.

While substantial, this annual increase of US$42 billion to US$48 billion represents around 7 to 8 percent on average of the global expenditure on water—estimated to be US$591 billion per year in 2014—and is commensurate to what cities like New York City are spending on watershed protection as a fraction of their overall water expenditure. Water funds can provide a mechanism to connect the benefits produced by source water protection to potential payers to close the funding gap.

Annual source water protection costs to achieve a 10 percent reduction in sediment and nutrients in 90 percent of urban source watersheds

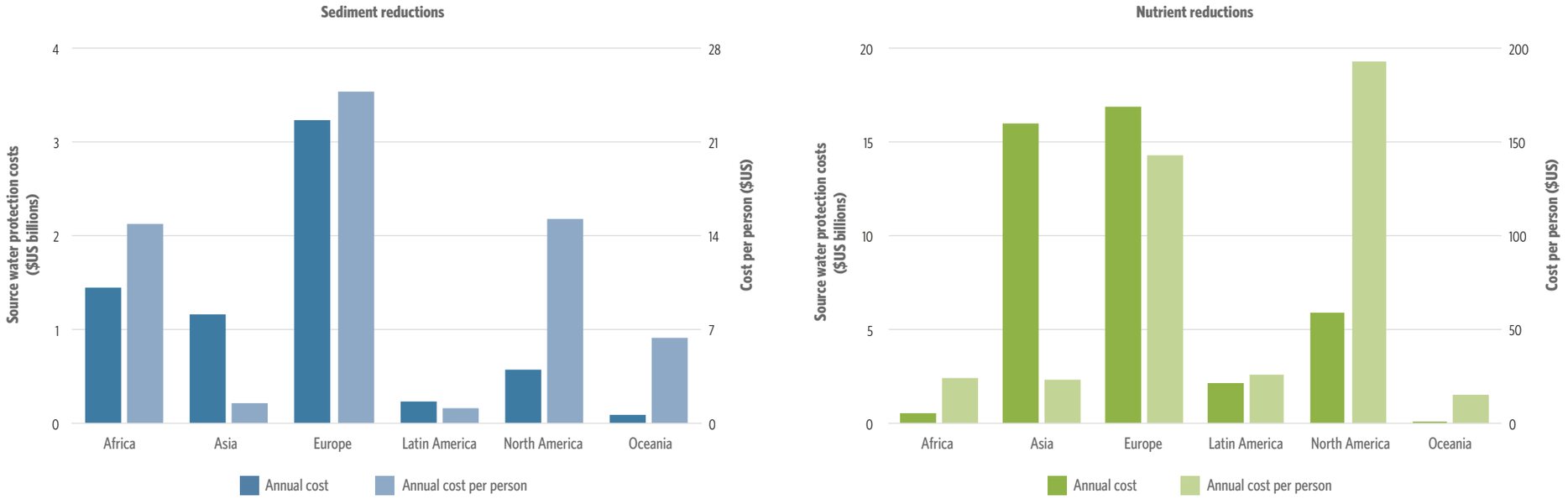


Figure ES.6. Estimated annual costs (total and per capita) of source water protection implementation—through forest protection, pastureland reforestation and agricultural BMPs as cover crops—to achieve a 10 percent reduction in sediment (left) or nutrients (right) in source watershed areas. For each region, a subset of watersheds—particularly within very large basins— heavily skew costs upwards. Results reported here remove these outlier watersheds as measured by per capita costs, showing values for the remaining 90 percent of watersheds within each region.

Integrating reveals more value

Understanding the value proposition of source water protection to each city is critical to making the business case and pooling resources. We analyzed the relative water treatment return on investment (ROI) for the roughly 4,000 cities in our source watershed model and cross-walked these to relative values of co-benefits such as climate change mitigation, biodiversity, and human health and well-being (Figure ES.7). This analysis allows us to target cities that are the most likely candidates for source water protection based on one or more values. The cost-to-benefit ratio of source water protection falls into three broad categories:

1. We estimate that one in six cities—roughly 690 cities serving more than 433 million people globally—has the potential to fully offset conservation costs through water treatment savings alone.
2. Other cities may have a moderate to low relative ROI for water utilities, but may be able to achieve source water protection by also monetizing their climate change mitigation potential. Cities could intercept payment streams where these exist from national ministries or international actors who have made a strong commitment to a stable climate and are looking for on-the-ground opportunities for mitigation.
3. Other cities may be able to achieve source water protection by combining more than two benefits for which payers—public or private—exist. For example, through an examination of the source watersheds of a set of Colombia's largest cities, we find a range of 13 to 95 percent savings when land uses are optimized to achieve multiple goals (sediment, nutrients and carbon) simultaneously rather than individually, on average representing a 63 percent savings in public investment.

