



MANAGEMENT AND CONSERVATION OF  
**MT. KENYA FOREST**

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BUSINESS CASE FOR SUSTAINABLE RESTORATION



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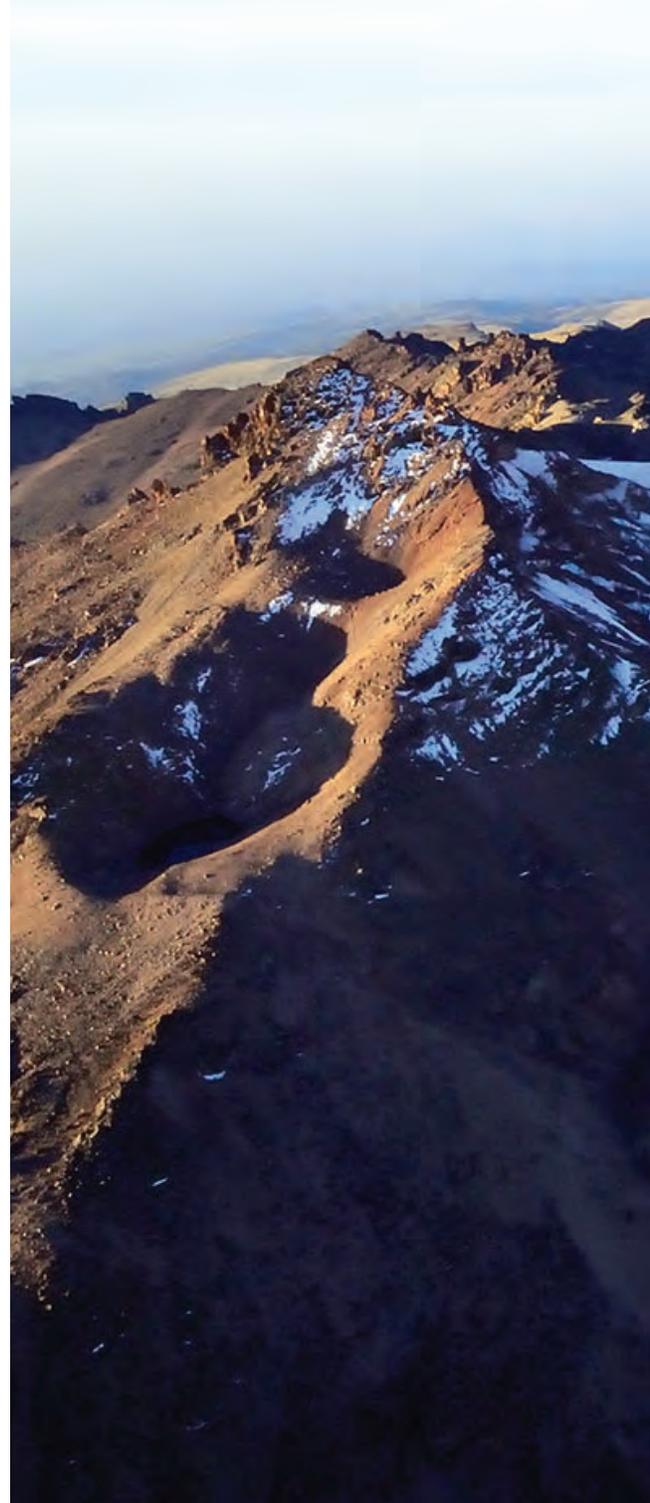
## BACKGROUND

**M**t. Kenya ecosystem holds one of the key pillars to Kenya's economic development. Its forest is an important water catchment area that provides fresh drinking water for over two million people. The forest is also a major source of water for agriculture, hydro power generation and manufacturing industry.

Unfortunately, the Mt. Kenya ecosystem is undergoing a serious degradation. Deforestation remains the greatest threat facing the Mt. Kenya forest. This threat has impacted negatively on the quality and quantity of water flowing downstream. Over the years there has been a decrease in water volume due to loss of forest cover. Hydro power and water abstraction reservoirs are getting silted with sediments from degradation, significantly raising water treatment costs. Rapid urban population growth and unprecedented industrial activity has given rise to increased water stress, further compounding the situation. Kenya's ability to realize Vision 2030 targets is in jeopardy.

Rehabilitating Kenya's degraded water catchment areas is key to securing quality water supplies. Restoring Mt. Kenya and indeed other vital watersheds, and their surrounding landscapes, is not a choice but an obligation.

Engagement and collaborative working sit at the heart of a viable catchment restoration approach. ***The Management and Conservation of Mt. Kenya Forest: Business Case for Sustainable Restoration*** describes how governments (national and county), local communities and the private sector can collaborate to conserve the Mt. Kenya catchment area. This business case proposes interventions for private sector engagement in restoration and repair of damaged watersheds found within this important ecosystem. Through a business case centered on a practical partnership that seeks to rehabilitate and manage catchments, corporates can take actions that support restoration of a sustainable water balance while also generating business value for their particular enterprises. By so doing, companies will adapt to a new approach of working with communities to safeguard not only their water supplies but also their reputation, for the good of the environment, business and people.

