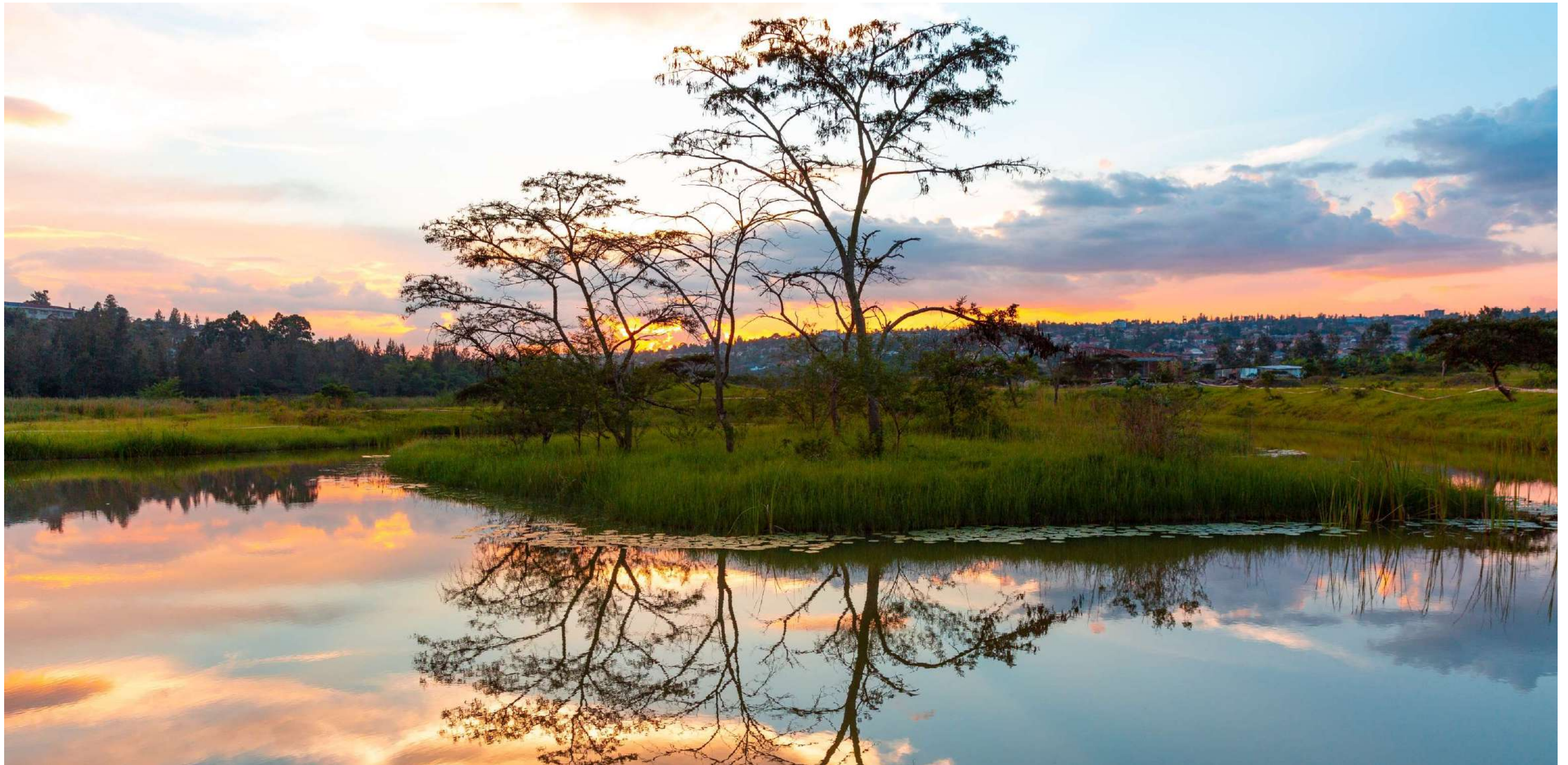


NYANDUNGU URBAN WETLAND ECO-TOURISM PARK

PROJECT COMPENDIUM



Client:



Consultants:



