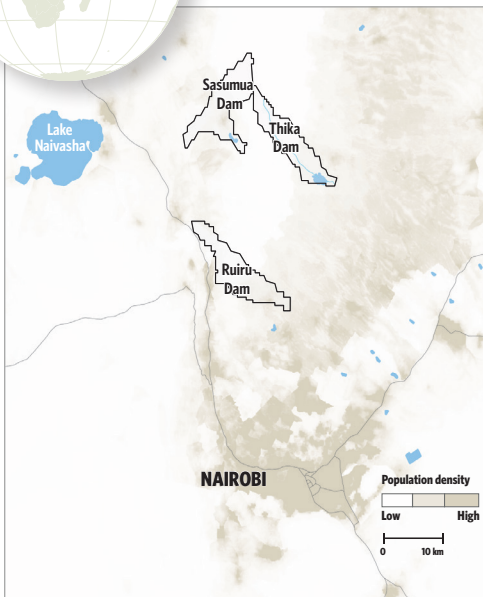


LOCAL SPOTLIGHT

Upper Tana Watershed, Nairobi, Kenya—Economic benefits of protecting source watersheds



Photo: © Nick Hall



The challenge

The Upper Tana River Basin is of critical importance to the Kenyan economy. Covering an area of about 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, resulting in the conversion of forest to cropland and decreasing land per capita.

Smallholder farms are the largest upstream users in aggregate of Upper Tana Basin water above the river's Masinga Reservoir. While economic prosperity in the Upper Tana is closely linked to a range of ecosystem services, natural resources and off-farm employment, the agricultural sector (including crops and pastureland) forms the dominant source of livelihood and labor employment. Unfortunately, the sustainability of small- and large-scale agricultural practices is under growing pressure due to over-cultivation, poor nutrient management, low productivity of livestock in the lower reaches of the basin and persistent encroachment of cropland into forested riparian and high slope areas.

Hydropower generation is the second largest user of water, and threats facing the main hydropower reservoirs, Masinga and Kamburu, encapsulate larger water security risks in the basin. 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 efficiency and lifespan of reservoirs. For instance, by 2001, the Masinga reservoir had already lost an estimated 158 million cubic meters of storage volume due to siltation rates, twice as high as the reservoir was designed to accommodate. Reservoir function has been further compromised by reduced dry season flows resulting from increased demand for irrigation water and encroachment on natural wetlands that once stored runoff water and recharged aquifers.

Action and opportunity

In response to these challenges, the Upper Tana-Nairobi Water Fund was launched to implement a holistic set of conservation activities with the objectives of increasing water yields, reducing sediment loadings, promoting sustainable food production and increasing 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 increased pollinator habitat and carbon storage, were identified (Table 5.4), and cumulative costs and benefits were modeled and assigned to stakeholder groups (Table 5.5). The final analysis concluded that even by conservative estimates the selected watershed interventions could deliver a two-to-one ROI on average over a 30-year timeframe (Figure 5.5). Importantly, the value of co-benefits is estimated to be far greater

List of non-monetized benefits

Stakeholder	Benefit
Nairobi City Water and Sewerage Company (NCWSC)	Reduction in wet sludge disposal
NCWSC	Avoided service interruptions
NCWSC	Increased dry season flows
Other water suppliers	Lowered sediment levels
Municipal water processors	More reliable water supply
Kenya Electricity Generation Company (KenGen)	Reduction in reservoir sedimentation
KenGen	Avoided turbine intake maintenance costs
Upstream farmers	Increased fodder for livestock
Upstream farmers	Additional income and employment opportunities
Urban private sector processors	Improved water supply
Local communities	Cleaner drinking water
General: Ecosystem services	More habitat for pollinators
General: Ecosystem services	Increased carbon storage in new trees planted

Table 5.4. Anticipated benefits of source water protection in the Upper Tana River Basin and recipient stakeholder groups. Adapted from The Nature Conservancy 2015.

than the water treatment savings. By recognizing the multiple embedded values of a healthy watershed, and involving key stakeholder groups, the water fund was able to design a collective action program whereby investing together makes the most financial sense.