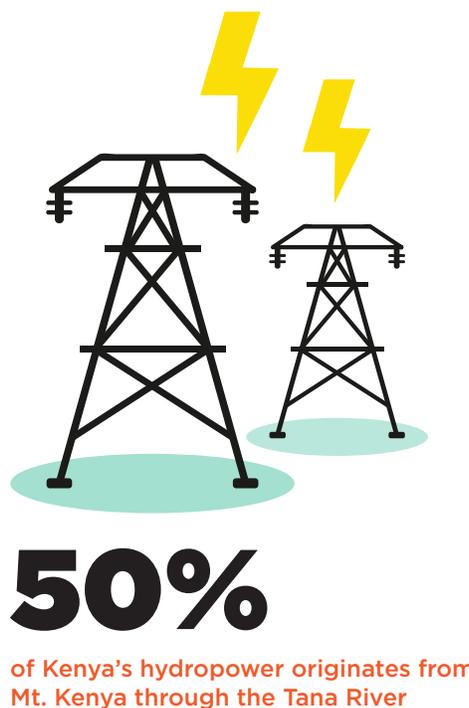
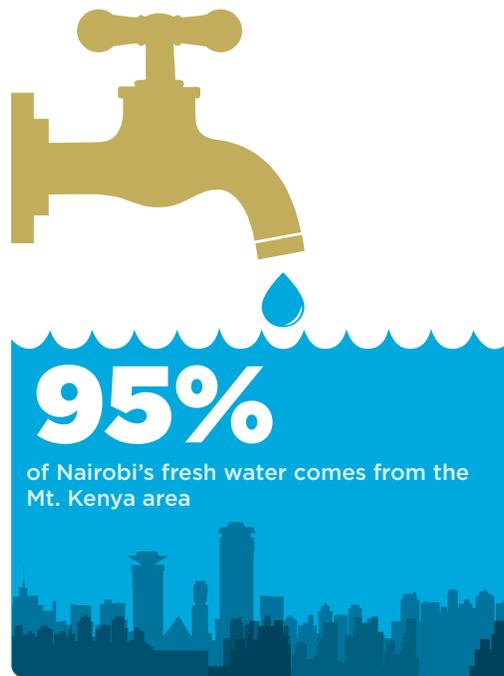




## THE PROBLEM

**M**t. Kenya is one the largest water catchments for Kenya. It is strategic to Kenya's development: It is vital for food production, fisheries, electricity, livestock wildlife, and people. Mt Kenya forest, together with the Aberdare ranges provides about 95% of Nairobi's water and 70% of Kenya's hydropower through the Tana River. However, Mount Kenya Forest receives inadequate attention and protection leading to rapid environmental degradation. Water quantity and quality is reducing. Flood regulation functions are increasingly impaired. Climate change is biting. Future business sustainability is uncertain. Kenya's economic growth targets are at risk.

Local residents, who farm in the upper Tana watershed, receive insufficient incentives from downstream water users. Agencies and community forest associations have insufficient capacity to implement forest policy and law. As a result, measures to reduce forest degradation and soil erosion are insufficient. The forest is encroached, tree cutting is rampant, riverine vegetation and river banks are destroyed. The rivers and water storage reservoirs including hydro-power dams are being choked by sediments. The quantity and quality of water is reducing. Hydropower and water supply dams are silting. Business and provision of services (water supply, electricity generation, and food production) are threatened. Future Kenya's economic prosperity and human wellbeing is in jeopardy. Conserving Mt Kenya is not a choice but an obligation for business, government and local communities.



## THE SOLUTION

**U**rgent action is needed. Downstream water users including business, hydropower producers, crop farmers, and water transfer companies need to provide incentives for upstream stakeholders and forest protectors to halt forest loss and restore degraded areas and promote sustainable land management and production. Funding this proposal is equal to funding future sustainability of your water-dependent business. It offers a very powerful way to motivate and engage your employees, as well as your suppliers and customers and it is also a simple cost-effective way of enhancing well-being in the communities where you operate. It is a model for other businesses.

This intervention will enable your company to demonstrate your commitment to environmental management, but also to build a strong relationship with your neighbours who are the water producers or to help you drive towards replenishing the raw material of your product. Sustaining water flows is equal to business sustainability.

### **Duty Bearers**

Government, business and local communities.



## WHY MT. KENYA?

The hydrologic services provided by Mt. Kenya and the Upper Tana River ecosystem are of key importance for the Kenyan economy and environment. Tana River is the most productive basin for agriculture in Kenya that provides water, generates 70% of the total hydropower production of the country, and supplies 95% of Nairobi's water. Rain-fed smallholder agriculture uses 36% of the water budget, mostly through transpiration from crops.

Hydropower uses 33% of the Mt. Kenya water. Although hydropower use is non-consumptive, the business is seriously affected by low water levels and siltation. Irrigated agriculture utilizes about 4% of the water budget, while around 2% is abstracted for Nairobi's water supply.

Nearly all the The Upper Tana basin supplies Nairobi city water through the Sasumua and Ndakaini dams drawing water from the Chania and Thika rivers respectively. 82% of forest adjacent community in Kirinyaga, Embu, Meru, Nyeri and Tharaka Nthi Counties access water for domestic use from rivers originating from Mt. Kenya forest. Water quantity and quality is generally reducing. Sediment load into hydropower dams is threatening electricity production. The cost of water treatment has increased due to pollution. Water demand for drinking and industry water cannot be met. Taking immediate action is not a choice but an obligation.



# FOREST ECOSYSTEM VALUES

Forests are important in many ways. Mt.Kenya forest is estimated to provide ecosystem services valued at US\$220 million annually. Some of the values of forests that we know about today include:

## 1 Water:

Forests catch, store, clean and release water.

By trapping and absorbing water, forests reduce flooding. By storing and releasing water slowly, forests stabilizing water supplies and reduce the effects of drought.



## 2 Energy:

Forests produce wood, which may be used as firewood or charcoal.

Water from forests flows to hydro-electric power plants, producing electricity:-90% of household use Firewood and charcoal as the main sources of cooking energy. 70% of Hydropower in Kenya is generated in the Tana River basin.