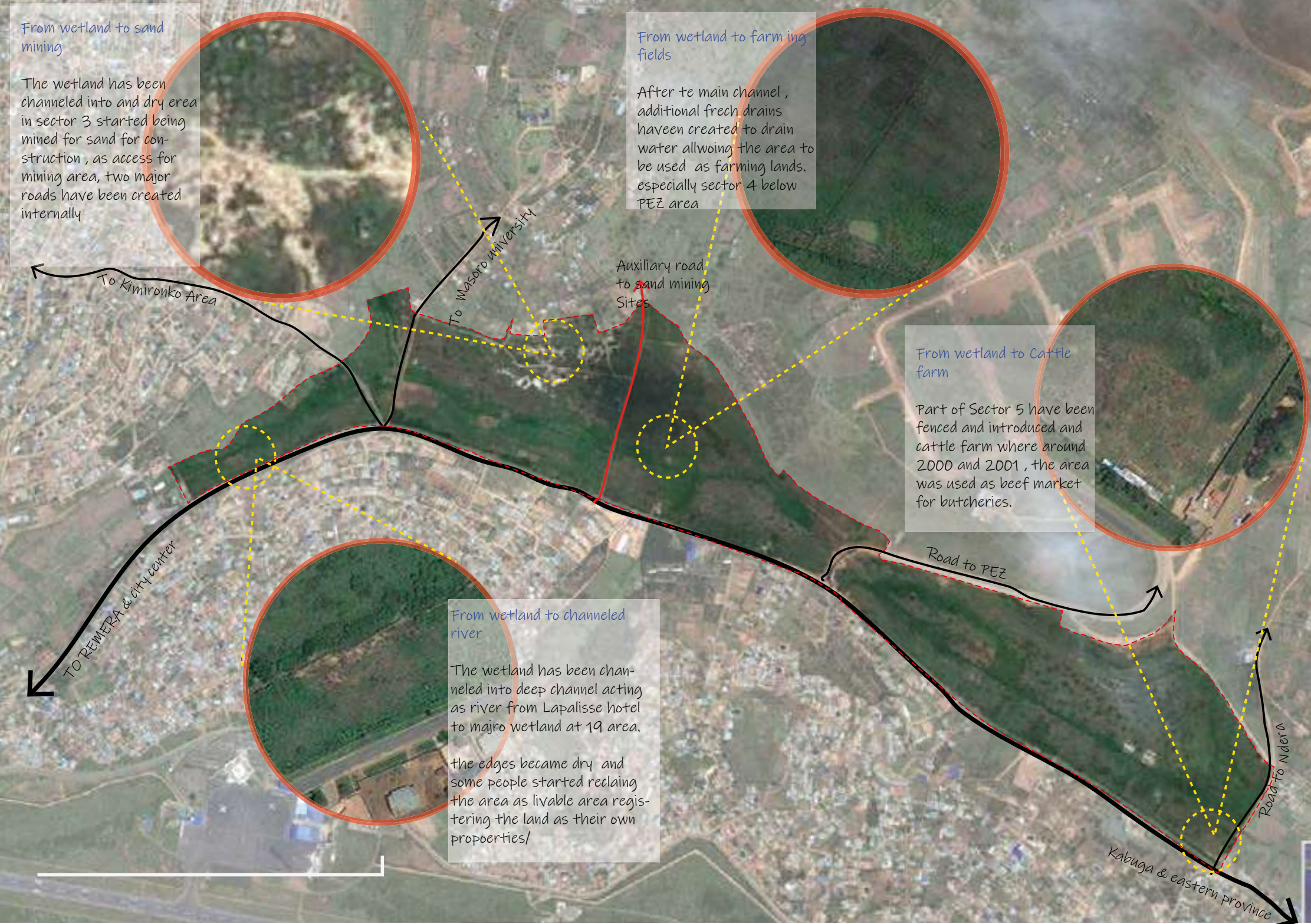
AFRILANDSCAPES LTD

Contractor:



PROJECT BACKGROUND

The land on which the park sits has transformed through several uses over the years. These include agricultural functions and pastoral uses. There was also growing pressure from encroachment by competing land uses. Due to underutilization and minimal management, the site became degraded and posed a flood-risk to the downstream areas. It also received polluted water including sewage outflow from surrounding areas.



PRE-PROJECT SITE PHOTOS

The photos below illustrate the state of vegetation, soils and hydrology prior to the project in 2012.



Soils were mostly clay and sand which was mined while the water was heavily polluted from unfiltered runoff from the surrounding rapidly urbanizing areas.

PROJECT BRIEF

The site is part of the greenbelt or green corridor in Rwanda that provides ecological functions essential to the survival of all ecosystems. The Ecological functions of the wetland include the provision of slow and steady water source for downstream users, protecting water quality and quantity, buffering storm water runoff and providing critical habitat where natural drainage is restricted by human activities. However, before the rehabilitation works, the wetland had been drained of water as described in the pre project site analysis above.

Rwanda Environmental Management Authority (REMA) contracted Afrilandscapes Ltd to carry out the restoration of the Nyandungu wetland into a healthy wetland and an urban eco-tourism park. Afrilandscapes collaborated with the project design consultants M/S Gasabo 3D & Astrik International in undertaking the project.

Client : RWANDA ENVIRONMENT MANAGEMENT AUTHORITY(REMA)



Consultant: GASABO 3D DESIGN LTD & ASTRIK INTERNATIONAL



Contractor: AFRILANDSCAPES LTD



KEY PROJECT OUTPUTS:

The overall intention of the project was based on the mitigation of the above environmental risks and to increasing the utility value of the site for the neighboring community and Kigali city as a whole.

