



USING NATURE FOR SUSTAINABLE DEVELOPMENT IN RWANDA

INCENTIVES FOR GREEN INFRASTRUCTURE



BACKGROUND

Conservation International (CI) and the International Union for Conservation of Nature (IUCN) are working together with the Government of Rwanda to undertake a range of forest landscape and green infrastructure initiatives. This work is taking place, among other places, in the Yanze sub-catchment. The purpose of the work is to make sure that farmers in rural areas are provided with tools and opportunities to improve their livelihoods. In addition, the benefits of the work include cleaner and more regular water supply in urban areas like Kigali.

USING NATURE FOR SUSTAINABLE DEVELOPMENT

In Rwanda, CI and IUCN are helping to guide forest restoration and raise funds for green infrastructure to ensure clean water supply in Rwanda's cities.

Forest restoration

Presently, IUCN is supporting the Government of Rwanda to implement national wide forest and landscape restoration. IUCN, in partnership with the Rwanda Water and Forestry Authority (RWAF), are implementing a forest landscape restoration project to promote restoration of mosaic landscapes and enhance carbon stocks in Rwanda as well as deepen commitments to Forest Landscape Restoration (FLR) across Eastern Africa. The overarching project goal is the enhancement of carbon stocks and other ecosystem services delivered through landscape scale restoration while catalyzing private investment to upscale nationally and promote regionally.

Green infrastructure for water control

In the past, there has been a lot of emphasis on **grey infrastructure**; grey infrastructure includes infrastructure like tunnels and wastewater treatment plants, and other man-made structures that have been built by societies to help manage their environment, including water flows.

In contrast, **green Infrastructure** is the use of nature to solve urban and climatic challenges. This includes using nature to address water management, reduce heat stress, increase food production, clean water and ensure healthy soils, among other items. These benefits from green infrastructure are also called **ecosystem services**. As one example, green infrastructure can complement and make grey infrastructure more cost-efficient by reducing the volume of stormwater collected—thus avoiding high erosion and sedimentation during heavy rain events. Green infrastructure is a cost-effective and resilient approach to managing wet weather impacts that provide many community benefits. While single-purpose gray stormwater infrastructure is designed to move stormwater away from the built environment, green infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits.

Water runoff is a major cause of water pollution in urban areas. When rain falls onto heavily degraded areas – or areas with lots of cement – the water cannot soak into the ground as it should. Instead, it runs off the land quickly with these high flows resulting in erosion and flooding as well as damaging habitat, agricultural produce, property, and infrastructure. In contrast, when rain falls in natural, undeveloped areas, the water is absorbed and filtered by soil and plants. Water runoff ending in rivers is cleaner, with lower sedimentation loads. Green infrastructure uses vegetation, soils, and other elements and practices to restore some of the natural processes required to manage water and create healthier urban environments.