## 3 Soil Conservation and Fertility:

Trees enrich the soil and protect it from erosion. This means less silt in rivers, dams and the sea, and better soil for farmers. The PELIS Program earns US\$39million annually through sale of farm produce. Nyayo Tea zone in Mt. Kenya earn US\$5million annually.



## 4 Air Quality and Environmental Services:

Forests help to moderate the climate. Near forests, hot days are less hot, and cold nights less cold, than in open areas. By storing carbon dioxide, forests help to regulate the gases in the atmosphere around the earth. This helps to slow down climate change. Carbon stocks of Mt. Kenya forest are estimated to 83 million tonnes valued at U\$D1.8 billion.

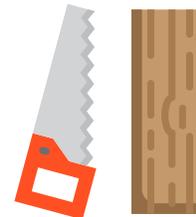


## 5 Timber:

Forest trees produce wood and poles

for houses, furniture, fences, telephone and electricity lines, paper, tools and works of art.

Certain special trees are used to make products for religious or social ceremonies. The annual value of timber from forest plantations in Mt. Kenya estimated US\$14million annually.



## 6 Non-timber Forest Products:

These include medicinal plants, gums and resins, fibres for ropes, seeds for ornaments, fruits and honey from forest flowers. Harvested non-timber forest products from Mt. Kenya forest is estimated value of wild -US\$124 million annually. This is mainly livestock fodder, firewood and honey.



## 7 Biodiversity:

Mt. Kenya  
Ecosystem

is a biodiversity hotspot that is globally recognized as an Important Bird Area (IBA), Key Biodiversity Area (KBA) and a World Heritage Site. In Kenya, 50% of all the different kinds of trees, shrubs and woody vines are found in forests. And 40% of large or medium-sized kinds of mammals, 35% of butterflies and 30% of bird species live in forests. (Yet forests are only 2% of the land area!). In Kilifi County, for example, forests shelter six bird species that are globally threatened with extinction – unless the forests are conserved. Mount Kenya forest provide water that is the lifeline to wildlife in many other conservation areas including community conservancies (West Gate, Meibae, Kalama, Sera), Private conservancies (Ol Pejeta, Borana, Lewa, Losaba etc), National Reserves (Samburu NR, Buffalo Springs NR and Shaba NR) and National Parks (Meru and Kora).



## 8 Tourism and Recreation:

Mount Kenya ecosystem has a high tourist appeal due to its unique geomorphologic features; scenic, cultural and historical sites; and a rich biodiversity heritage. Mt. Kenya is the second highest mountain in Africa and has a great appeal to mountain climbers. Many people derive livelihoods as porters and guides while the running of hotels around the ecosystem promotes employment both directly and indirectly through the follow-on demand for goods and services. Visitors to Mt. Kenya National ecosystem bring in US\$ 15.6million annually into the local and national economy. This would decrease to



about US\$ 9.6 million if the current forest degradation trend continues.

## 9 Sacred Spaces:

Many forests are sacred places to local communities. Some forests are the sites of religious or cultural ceremonies, for example the coastal Kaya forests, In the case of Mt. Kenya, the ecosystem has a high but undocumented cultural value to the local community members. Communities living around Mt. Kenya Forest derive cultural and religious benefits from it. The ecosystem provides an important location for religious rituals for many of the local communities. During the struggle for independence of this country, the mountain was used as a hideout and a sanctuary for the Mau Mau freedom fighters. The forest has also been recognized internationally having been declared a world heritage site in 1997.



## 10 Drought Refuge:

Traditionally, pastoralist peoples conserved forests, in order to use them for grazing in times of drought. They moved the cattle out of the forest once the drought was over.



## 11 Other Services:

Activities in forests provide employment to neighboring communities in forestry and conservation activities and in the recreation and tourism enterprises.



## THE EFFECT OF DEFORESTATION ON KENYA'S ECONOMY

**D**eforestation has a cumulative effect. Whereas the cash value of timber and fuelwood has a one-off value, the consequences of deforestation in preceding years continues to be felt in the economy in every subsequent year. The regulating services of Kenya's natural ecosystems are important production factors in the agriculture, forest, fishing, electricity, water, and public administration and defence sectors. In 2018, agriculture, forestry and Fishing contributed 34.2 % while electricity, water, public administration contributed 6.0 % of the Kenyan GDP in 2018 of the GDP (KNBS, 2019)<sup>1</sup>. In addition, these sectors have a very significant multiplier effect on the rest of the economy's GDP. Deforestation can lead to significant economic losses. For example, by 2010, the cumulative negative

effect of deforestation on the economy through reduction in regulating services was approximately KSh 3.652 billion/year (UNEP 2012)<sup>2</sup>.

Forest degradation also leads reduction in water quality due to siltation and elevated nutrient levels running off degraded land into fresh water systems, reduced inland fish catch by KSh 86 million and increased the cost of water treatment for potable use by KSh 192 million (UNEP 2012)<sup>2</sup> in 2010. At Masinga Dam, sedimentation rates have increased from 0.6 - 0.9 million tonnes/year (Brown et al (1996)<sup>3</sup> to the current 7.0 million tonnes/year (Njogu 2019)<sup>4</sup>. Deforestation also reduces the water flow regulation potential of a forest ecosystem.



Kenya shillings

**3.65**

billion/year

the cumulative negative effect of deforestation on the Kenyan economy.