Output 1: Biodiversity conservation through introduction of native tree species and terrestrial habitat restoration..

Output 2: Biodiversity conservation through aquatic habitat creation and restoration

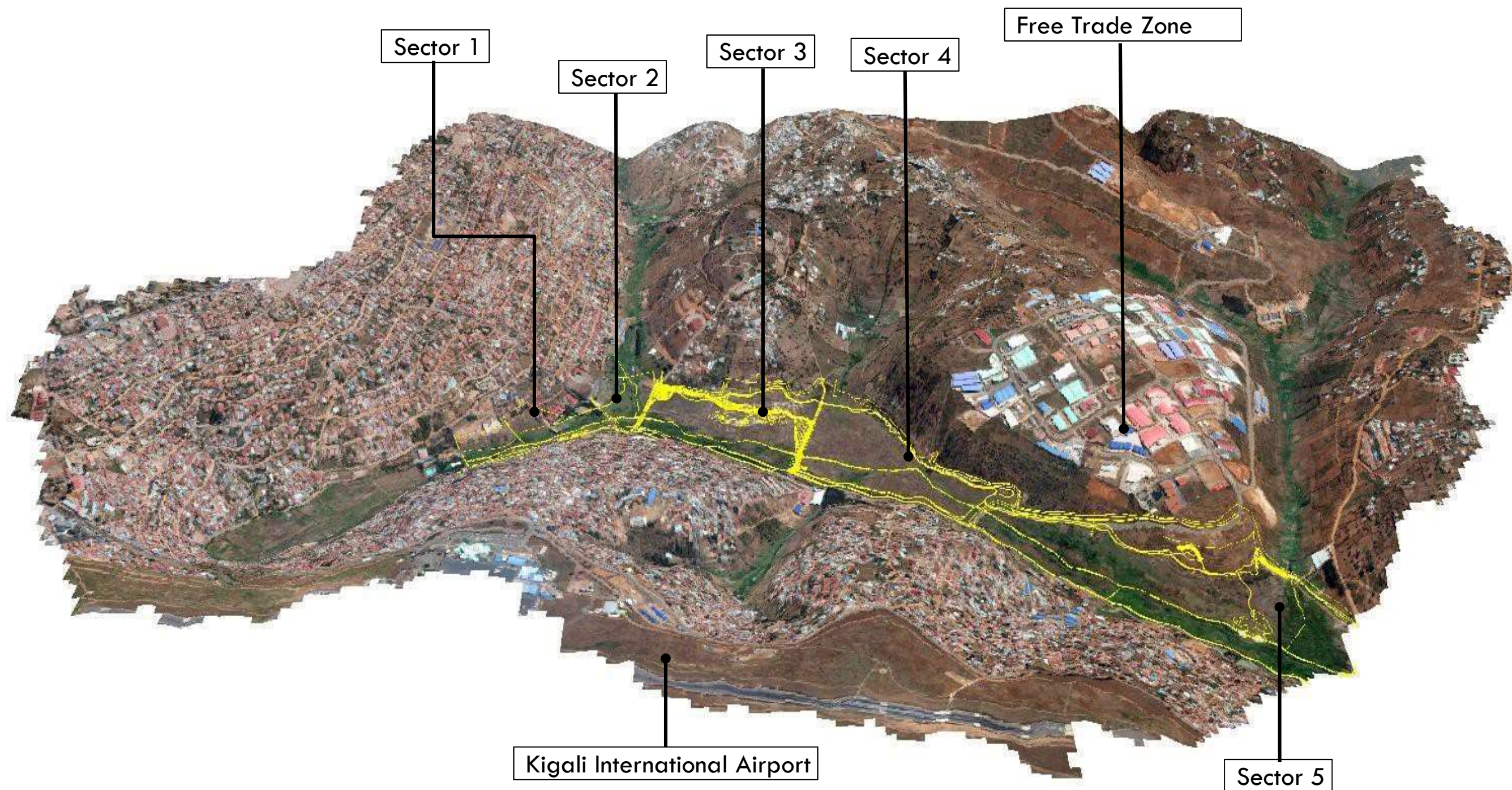
Output 3: Dissemination of Lessons Leant

Output 4: Eco-Tourism opportunities

Output 5: Job opportunities during construction and operation phase

PROJECT LOCATION

The Nyandungu site is located in the valley of Masoro-Bumbogo hill in Ndera, Gasabo District and Kanombe-Nyarugunga hill in Kicukiro District between $1^{\circ}57'30.81''\text{S}$ and $30^{\circ}8'42.20''\text{E}$. It stretches 3.6 Kilometers along the KK 3 Road and intersected by the KK 15 Road and the road towards the Adventis Central Africa University. The wetland park is divided into five Sectors, starting below La Palisse Hotel and ends at the road to Ndera.