Demonstration of stacking co-benefits in different city archetypes

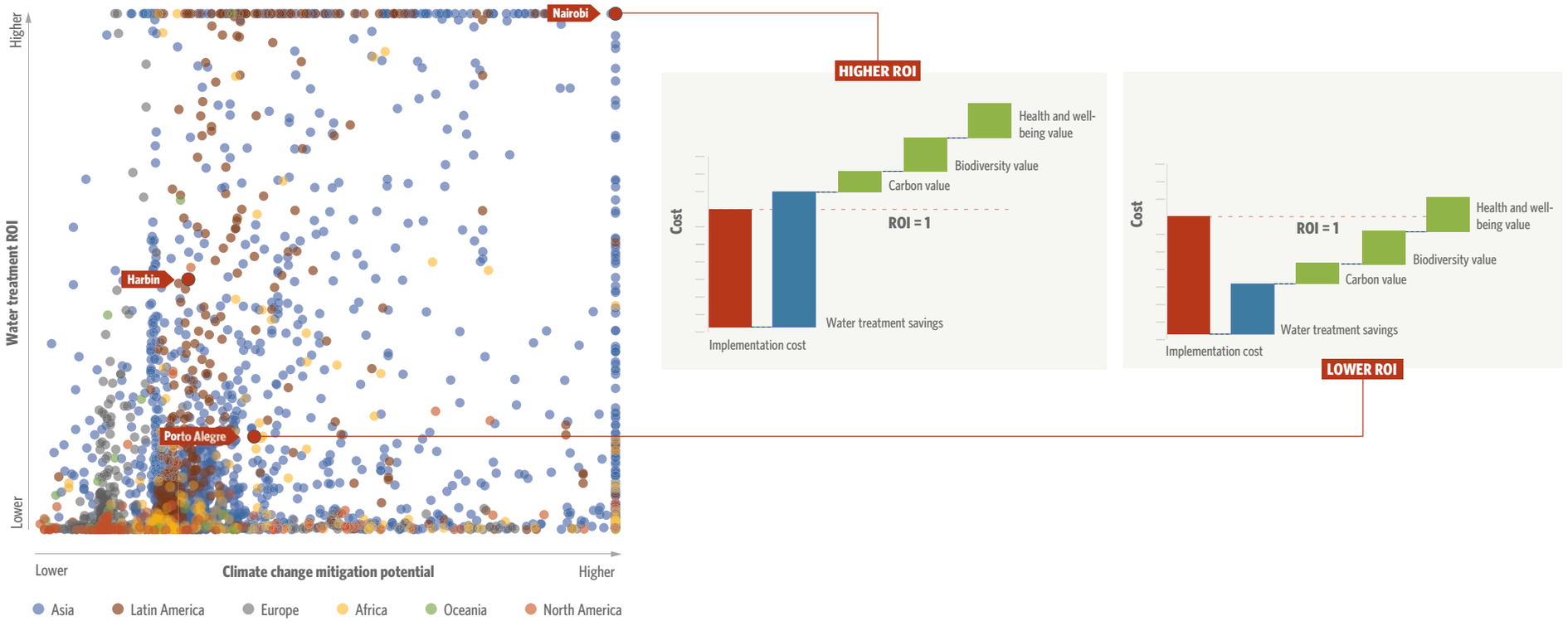


Figure ES.7. Left: Comparison of indicators of potential co-benefit value (horizontal axis) versus relative water treatment ROI (vertical axis). Climate change mitigation potential estimated from annual sequestration potential from reforestation and cover crops as implemented to reach a 10 percent reduction in sediment or nutrients. **Middle:** Illustrative graph showing cities with a positive ROI based solely on water treatment savings. **Right:** Illustrative graph showing cities whose ROI could be positive with the addition of co-benefit values.

Using water funds to scale source water protection

Water funds can scale source water protection by increasing participation based on a solid value proposition. Water funds provide an attractive vehicle for pooling and deploying revenue in watersheds from the diverse beneficiaries of watershed services. Nonetheless, to get to scale, water funds need greater diversity and surety of cash flows. Opportunities to do so include:

- strengthening public funding flows based on a value proposition for water and other values;
- diversifying buyers by bridging into new sectors; and
- positioning source water protection as a smart option for infrastructure investment beyond operations and maintenance (O&M) savings.