Green infrastructure in Rwanda

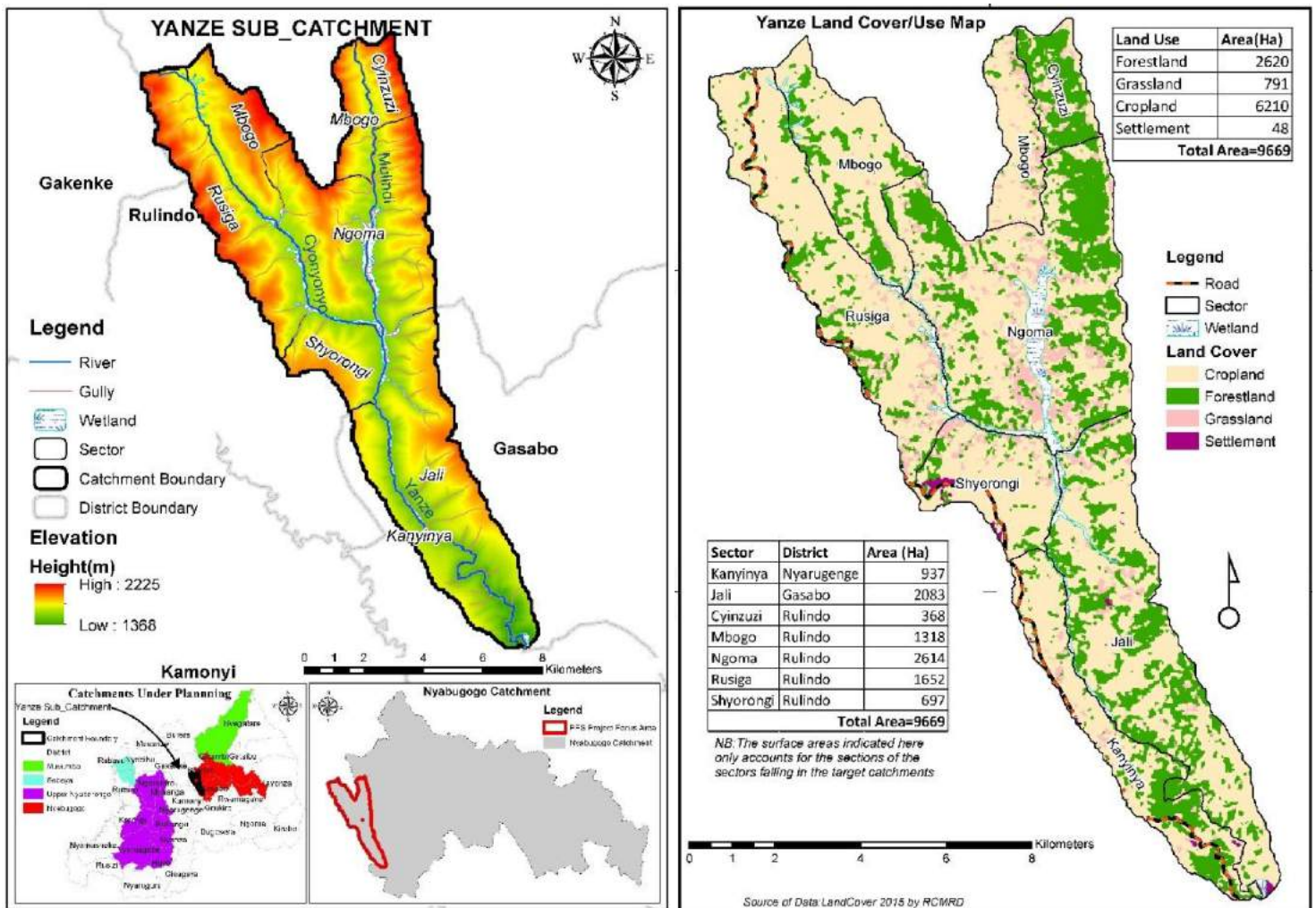
In Rwanda, there has been a push to increase green infrastructure through forest restoration and soil erosion control. However, this was not always the case. In the mid-2000s, Rwanda experienced an electricity supply crisis because the Ntaruka hydropower station did not have enough water running through it; at the time, the Ntaruka hydropower station and another station provided 90% of Rwanda's electricity. The lack of water was because of a mixture of lower rainfall and degradation of the area upstream from the hydropower station (i.e. in the Rugezi Wetlands and the Rugezi-Bulera-Ruhondo watershed). Likewise, high sedimentation significantly increases the costs of water treatment, with many water processing plant requiring frequent repair or change of their machinery.

In response, the Government of Rwanda began promoting erosion control structures, plant trees and grasses, promote environmentally-friendly farming practices, and distribute improved cook stoves. Nowadays, the Ntaruka hydropower station has returned to full operational capacity. This past experience in Rwanda of using green infrastructure to ensure continued clean water availability, is evidence that this kind of approach works.