Terrain model of Nyandungu wetland eco-tourism park

KEY OBJECTIVES AND GOALS

The Nyandungu Wetland Eco-tourism parks was envisioned to serve as a good example for the “green economy” as outlined in the Green Growth Climate Resilience Strategy (GGCRS). It would demonstrate how nature-based solutions and proper planning and management can be used to attenuate floodwater and manage pollution. These demonstrations will serve as an example for other areas within the City of Kigali and Rwanda. The project would also provide jobs during construction and permanent jobs during operation. It was also envisioned as a tourist attraction that would help the Government in its development of Ecotourism. More specifically they include:

- Maintaining and enhance local biodiversity by the restoration of a wetland ecosystem, incorporation indigenous trees and vegetation
- Promote the tourism industry, specifically in the area of urban eco-tourism
- Promote education on how to develop sustainable eco sensitive urban parks.
- To protect the country’s wildlife and habitats
- Improve integrated watershed management



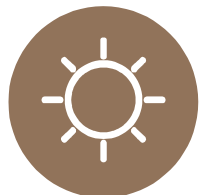
Environmental Services

- Demonstrate how Nature Based Solutions (NBS) can be used to attenuate floodwater, control flooding and water pollution
- Restore flora and fauna
- Restore Eco systems and Biodiversity



Social

- Creating spaces for community to meet, mingle and socialize within a safe and secure environment



Recreational

- Serve recreational need of the community and Kigali as a whole through walking and jogging facilities, biking, picnicking



Economical

- Increase in land values in the surrounding areas
- Employment created during the implementation stage and after completion during its operation and management.
- Revenue from various activities and services provided in the park as well as local and international tourism



Education and Research

- The project will contribute to the implementation of Rwanda’s Green Growth and Climate Resilience Strategy
- Education through demonstration of how wetlands work and their benefits
- Research site on wetland ecosystems and species by students, institutions and universities.

PROJECT DESCRIPTION

The Nyandungu Urban Wetland Eco-Toursim Park (NUWEP) project provides a biodiverse, restored wetland habitat, Native and indigenous forest tree species in a ring around the outskirts of the site and along the service road, nestled within the forest ring will be a circulation cycle lanes and walkways set around a healthy wetland. The wetland restoration and flood attenuation was achieved through the widening of the channels and creation of ponds for flood alleviation potential of wetlands and the use of reed-bed for pollution abatement. The project has a network of paths, bicycle tracks, a service road, ablution facilities, bird habitats and picnic areas to provide the facilities required by tourists and visitors. Included in the project is a concession for a restaurant in a central location on the site. The project includes a visitor or information center, at its exterior is a medicinal garden demonstrating specific indigenous and native plants with medicinal properties well known to locals. The project will facilitate education on the role of wetlands in conservation and the ecosystem services they provide and help support the Rwandan Ecotourism Sector.

 A restaurant, Information Center, Ablution facilities, Iconic Entrance and Maintenance House	 Flora: A forests ring around the site made up of native and indigenous plant specious, some of which are on the IUCN Red list , and a Medicinal Garden	 Fauna: Creation of a bird habitat, attraction of Beneficial species of butterflies	 Wetland restoration through spreading of channels and creation of attenuation ponds and use of gabions to allow slow and natural water movement to remove pollutants and manage floods
 Cycle lanes along the fringes of the wetland	 Walkways and Jogging tracks through the lush environment	 Eco tourism opportunities including Bird watching	 increase in land values in residential areas immediately surrounding the site

Sector 1

Filtration Plants

Attenuation Ponds

Sector one is full of nature in terms of filtration plants and attenuation Ponds. It's main function is to reduce the speed of the water as it filters into the rest of the wetland

Sector 2

Filtration Plants

Sector two is the smallest of all the sectors. It's populated with species of filtration plants to further slow down and clean the water

Sector 3

 Walkway & Bicycle Lane

 Restaurant

 Pond Muhazi

 Pond Kivu

 Pope's Garden

 Recreational Area

 Restrooms

 Parking

Sector three is the center of the ecotourism activities in the park. It therefore hosts conviniences to make the experience of visitors pleasurable and safe.

Sector 4

 Walkway & Bicycle Lane

 Information Center

 Maintenance Building

 Medicinal Garden

 Pond Ruhondo

 Recreational Area

Sector 4 is a mix of light ecotourism activity as well as natural processes. It is populated with species of filtration plants to slow down and further clean the water

Sector 5

 Walkway & Bicycle Lane

 Pond Ihema

Sector five is the final processing point for the wetland. It hosts the deepest pond dubbed Ihema and plenty natural forests and filtration plants.. It's also habitat to many bird and burttefly species.