Public funding will continue to be critical to source water protection efforts. Water funds with a strong ROI for water treatment or climate adaptation, for example, can pool a percentage of water tariffs, taxes or transfers.

Other sectors could benefit from source water protection but have not entered the market strongly. For example, there is a clear case for the return on investment to hydropower companies. A number of water funds, such as those of Nairobi and Quito, are in operation and on-track to provide direct benefits to hydropower facilities. A detailed cost-benefit analysis predicts a positive return on investment for reforestation efforts upstream of Colombia's Calima Dam.

Equally important is the case for source water protection as a complement to gray infrastructure to capture investments into water funds. In the case of Lima, Peru an analysis of anticipated costs and related dry-season flow benefits found source water protection to be preferable to gray infrastructure in eight-of-ten cases (Figure ES.8).

Enabling upfront financing

If monetized, the benefits will help scale source water protection by enabling upfront financing. With enough diverse and stable payers contributing to water funds, upfront financing becomes possible and could dramatically increase the rate of deployment under the right conditions. For example, in the case of San Antonio, Texas, voters approved four ballot initiatives that authorized bond offerings to fund the Edwards Aquifer Protection Program. The bonds are repaid through tax increases. The capital made available through the bonds made land protection efforts possible in a condensed time frame, critical in an area where urban sprawl was both reducing available protection opportunities and increasing the cost of action over time (Figure ES.9).

In addition to overcoming financial barriers, there are a number of gaps that, if addressed, could accelerate the development and implementation of water funds to help achieve the global impact described here. These include gaps in policy and governance, adequate capacity to deliver, economies of scale in implementation, social acceptance, science and general awareness of source water protection's full potential.

Estimated ROI for generating dry season flows to Lima, Peru's metropolitan area via puna/mamanteo restoration

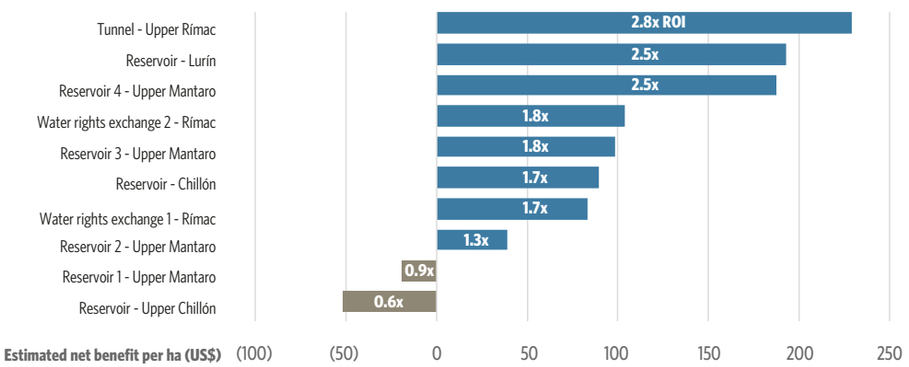


Figure ES.8. A positive ROI is shown with bars extending right of the zero on the X-axis, and represents the ROI of replacing the listed gray infrastructure option on the y-axis with a specific green infrastructure option (restoration of puna/mamanteo system).

Proposed cash flow pattern of water funds with upfront investment

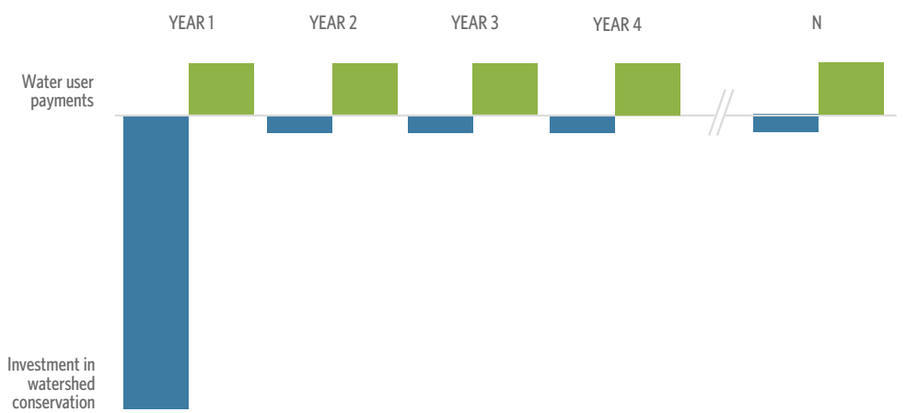


Figure ES.9. Upfront investment in upstream watershed conservation commensurate with program goals, with annual repayment by water users. Adapted from Credit Suisse Group AG and McKinsey Center for Business and Environment 2016 with permission.