# THE MT. KENYA BUSINESS CASE

## Role of Mt. Kenya on Hydropower Generation

Mount Kenya, Kenya’s highest mountain is located on the equator. Forests cover the major part of the mountain which presents a rich biodiversity, not only in terms of ecosystems but also in terms of species. Mt. Kenya plays a critical role in water catchment and is one of the five main “water towers” of Kenya with the Aberdare Range, Mau Complex, Cherangani Hills and Mount Elgon, all providing most of the nation’s water

Most (70%) of Kenya’s hydropower is generated at 10 hydropower stations on the Tana River. Most of this power is generated at the Seven Forks scheme built between 1968 and 1988 and the Masinga Dam and the Kiambere dam, built in 1981 and 1988, with an installed generation capacity of 40 MW and 144 MW respectively (WRMA,

2009)<sup>5</sup>. The Government of Kenya (GoK) plans to further boost hydropower to meet the increasing electricity demand through additional hydropower stations like the High Grand Falls (HGF) dam, which is projected to have a rated power output between 500 MW and 700 MW. Hydroelectricity production has historically been lower during periods of drought. Although hydropower generation is not a highly consumptive water use, it is highly sensitive to decreases in water availability and river flow. Dry-season flows especially severely limit hydropower generation. Owing to the importance of hydropower in the economy of Kenya, reduced dry-season flows make the economy of Kenya especially vulnerable to deforestation.



**Table 1: Main Characteristics of the Seven Forks Dams (Republic of Kenya, 2011a)<sup>6</sup>**

| Dam Characteristics                          | Masinga | Kamburu | Gitaru | Kindaruma | Kiambere |
|----------------------------------------------|---------|---------|--------|-----------|----------|
| Catchment Area (km <sup>2</sup> )            | 7,335   | 9,520   | 9,667  | 9,807     | 11,975   |
| Reservoir Capacity (million m <sup>3</sup> ) | 1,560   | 150     | 20     | 7         | 485      |
| Average Discharge (m <sup>3</sup> /s)        | 75      | 97      | 98     | 99        | 112      |
| Power Plant Capacity (MW)                    | 40      | 94      | 226    | 44        | 168      |
| Head (m)                                     | 50      | 82      | 144    | 37        | 150      |

Source: (IVM, 2016)<sup>7</sup>

## Contribution of Mt. Kenya to Water Services

### Drinking Water

Further upstream of the Seven Forks Dams, the flow of the Chania and Thika tributaries was blocked by the Sasumua (1968) and Thika (1993) dams (Nippon Koei, 2013a)<sup>8</sup>. These dam reservoirs are utilized to divert water for domestic purposes to Nairobi and satellite towns, located in the neighbouring Athi Catchment Area. It delivers more than 80% of the water consumed in the (peri-) urban regions of Nairobi (Odhengo *et al.*, 2012)<sup>9</sup>. Other water transfer schemes are in place from the Masinga reservoir to Kitui and from the Kiambere reservoir to Mwingi, both supplying water for domestic purposes as well.



*Protecting trees, woods and forests is the first and often the cheapest step to sustaining drinking water supplies.*

**Table 2: Main Characteristics on the Water Transfer Schemes**

| Water Source                               | Sasumua Reservoir         | Thika Reservoir           | Masinga Reservoir | Kiambere Reservoir |
|--------------------------------------------|---------------------------|---------------------------|-------------------|--------------------|
| <b>Demand Centre</b>                       | Nairobi & satellite towns | Nairobi & satellite towns | Kitui             | Mwingi             |
| <b>River</b>                               | Chania                    | Thika                     | Tana              | Tana               |
| <b>Year of Commissioning</b>               | 1968                      | 1993                      | 1981              | 1998               |
| <b>Transfer volume (m<sup>3</sup>/day)</b> | 56,200                    | 414,700                   | 7,296             | 1,390              |
| <b>Inter/intra Basin water transfer</b>    | Inter                     | Inter                     | Intra             | Intra              |
| <b>Transfer distance (km)</b>              | 60                        | 50                        | 60                | 70                 |

Source; (IVM, 2016)<sup>4</sup>

### Food Production

According to the Republic of Kenya (2011)<sup>10</sup>, the total cropping area in the Tana watershed in 2011 was about 1.0 million ha. However, irrigation-based farming is still a limited practice in the basin. The irrigation potential is estimated to be around 132,000 ha, of which 64,425 ha is irrigated already (Agwata, 2006)<sup>11</sup>. The irrigated land is divided into 11,200 ha (17%) large-scale schemes, 14,823 ha (23%) small-scale schemes, and 38,402 ha (60%) private schemes. They are managed by several governmental authorities, such as TARDA or the National Irrigation Board (NIB), or by private organizations (Republic of Kenya, 2011b)<sup>9</sup>. These crops are respectively farmed at the Mwea (7,860 ha), Kaggari-

Gaturi-Kieni (700 ha), and Mitunguu (600 ha) irrigation schemes. The large-scale irrigated areas currently in use, represent just a fraction of the land that was initially proposed for irrigation. These schemes include the Bura Irrigation Project (maize), Hola Irrigation Project (maize) and Tana Delta Irrigation Project (rice), currently areas under irrigation of 3,000 ha, 1,000 ha, and 2,000 ha, respectively. By contrast, the initial plans were to cover 11,700 ha in Bura, 4,800 ha in Hola and 4,000 ha in the Delta.