PROJECT COMPONENTS

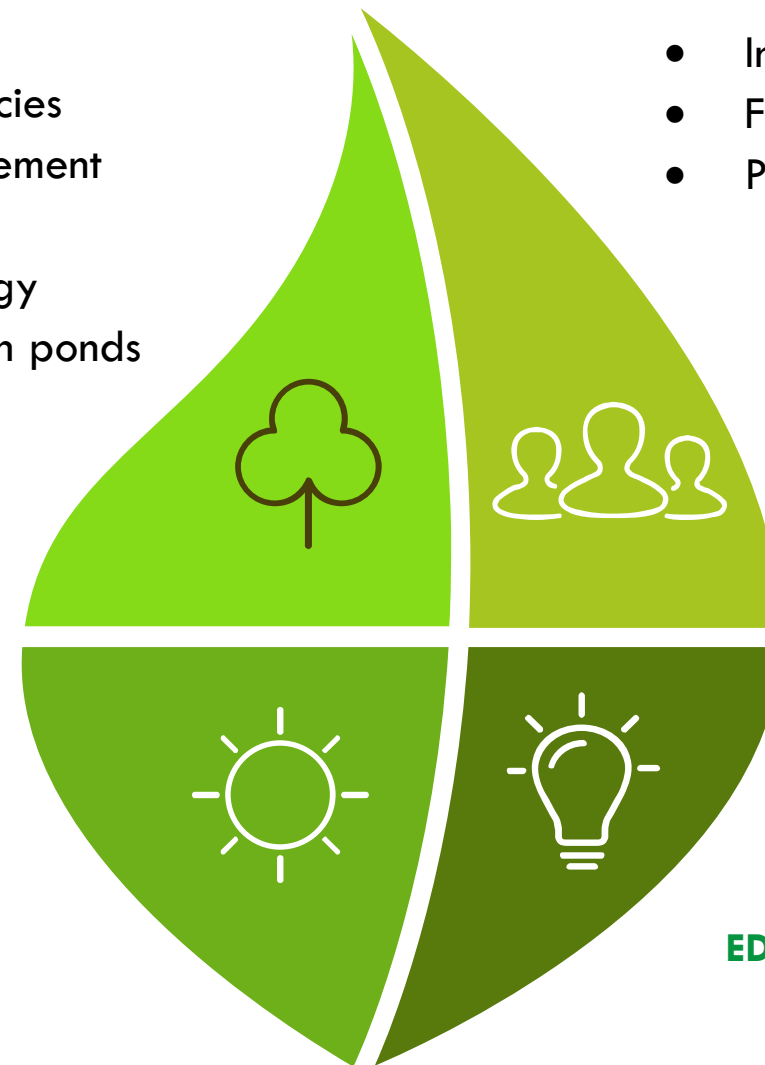
ECOLOGICAL COMPONENTS

- Use of Indigenous Plants
- Birds, Butterflies and Insect Species
- Hydrology, storm water management
- Use of natural materials
- Energy conservation Solar Energy
- Water Conservation-Attenuation ponds
- Water harvesting strategy