For half of cities, source water protection could cost just US$2 or less per person per year
Photo: © Kevin Arnold

A call to action

Forward-looking cities, utilities, land stewards, local communities, lawmakers, corporations and philanthropists are taking steps to secure a more sustainable water future and support the development of healthier, more resilient communities. But more is needed.

Urban leaders should take a full inventory of the economic benefits that would accrue to the city through source water protection. These would include reduced water supply O&M costs and potential avoidance of capital infrastructure and other co-benefits such as climate change mitigation and the conservation of biodiversity and open spaces that have significant positive impacts. City administrations are the most natural participants in the water fund platform, and through policy design, can help intermediate water tariffs, taxes or transfers into cash flows that could support long-term payments to source water protection and help finance interventions.

National leaders should explore how a source water protection portfolio can optimize multiple goals and public investment. In particular, countries may be able to meet a portion of national climate, biodiversity and SDG targets through source water protection efforts that also address regional economic development goals and support water security for municipalities.

Public and private financers and donors are critical as we move from innovation to expansion of water funds. Getting the science and tools to a local scale is essential. Investing in landscape assessments and water fund feasibility studies is a key gap. Ultimately, the scale-up of water funds will also require their development as financial vehicles that can connect capital from mainstream capital markets and institutional investors into the watersheds and their benefits. This will require significant innovation and trial to build a reliable track record for what is effectively a new asset class.

Corporations, as core beneficiaries of water security, are key champions and leaders in water security efforts. Corporations should explore where they face business risks related to water quality or availability, including indirect use such as the power their operations depend upon, and partner with the civil and government sectors to establish water funds in those locations. Corporations might also explore where their own business operations might be expanded to deliver some of the components required to achieve source water protection.

The scientific and non-governmental communities have much to do. This report lays out areas that require more analysis and reflection. These communities should continue efforts to build the understanding of how and when water funds, and more generally source water protection efforts, will be successful, as well as exploring new policy, governance and financial approaches to implementing them.

Upstream land stewards should know the value of their land and understand the impacts of their practices on downstream water quality and quantity. By evaluating the benefits that may be offered through the establishment of a water fund, upstream landowners have an opportunity to improve their lives and livelihoods while improving downstream water quality.

Citizens of the cities that depend on source watersheds should be advocates for their water. The public should know where their water comes from and what's impacting its long-term security. People can advocate for leadership to protect water at its source through policy changes and programs like water funds that put in place long-term implementation capacity.

Cities are and will be the drivers of economic growth of the future, requiring vast public investment as well as creating impact on the lands and waters that make up the extended natural infrastructure on which their resilience will depend. Cities can and should lead in considering what actions should be taken to improve their water security and resiliency. Their actions can also generate benefits such as climate change mitigation and biodiversity conservation that extend far beyond city borders and reach wide constituencies. Our aspirations for a better world require collective action. We cannot afford to work in jurisdictional, financial or motivational silos. Cities can lead, but they cannot do it alone. All of us have a role to play.

The value of source water protection goes beyond water security

Photo: © Sergio Pucci

Online Resources

Interact with the data

The maps and underlying data used in Beyond the Source represent a rich set of resources that lend themselves to further exploration. The Nature Conservancy has developed an online companion to the report, accessed via www.protectingwater.org, that features an interactive map and enables users to explore the data. Users will be able to quickly learn more about the potential for pollution reduction through source water protection around the world, areas of synergy among co-benefits of source water protection, and existing water fund programs and their attributes. Visitors to the site can also gain entry to The Nature Conservancy's Water Funds Toolbox, which provides support to those seeking to establish a water fund, as well as access information and resources on addressing water scarcity around the world.

Dig deeper into the stories

The page developed on The Nature Conservancy's Global Solutions site for the Beyond the Source report digs deeper into the stories of the people whose lives were positively impacted by source water protection and features videos, infographics and photo galleries that further explain the value of conserving nature for the protection of our water resources. This page also offers options to download the report and executive summary. To explore the page, visit www.nature.org/beyondthesource.

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For more information, visit:

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Mapping portal: www.protectingwater.org

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