Yanze sub-catchment

CI and IUCN aim to promote forest reforestation and green infrastructure work in the Yanze sub-catchment. This sub-catchment is within the Nyabugogo catchment and has an area of 24,623 ha extending in two districts of Kigali City (Nyarugenge and Gasabo) and Rulindo district in the Northern Province. It is characterized by moderately steep slopes (with many areas registering slopes of over 25%), high rainfall intensity and intensive land use.

The sub-catchment's major water source is Yanze river which also feeds the Water Treatment Plant that supplies over 80% of water requirements for Kigali City. Due to increased water demand in Kigali City, coupled with decreased water quantity in Yanze River, Electricity Water and Sanitation Authority (EWASA) constructed a small dam a few meters away from the intake for water storage.



Figures: The locations of rivers in the Yanze sub-catchment as well as elevation (left) and land cover (right).



Water flow

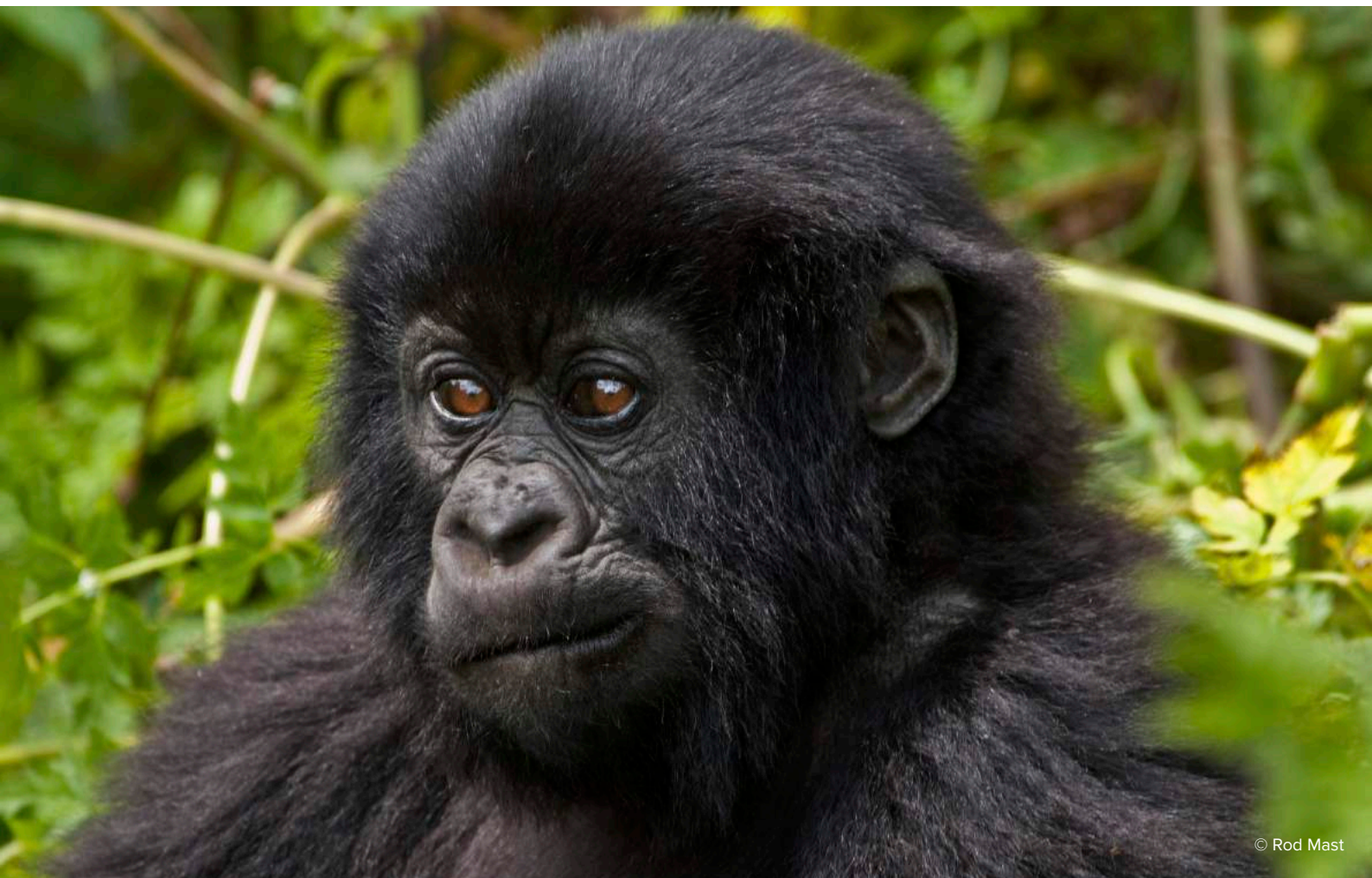
The Yanze catchment is characterized by three main rivers: Cyonyonyo, Mulindi and Yanze. Flowing from North to South, both Cyonyonyo and Mulindi drain their waters in river Yanze which also flows to the south. Water in the river is known to be of poor quality, mainly due to sediments from agriculture and upstream mines, and pollution from drainage/sewerage among others.