**Table 3: Key Characteristics of the Existing Large-scale Irrigation Schemes in the Tana Catchment Area**

| Irrigation Scheme                                            | Mwea             | Kaggari-Gaturi-Kieni | Mitunguu        | Bura                    | Hola                   | Tana Delta                        | Del Monte K. Ltd             |
|--------------------------------------------------------------|------------------|----------------------|-----------------|-------------------------|------------------------|-----------------------------------|------------------------------|
| <b>Irrigated Area (ha)</b>                                   | 7,860            | 700                  | 600             | 3,000                   | 1,000                  | 2,000                             | 8,000                        |
| <b>Water Source</b>                                          | Thiba & Nyamindi | River Thuchi         | River Thingithu | Nanighi pumping station | Makere pumping station | Tana River, 13 km north of Garsen | Thika River, Makindi, Samuru |
| <b>Average water abstraction (1,000 m<sup>3</sup>/month)</b> | 43,034           | 555                  | 485             | 2,379                   | 793                    | 1,095                             | 11,718                       |
| <b>Dominant Crop</b>                                         | Rice             | Bananas              | Horticulture    | Maize                   | Maize                  | Rice                              | Pineapple                    |
| <b>Year of Commissioning</b>                                 | 1956             | Unknown              | 2013            | 1982                    | 1953                   | 1997                              | Unknown                      |
| <b>Executing Agency</b>                                      | NIB              | NIB                  | NIB             | NIB                     | NIB                    | TARDA                             | Del Monte K. Ltd             |

Source; (IVM, 2016)<sup>4</sup>



## CHALLENGES FACING THE **UPPER TANA**

Since the 1970s, large areas of forests in the Upper Tana have been replaced by agricultural fields. Demand for irrigation water has increased, particularly to support horticulture production. Encroachment on natural wetlands that once stored runoff water and recharged aquifers has reduced dry-season flows. Agricultural expansion along with soil erosion and landslides has increased sediments in local rivers and dams. The combination of these factors

means that in the Tana River there are lower water yields during dry periods and increased sediment in streams. Studies indicate that over sediment load into hydropower and water abstraction dams is 2,796 tonnes/day in the dry season and 24,322 tonnes/day in the wet season. With this rate of silt load, hydropower productivity and water supply is assured to reduce to uneconomical levels.



# MT. KENYA DEFORESTATION STATUS AND TRENDS

In the late 1990s, numerous reports and public outcry about forest destruction on Mt. Kenya called for a rapid and systematic assessment of the status of the forests. The assessment was to inform all stakeholders and trigger new policy measures to stop forest destruction. Consequently, Kenya Wildlife Service, with the support of UNEP, undertook an aerial survey of the entire forest of Mt. Kenya in 1999. The survey was to provide factual information on the type, extent and location of destructive activities in the forests.

The result of the survey established that the whole of Mt. Kenya forests are heavily impacted by extensive illegal activities leading to serious destruction below the bamboo/bamboo-podocarpus belt. Over 6,700 Camphor (*Ocotea usambarensis*) trees have been destroyed through logging whereas in

the overall 14,662 indigenous trees have been cut. Over 75 percent of clear-felled plantations have not been replanted with tree seedlings. Encroachment into edges of indigenous forests was recorded emanating from Shamba-system cultivated areas. Most of all the natural forest in the Lower Imenti have been destroyed and are under crop cultivation. In the lower part of the Upper Imenti, extensive past and on-going charcoal production is rampant, leading to extensive destruction of the indigenous forest. Marijuana (bhangi) cultivation is quite extensive totaling 200 hectares in 1999, and is being grown in the indigenous forest from the edges to deep inside and high up in the forest. The Ngare Ndare is impacted by illegal logging of Cedar (*Juniperus procera*), livestock grazing and fires.

**Table 4: Forest Values their Drivers of Change and Impacting Beneficiaries**

| Impacted Forest Services                                                                                                                                                                                                                                                                                                                                        | Direct Drivers of Change                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Energy (wood fuel/hydro-power)</li> <li>• Wildlife habitat (e.g. Mt Kenya, Aberdares)</li> <li>• Rain water storage/recharge</li> <li>• Regulation of river flows</li> <li>• Regulation of climate</li> <li>• Carbon sequestration</li> <li>• Medicinal plants</li> <li>• Cultural/sacred sites and tourism</li> </ul> | <ul style="list-style-type: none"> <li>• Encroachment</li> <li>• Overharvesting of commercial timber (e.g. Camphor in Mt. Kenya)</li> <li>• Illegal logging (e.g. Cedar posts)</li> <li>• Overgrazing</li> <li>• Human induced forest fires (e.g. Mt. Kenya and Aberdares)</li> <li>• Poorly managed plantations</li> <li>• High timber market prices</li> <li>• Climate change</li> </ul> |
| Economic Sectors that Benefit                                                                                                                                                                                                                                                                                                                                   | Economic Sectors that Impact                                                                                                                                                                                                                                                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Agriculture</li> <li>• Forestry</li> <li>• Fishing</li> <li>• Electricity (hydropower)</li> <li>• Water services</li> <li>• Public administration and defence</li> <li>• Tourism (hotels and accommodation)</li> <li>• Households that benefit indirectly</li> </ul>                                                   | <ul style="list-style-type: none"> <li>• Agriculture</li> <li>• Forestry</li> <li>• Fishing</li> <li>• Electricity (hydropower)</li> <li>• Water services</li> <li>• Public administration and defence</li> <li>• Tourism (hotels and accommodation)</li> <li>• Households (e.g. fuel wood)</li> </ul>                                                                                     |

A recent assessment by Nature Kenya (2019)<sup>11</sup> has shown that forest degradation in Mount Kenya ecosystem is still taking place as reflected by changes land cover. For example between 2000-2018, closed canopy forest reduced from 102,962ha-80,962ha - a 21% decrease. Some forest sections have also lost tree cover completely. Most of the changes can be attributed to anthropogenic causes including illegal logging, encroachment, forest fires, and unsustainable livestock grazing pressures.