RECREATIONAL COMPONENTS

- Restaurant
- Open spaces with seating
- Walkways and Cycle lanes



SOCIAL COMPONENTS

- Info Center-Education
- Function Grounds interaction
- Popes Garden



EDUCATIONAL COMPONENTS

- Medicinal garden
- Information Center
- Environmental Research



MASTERPLAN

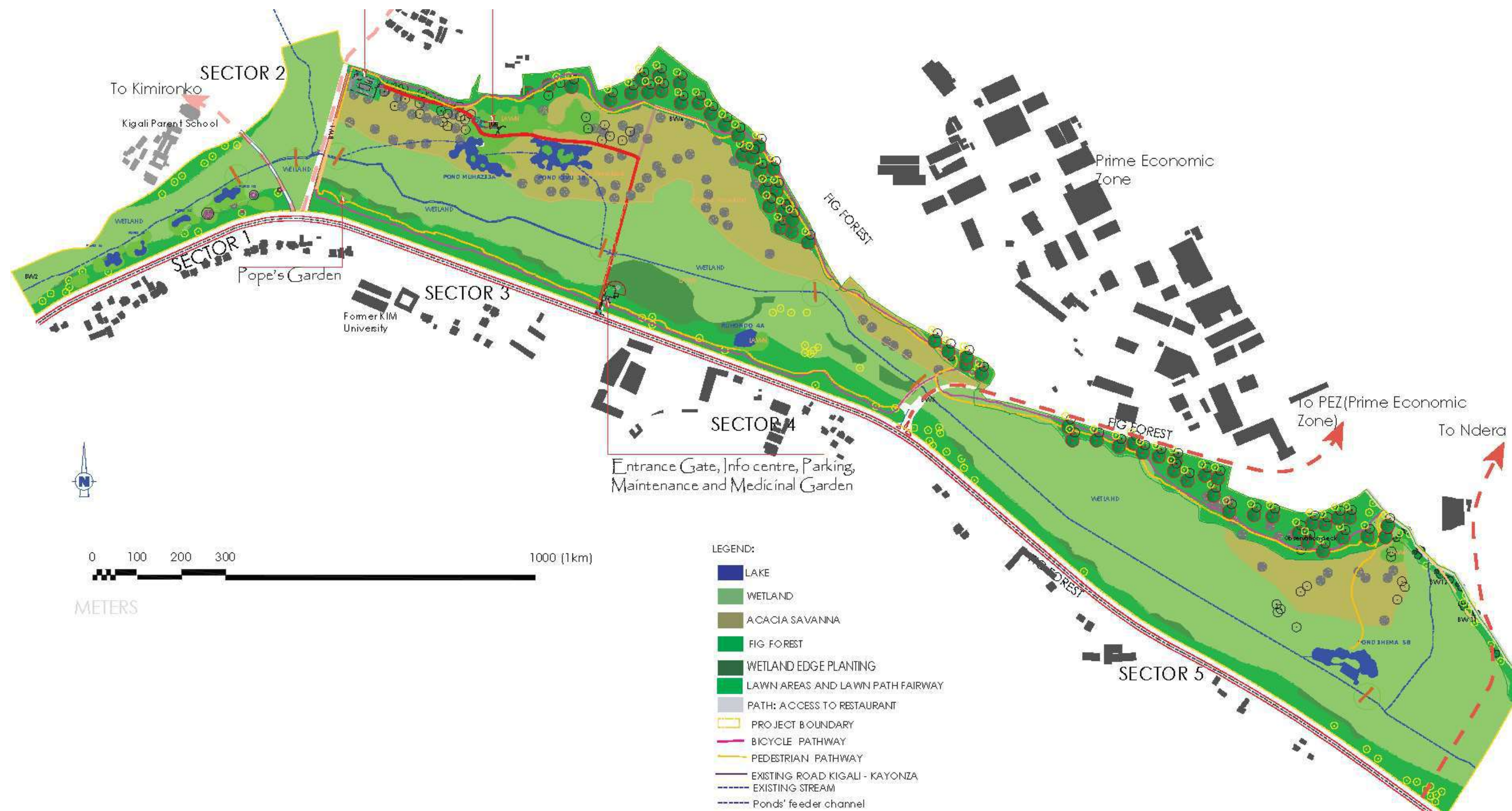


FIG FOREST AROUND THE FRINGES OF THE SITE

The fig forest around the site provides shade for the walkways and cycle paths. It is also a way of conserving the plants species in undisturbed areas as well as provide a platform for educating visitors on indigenous and beneficial tree species as they explore the park.

	Trees						
1	Acacia abyssinica	20	Croton macrostachyus	39	Hagenia abyssinica	58	Prunus africana
2	Acacia polyacantha	21	Croton megalocarpus	40	Harungana madagascariensis	59	Pterygota mildbraedii
3	Acacia sieberianna	22	Dombeya torrida. Syn: D. goetzeinii	41	Harungana Montana	60	Schrebera alata
4	Acocanthera schimperi	23	Dracaena steudneri	42	Hymenodiction floribundum	61	Spathodea campanulata
5	Albizia adiantifolia	24	Elaies guineensis	43	Kigelia Africana	62	Strombosia scheffleri
6	Albizia gummifera	25	Entada abyssinica	44	Macaranga kilimandscharica	63	Symphonia globulifera
7	Albizia forbesii	26	Entandrophragma excelsum	45	Macaranga schweinfurtii	64	Syzygium guineense
8	Albiia versicolor	27	Erythrina abyssinica	46	Maesa lanceolata	65	Syzygium parvifolia
9	Anthocleista grandiflora	28	Euphorbia candelabrum	47	Maesopsis eminii	66	Syzygium rowlandii
10	Bamboussa vulgaris	29	Ficus asperifolia	48	Markhamia lutea	67	Tabernamontana johnstonii
11	Bambousa textillis var gracilior	30	Ficus ignes	49	Milletia dura	68	Trema orientalis
12	Bersama abyssinica	31	Ficus burkei	50	Myrianthus holistii	69	Trilepisium madagascariensis
13	Blighia unijugata	32	Ficus lutea	51	Neoboutonia macrocalyx	70	Xymalos monospora
14	Bridelia macrantha	33	Ficus ovate	52	Newtonia buchananii	71	Zanthoxylum chalbeum
15	Carapa grandiflora	34	Ficus sur	53	Olea europea var africana	72	Ziziphus mucronata
16	Celtis Africana	35	Ficus sycomorus	54	Phoenix reclinata		
17	Chrysophyllum gorugosanum	36	Ficus thonningii	55	Podocarpus latifolius		
18	Combretum collinum	37	Ficus vallis choudae	56	Podocarpus falcatus		
19	Combretum molle	38	Fleroya rubrostipulata	57	Polyscias fulva		