Socio-economic characteristics

The population of Yanze sub-catchment is estimated at 122,687 inhabitants with over 26,000 households at an average household size of 4.6. Generally, the Yanze sub-catchment is characterized by a rural population, largely dependent on subsistence agriculture and heavily on fuel wood.

Key actors in the sub-catchment

The key actors involved in various interventions in the sub-catchment are: Water and Sanitation Authority (WASAC), Skol Brewery, Ministry of Natural Resources (MINIRENA), Ministry of Environment (MoE), Ministry of Land and Forestry (MINILAF), Rwanda Environment Management Authority (REMA), Rwanda Agricultural Board (RAB) and Community Based Organisations (CBOs).



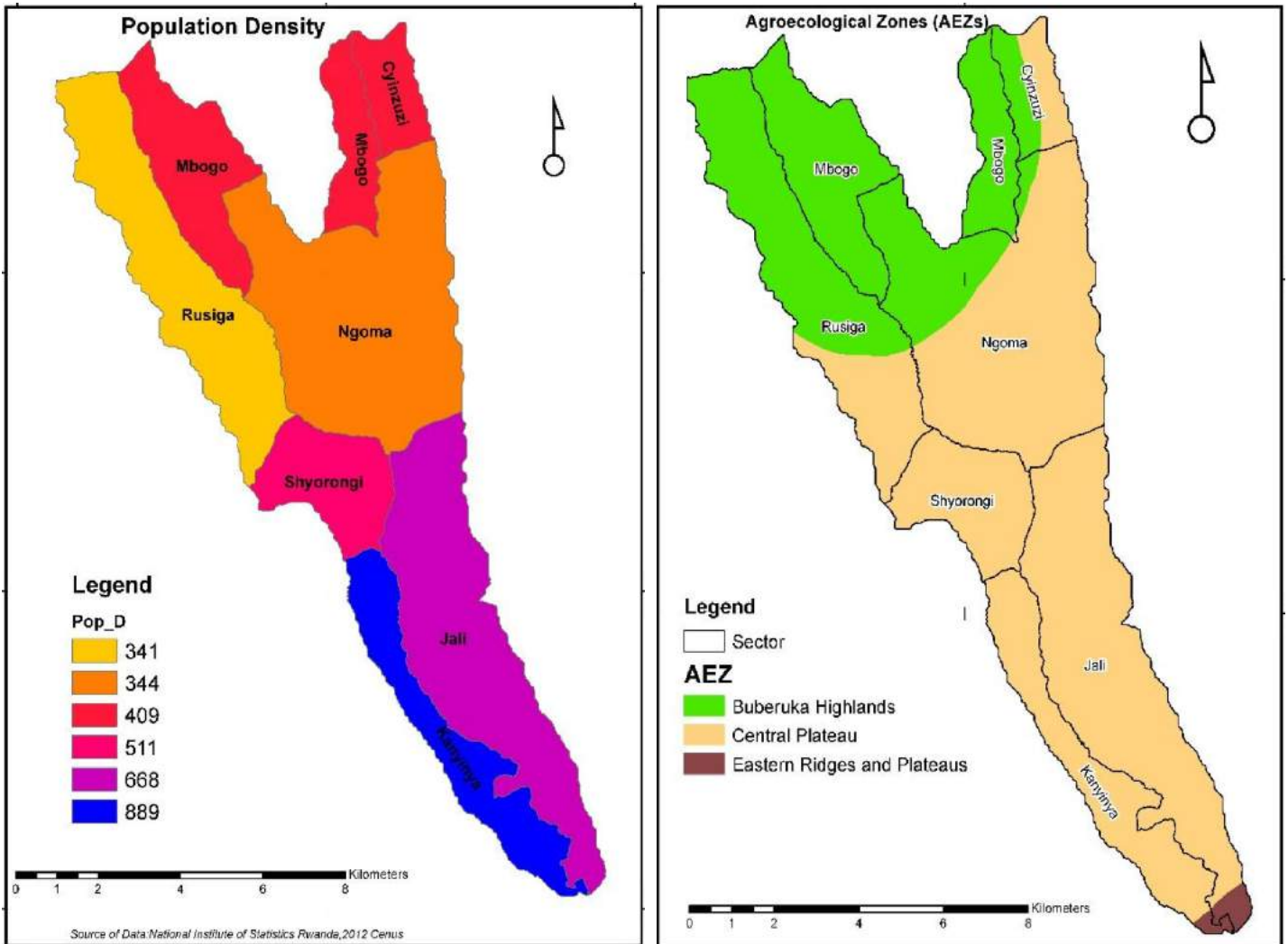


Figure: The human population density (left) and the types of agro-ecological zones (right) across the Yanze sub-catchment.

Challenges in the Yanze sub-catchment

Degradation: The catchment is degraded particularly due to soil erosion that affects an important portion of agricultural land. The impacts of erosion have been numerous: i) loss of soil fertility by leaching arable lands; ii) increasing sedimentation on land cultivated downhill from eroded plots; iii) Risk of destruction of crops and sand banks which are particularly high in marshlands and valleys. iv) Risks of landslides, flooding and mudslides and v) risk of irreversible leaching of soils.