Most local residents (90%) use firewood and charcoal as main sources of cooking energy and only 42% of households have fuel efficient cooking stoves while 69% of the local residents live timber for constructed houses. This exerts immense pressure on forest resources. It is therefore important to invest on in alternative clean cooking energy, LPG and on -farm tree planting to reduce over reliance of forests for biomass energy and building materials.



# THE EFFECT OF DEFORESTATION ON WATER SERVICES

## Water Quality

Water quality of the Mt Kenya and River basins is generally declining, due to point and non-point pollution. The Upper Tana is characterized by catchment destruction, high population, higher number of agro-based factories and urbanization. These contribute to quite substantial pollution of surface water resources by tea factories, poor sanitation and wildlife in the forest. Groundwater quality can be adversely affected by high fluoride levels. Poor water quality resulting from increased nutrient content increases the cost of water treatment for urban and domestic use. These costs are borne by water treatment works operated by the Government of Kenya and private companies. Reduced water quality increases the costs of removing sediment and nutrient loads from treated water.

Nairobi Water Company reports that water treatment costs often increase by more than 33% as sediment runoff fills and disrupts treatment equipment during the wet season, causing supply interruptions. Increasing sediment in the water supply is a growing problem for private sector interests. The annual water treatment and filtration costs at Coca-Cola's bottling plant in Nairobi, for example, are over US\$1 million, significantly impacting production costs and the company's bottom line. Without intervention, this problem will likely get worse, as climate change causes more intense rainfall events and population growth leads to more farming on steep slopes. Pollution load needs to be reduced for the total volume of water used by urban, rural and industrial water users.

## Nairobi Water Demand

Nairobi's water treatment and distribution facilities are already under pressure. The current water deficit for the city stands at

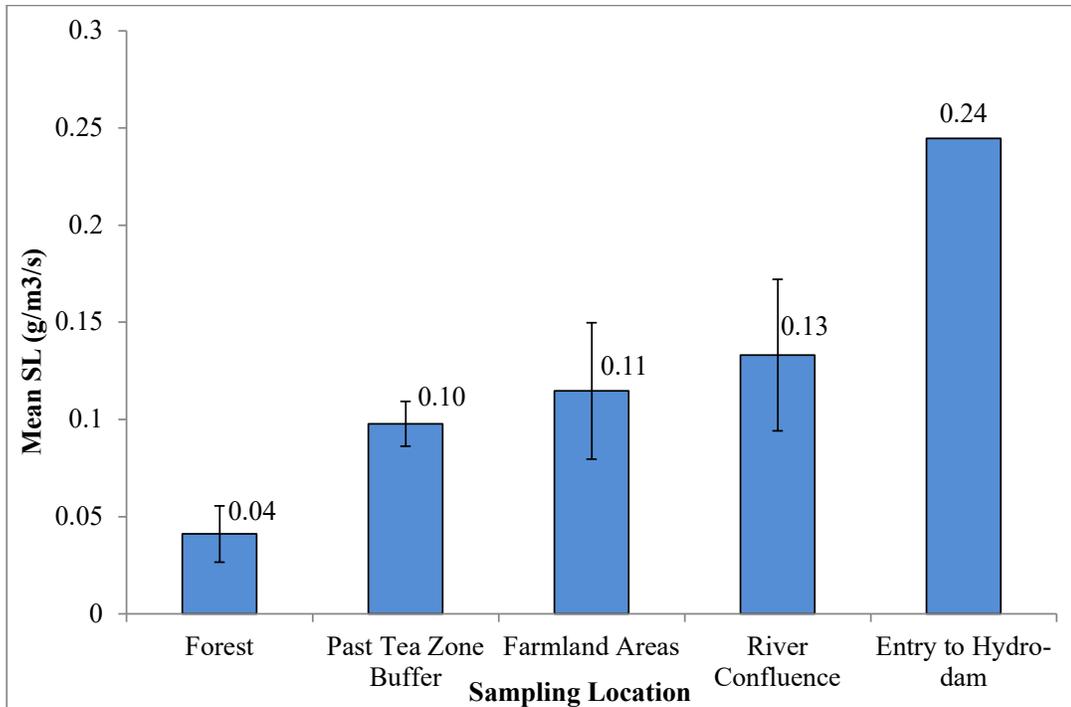


168,000 m<sup>3</sup> per day (or 30% of demand) when the system is operating at full capacity. There are plans to abstract more water using the northern collector channel to reduce this water deficit. If the water supply is to be maintained, there is urgent need to ensure continued water quantity and quality from the Mt Kenya and indeed the Aberdare catchment.

## The Impact of Sedimentation on Reservoirs

Sediment deposition in reservoirs is an increasing problem. For example, Masinga reservoir had lost an estimated 10% of its capacity between 1981 and 2010, and the Kamburu reservoir had lost an estimated 15% of its capacity between 1983 and 2010 (WRMA, 2011)<sup>12</sup>. By 2029, Masinga dam is expected to attain its minimum water level height as a result of 7 million tonnes/year of sediments entering the reservoir. This will disrupt power generation capacity.

A study on the sediment load in three rivers in the eastern side of Eastern Mount Kenya has shown that sediment load increases of an average  $0.04 \text{ g/m}^3/\text{s}$  to  $0.24 \text{ g/m}^3/\text{s}$  as the water enters Kindaruma Dam in Tana River (Nature Kenya, 2019)<sup>11</sup>. This is an increase of 600% implying that most of the sediments finding their ways to the dam comes from farmlands outside the forest ecosystem. As such conservation activities also need to be implementing in forest adjacent areas.