INDIGENOUS AND NATIVE FLORA CNT'D



LIVING FENCE

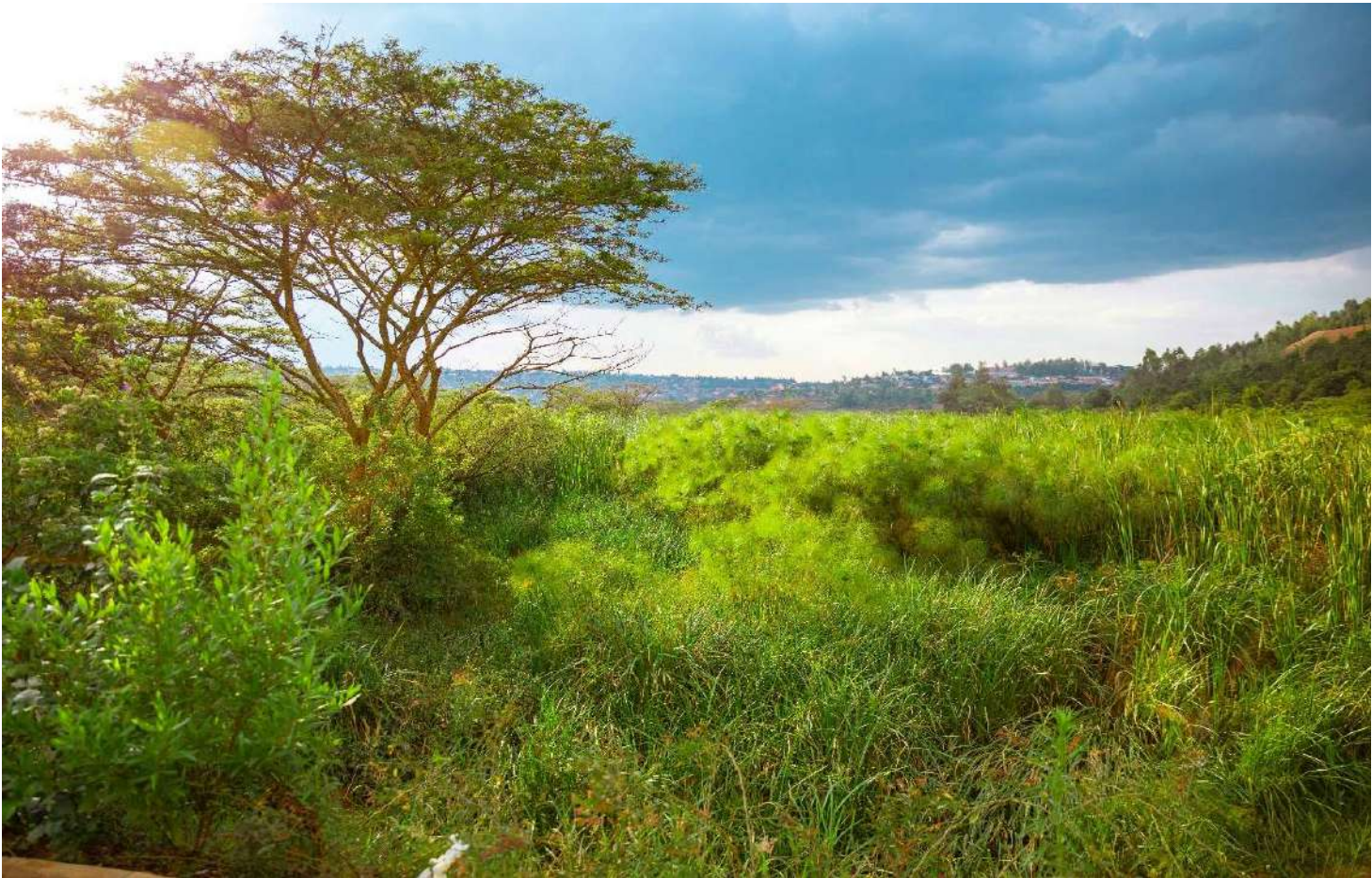
	Shrubs		Trees
1	Dracaena afromontana	1	Croton megalocarpus
2	Euphorbia tirucalii	2	Polyscias fulva
3	Maytenus	3	Markhamia lutea
4	Carissa edulis	4	Maesopsis eminnii
5	Vernonia amygdalina	5	Spathodea campanulata
7	Solanum aculeastrum	6	Hagenia abyssinica
8	Hibiscus diversifolius	7	Podocarpus, div, sp.
9	Phragmites mauritianum	8	Erythrina abyssinica
10	Acanthus pubescens	9	Dombeya torrida
11	Euphorbia tirucalii	10	Prunus Africana
12	Dodonea viscosa	11	Syzygium parvifolium
13	Ronce (Rosier sauvage)	12	Maesa lanceolata
14	Tetradenia riparia	13	Ficus thonningii
14	Toddalia asiatica	14	Ficus sur
16	Dwarf bamboo	15	Ficus vallis choudae
17	Bougainvillea	16	Elaeis guineensis
18	Acacia montigena	17	Kigelia Africana
19	Acalypha sp.	18	Olea europea var. africana
20	Hibiscus rosa sinens	19	Celtis Africana
21	Cyperus papyrus	20	Euphorbia Candelabrum
22	Dovialis caffra	21	Fleroya
		22	Syzygium guineense