Siltation and sedimentation: The costs for water treatment are high especially during the rainy seasons due to siltation and sedimentation. Stone quarrying along the steep slopes combined with run-off has resulted into the flow of soils, gravel, stones, vegetation and sand to low lying areas within Yanze River where some of them are retained and then finally mined. The water treatment costs especially chemical purchases and maintenance of equipment rise with the level of turbidity.

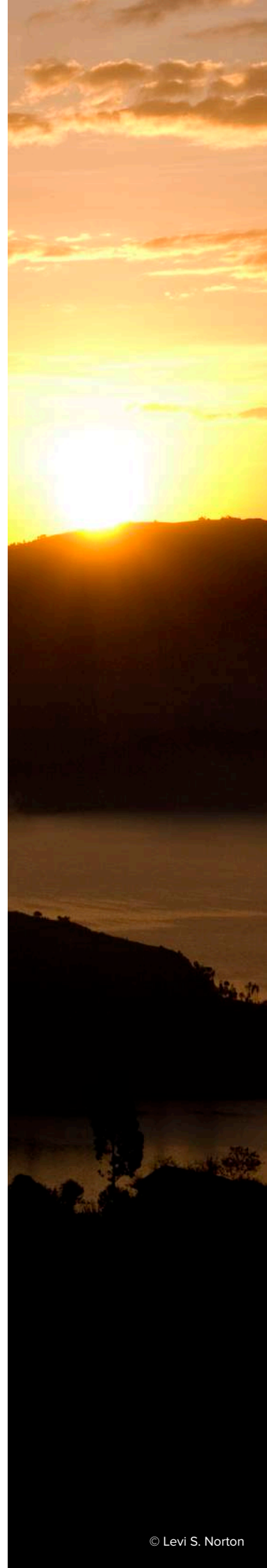


Encroachment on the river banks: There are a lot of human activities including agricultural activities and residential houses close to the banks of the River. These practices have been found to threaten the water quality of Yanze River. Hazardous waste such as pesticides, detergents, oils and petroleum products washed along the River banks pose a great health threat to the aquatic ecosystem within the catchment. Degradation in recent decades has brought reduction of the quantity and quality of land and water resources affecting water supply in Kigali.