**Changes in Sediment Load in Rivers Flowing through Different Ecological Zones in the Eastern Side of Mount Kenya**

## THE EFFECT OF DEFORESTATION ON CARBON SEQUESTRATION

Trees absorb carbon dioxide that is said to be responsible for climate change. There are opportunities for climate finance. Carbon-trading mechanisms provide an opportunity for the Government of Kenya and local communities and also private sector to earn foreign revenue. Once appropriate carbon trading mechanisms are available, unmitigated deforestation is thus a forgone revenue opportunity for the Government of Kenya, money that could otherwise have been spent on public administration. REDD+ is an initiative by the United Nations (UN), which intends to create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. The REDD+

concept is predicated on the assumption that forests will contribute to climate-change mitigation only if their value increases to a level that makes protecting forests consistent with viable development strategies (Zarin, 2009)<sup>13</sup>.

Mount Kenya ecosystem stores about 83 million tonnes of Carbon (Nature Kenya, 2019)<sup>11</sup>. Most of this Carbon (87%) is stored in Mount Kenya Forest while 11 and 2% is stored in Mount Kenya National Park and Ngare Ndare Forest, respectively. If the current trends continue there will be a reduction in the carbon stocks within the ecosystem but restoring forests within the ecosystem will lead to 8 % increase in carbon stocks by 2038.



---

# 5-10

**tonnes of carbon**  
are absorbed by  
one hectre of  
forest in one year.

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# THE INTERVENTION

## Aim of the Intervention

Strategic commitment from business sector to sustainable water flows from Mt Kenya due to sustained water catchment management by and for stakeholders.

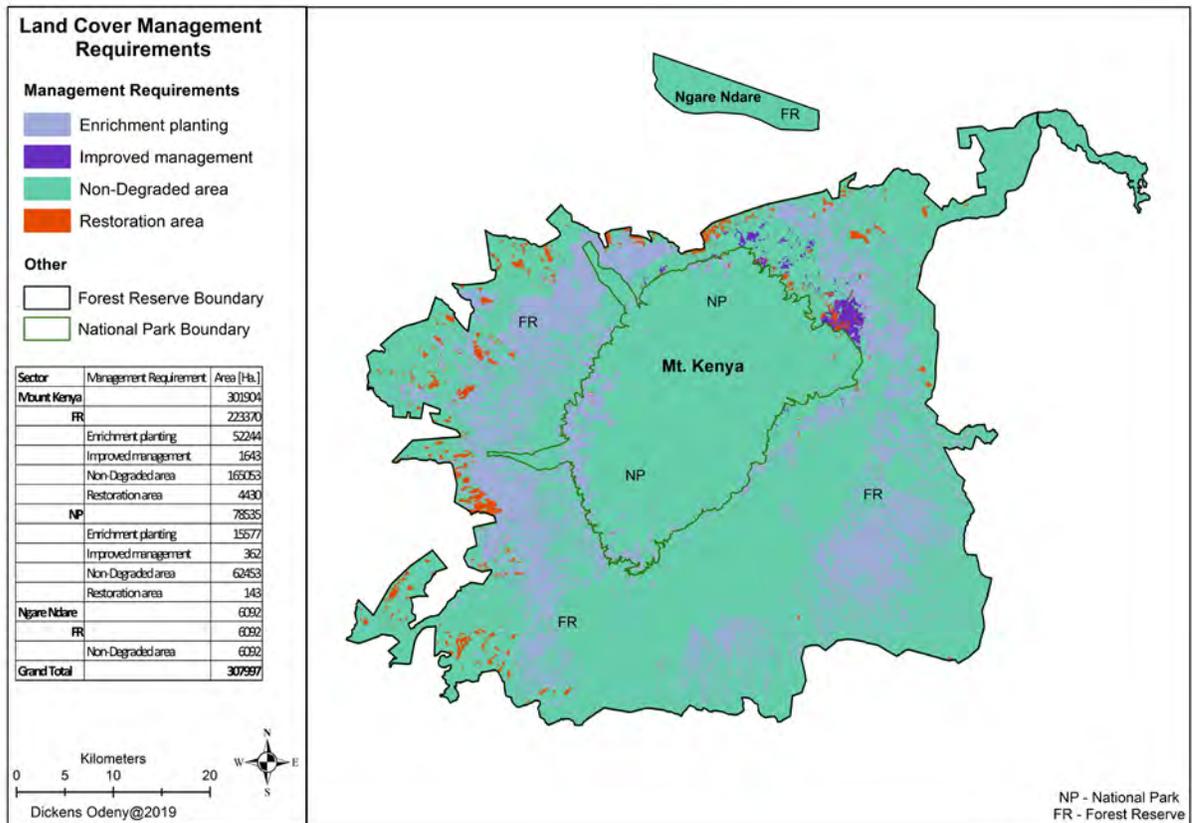
## Target

To provide KSh. 4 billion plant about 22 million trees to restore Mt Kenya forest and the upper Tana catchment landscapes to increase

quantity and quality of water and keep clean water flowing for access and use by down stream users and ecology.

## Cost of Restoring Mt. Kenya Forest

A total of 6,170 hectares is available for immediate restoration at a cost about 1.543 billion Kenya shillings or 0.281 billion Kenya Shillings per year if all areas in need of urgent restoration are to dealt with within 5 years.