Many of these projected benefits are already being measured through demonstration interventions. More than 600 smallholder farmers have received support in implementing soil and water conservation structures on their farms in the Thika-Chania sub-watershed. More than 1,000 small-scale farmers are adopting water harvesting structures in the Maragua sub-watershed. An additional 7,000 coffee farmers have been recruited to adopt soil and watershed conservation practices in the Sagana-Gura sub-watershed, equipping them with the skills to apply for certification by the Rainforest Alliance. As the Upper Tana-Nairobi Water Fund grows and evolves, monitoring the range of benefits will enable adaptive management of the fund and will provide valuable learnings for other programs embarking on developing their own business cases.

Cumulative benefits across benefit streams

Stakeholder	Benefit or (Cost)	Present Value (US\$)
Water Fund	Investment cost	(7,110,000)
Ag producers	Net additional cost, e.g., maintenance	(8,520,000)
Ag producers	Increased agricultural productivity	12,000,000
NCWSC	Avoided flocculants costs	394,000
NCWSC	Avoided electricity costs	36,700
NCWSC	Net revenue from saved process water	2,090,000
NCWSC	Benefits of above, applied to demand met in future	870,000
NCWSC	Total NCWSC benefits with scale-up	3,390,000
KenGen	Avoided interruptions	281,000
KenGen	Increased generation from increased water yield	5,870,000
KenGen	Total KenGen benefits	6,150,000
	Present value of benefits	21,500,000
	Present value of costs	(15,600,000)
	Net present value	5,900,000

Table 5.5. Predicted benefits are over a 30-year time frame. Figures are rounded to three significant digits within each row, while sums are based on exact values. Adapted from Vogl, et al., 2016.



Stanley, fruit and vegetable farmer on his farm 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.

Total annual benefits and costs over a 30-year timeframe including continued maintenance after 10 years (in US\$ million)

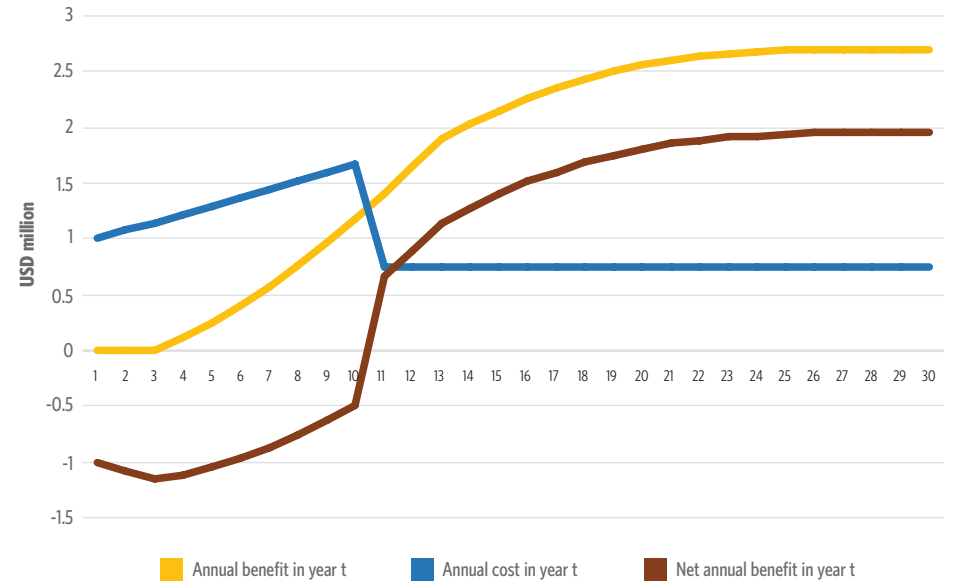


Figure 5.5. The cost-benefit analysis of the water fund based on a 30-year time horizon, with the investment of US\$10 million being disbursed at a rate of US\$1 million per year for 10 years. This figure shows how costs and benefits are anticipated to be realized over time. Adapted from The Nature Conservancy 2015.

NAIROBI DASHBOARD

Water fund start date

2015

Number of upstream participants to date

15,000

Number of potential downstream beneficiaries

More than 5,000,000

Number of partners to date

10

Primary funding sources

Private
NGO/Foundation
Bilateral/Multi-lateral donor agencies
Public
Utility

Activities



Anticipated co-benefits