Harnessing green infrastructure through incentives for ecosystem green infrastructure programming

In the Yanze sub-catchment, it is evident that working to build green infrastructure upstream will not only help the communities in the Yanze sub-catchment, but also help the businesses and communities that rely on the water from the Yanze river downstream. However, people living in Yanze often do not have the resources available to build green infrastructure on their own; for example, they may not have the funding or incentives to plant trees and to ensure that soil erosion is decreased.

This is where a program called Incentives for Ecosystem Services (IES) can be very useful. Ecosystem services are all of the benefits that came from nature and include all of the benefits that have been described in this brief, including cleaner and reliable water and healthy soils. In the case of the Yanze sub-catchment there are many businesses and communities downstream – in Kigali, for example – who benefit from the upstream ecosystem services that farmers (and others) can provide if they build infrastructure. In other countries, these downstream communities have sometimes provided incentives to upstream farmers to ensure that those farmers continue providing their green infrastructure services, hence the name: Incentives for Ecosystem Services.



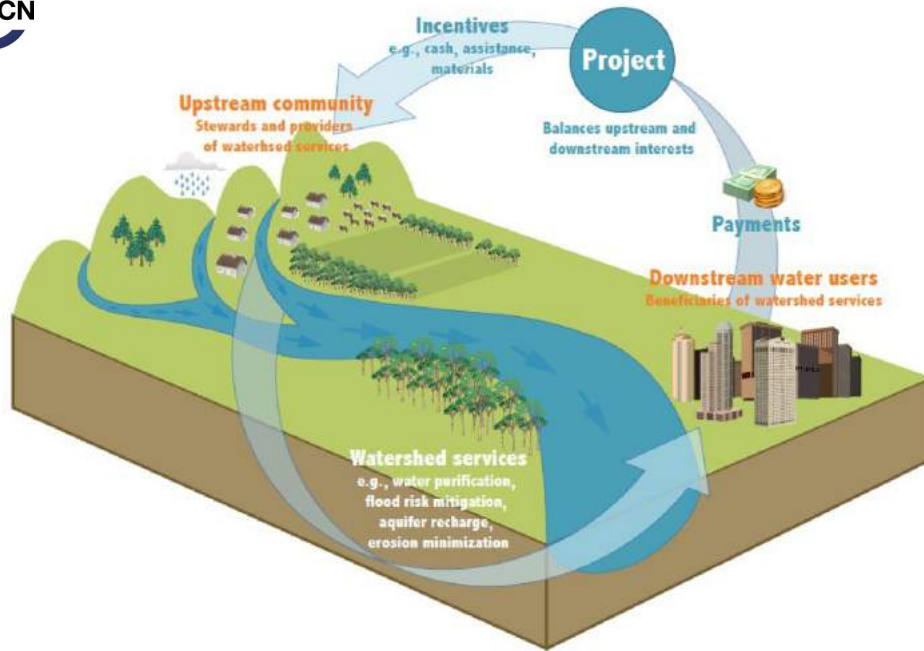


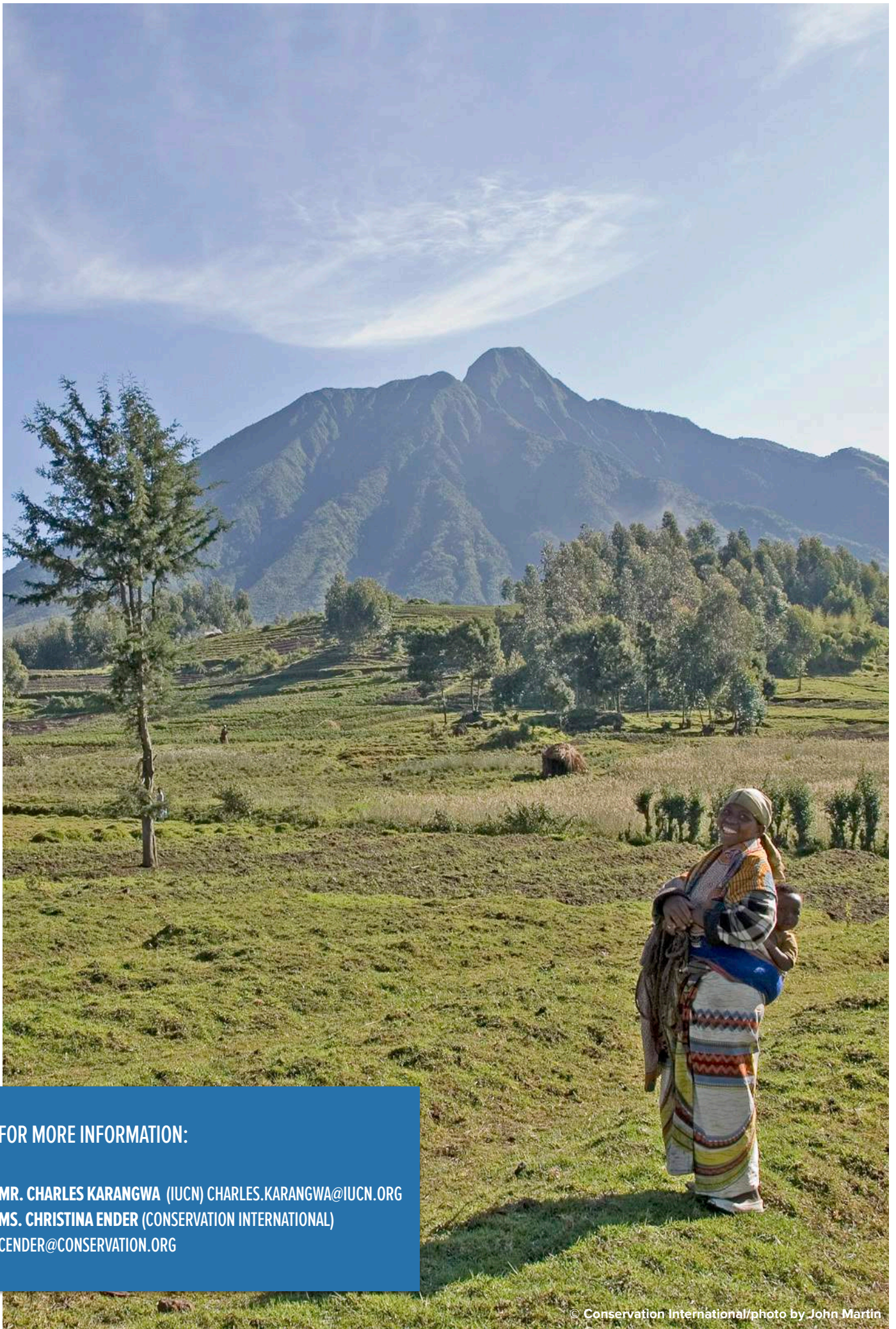
Figure: This image shows the how Incentives for Ecosystem Services works to connect downstream to upstream communities. Source: forest-trends.org

Next steps

IUCN and CI, together with the Government of Rwanda, are seeking resources to implement both green infrastructure programming and to pilot Incentives for Ecosystem Services in the Yanze Catchment. Over the next couple of years, we aim to work together with local communities as the resources are secured.

The Gaborone Declaration for Sustainability in Africa (GDSA) is working to share the lessons learned from this initiative with its member countries.





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