Mount Kenya Forest Restoration Areas

**Table 5: Costs of Restoration of Degraded Areas in Mount Kenya Forest**

| Project cost          | Units (Number of trees) | Unit cost (Ksh) | Total cost (Ksh) | Description                                                                           |
|-----------------------|-------------------------|-----------------|------------------|---------------------------------------------------------------------------------------|
| Cost of seedlings     | 21,843,200              | 25              | 546,080,000      | Indigenous trees will be produced by local community owned and managed tree nurseries |
| Cost of planting      | 21,843,200              | 20              | 436,864,000      | This includes hole making (Ksh 10), transport costs (Ksh 5), planting labor (Ksh 5),  |
| Protection, Weeding,  | 21,843,200              | 25              | 546,080,000      |                                                                                       |
| Administrative costs  | 21,843,200              | 21              | 458,707,200      | Costs incurred by Intermediaries, KFS, committees etc.                                |
| Total amount targeted |                         | 100             | 1,987,731,200    |                                                                                       |

### Other Actions that are Necessary

There is need to implement actions to mitigate threats to Mount Kenya Forest. These includes:

1. Awareness creation
2. Build capacity of CFAs and other stakeholders
3. Joint patrols/monitoring to detect illegal activities, arrest and prosecute offenders
4. Promotion of use of alternative energy sources
5. Control harvesting of non-wood forest products
6. Control grazing in indigenous forests
7. Monitor the presence and control the spread of invasive species
8. Monitoring and protection of endangered species
9. Forest fire management
10. Enhancement of climate adaptation and mitigation measures
11. Rehabilitation of riparian zone
12. Improvement the livelihoods of the local residents
13. Controlling and minimizing Human Wildlife conflicts ( HWC)

These actions are estimated to cost another 2 billion shillings over a 5 year period.

### Benefits

- When the forest is well managed, harvested wild good would reduce US\$57million annually
- Each hectare of forest restored of the indigenous forest has the ability to recharge up to 1million litres annually of water into the rivers . Increase Sequestration of more than 22 Billion Liters of water to rivers from Mt.Kenya has been lost
- If forest is restored and well managed it will increase carbon sequestration capacity by 8%
- Forest plantations under proper management will earn US\$17million annually in timber products
- Will save US\$6million tourism revenue loss annually from visitation to Mt.Kenya National Park

### Benefits to Government

- Meeting constitutional requirement of supply of clean and sufficient water to its citizens
- Forest restoration will contribute to the government's Big 4 Agenda and Vision 2030.
- Promote peace-Mitigate water resource conflict

- Demonstrate to the world commitments of combating climate change
- Meet global biodiversity targets-CBD, AICHI targets, SGD, Bonn Challenge, Climate Change agreements.

#### **Benefits to Energy Sector**

- Sustained water to hydropower dams along Tana River
- Enhanced sustainable affordable electricity supply to Kenyan citizen
- Meet global targets of Clean Energy Production
- Ensure that future projects and feasible-High Grand Falls multipurpose reservoir.

#### **Benefits to Participating Business Companies**

- Dedicated branding, corporate profile and updates on Nature Kenya webpage, social media and Nature Kenya magazines
- Adoption of a grove of planted trees in the business company name
- Sustainable water supply for business sustainability
- Reduced costs of water supply
- Improved biodiversity and scenic appeal leading to improved tourism earning.

#### **Benefit to Community**

- Business sustainability for longer term job opportunities
- Market for local produce in the tourism and hotel industry
- Direct income through production and sale of tree seedlings

- Longer term supply of forest ecosystem services e.g. water, medicinal plants, fuel wood and construction timber
- Education of local children at Mt. Kenya resource center and schools.

#### **Options for Financing**

- Enhance Corporate Social Responsibility (CSR) to include significant support for water services
- Develop initiatives for companies to allocate part of their profits to water catchment restoration.
- Provide financial resources to existing water funds. These include The Upper Tana and Nairobi Water Fund or the Kenya Forest Service Trust Fund
- Support Civil Society Organizations for example Nature Kenya to work with local communities to plant trees
- Sponsor events that aim to raise funding for catchment restoration. For example Nature Kenya's 'Lungs for Kenya' charity golf tournament organized annually at Karen Golf Club.
- Support community based organizations for example Community Forest Associations (CFAs) including building their capacity to raise, plant and take care of seedlings. Putting a tree seedling in the soil is important but useless without care for at least two years.

**Table 6: Overcoming Barriers in the Implementation of Mt. Kenya Forest Restoration Business Case**

| <b>Challenge</b>                             | <b>Actions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gaps in Legal and policy framework.          | Formulate the relevant legal and policy instruments to facilitate integration of private sector in the management of ecosystems that they depend on.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Lack of appropriate Institutional Frameworks | <ol style="list-style-type: none"> <li>1. Establish a Local Forest Restoration Committee whose membership will be comprised of the forest station management and the CFA, KWS, NGOs and CBOs and representative and private sector players to oversee activities at the forest station level.</li> <li>2. Establish Mount Kenya Ecosystem Forest Restoration Committee comprising of KFS's Ecosystem Conservators, KWS, NGOs working in the ecosystem, key ecosystem service users including representatives of water companies, hoteliers, and also other National government conservation agencies can coordinate forest restoration activities.</li> </ol> |
| Capacity gaps and lack of awareness          | <ol style="list-style-type: none"> <li>1. Further training of existing personnel in project management, governance, record keeping, monitoring and reporting among CBOs</li> <li>2. promoting collaboration between government agencies, civil society, research organization and local CBOs.</li> <li>3. Awareness creation at all levels and among all stakeholders on the need for private sector engagement in forest restoration</li> </ol>                                                                                                                                                                                                              |
| Limited scientific evidence                  | <ol style="list-style-type: none"> <li>1. Strengthening research and monitoring capacity including through collaboration with research organisations and universities.</li> <li>2. Document lessons on engagement of the private sector in ecosystem conservation in running viable conservation enterprises.</li> </ol>                                                                                                                                                                                                                                                                                                                                      |
| Need for Landscape approach                  | Participating companies will also be encouraged to support conservation work in the buffer areas around Mount Kenya Forest.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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