FILTRATION PLANTS

	Reeds
1	Cyperus papyrus –paper reed
2	Cyperus latifolius-
3	Typha domingensis
4	Typha latifolius
5	Typha capensis

NATURAL GRASSES

	Ground Covers
1	Juncus effusus
2	Ludwigia abyssinica
3	Polygonum salicifolium



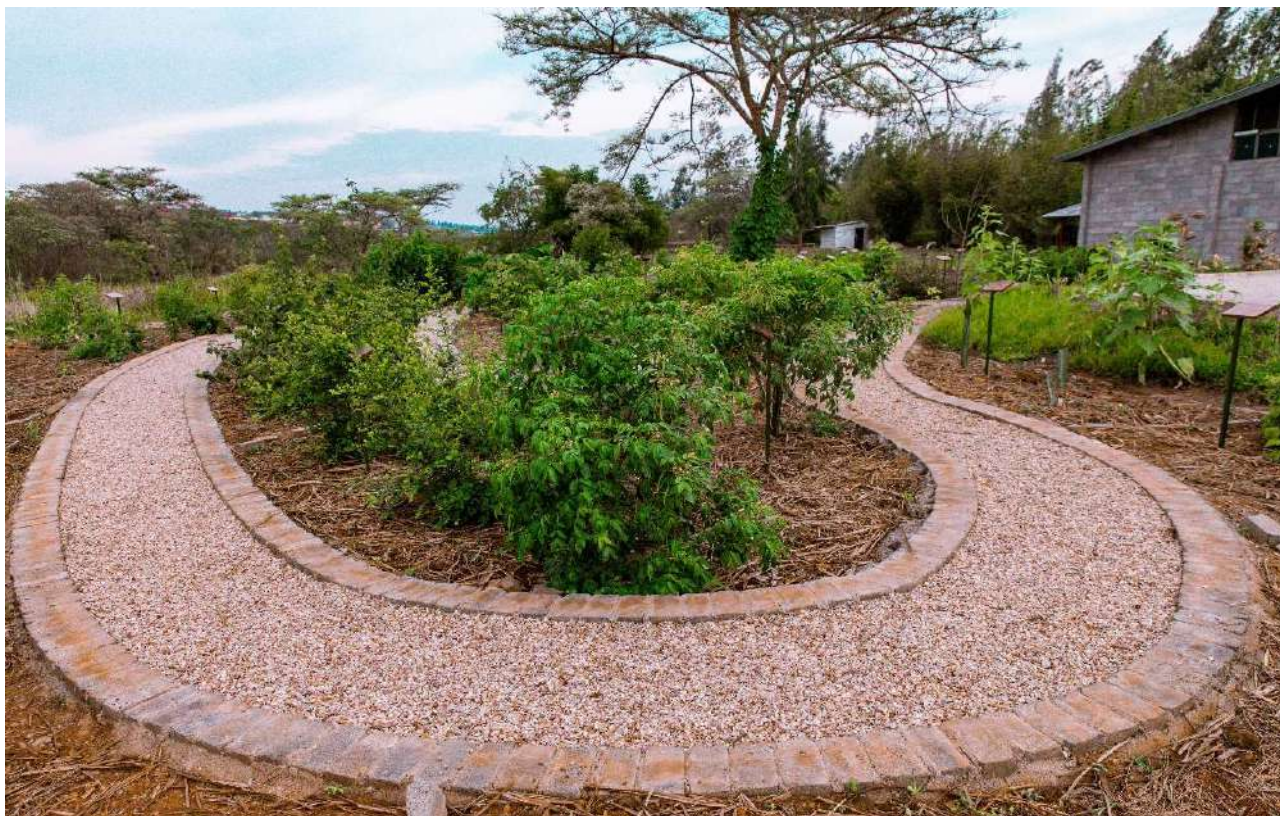
MEDICINAL GARDEN

	Trees				
1	Acanthus pubescens	21	Euphorbia tirucallii	41	Rhoicissus tridentata
2	Aloe lateritia	22	Flueggea virosa	42	Rhus vulgaris
3	Blumea alata	23	Gomphocarpus fruticosus	43	Rumex bequaertii
4	Borreria verticillata	24	Guizotia scabra	44	Solanecio mannii
5	<i>Brillantaisia cicatricosa</i>	25	Harungana madagascariensis	45	Solanum aculeastrum
6	Capparis erythrocarpos	26	Hibiscus diversifolius	46	Synadenium grantii
7	Cardiospermum hariccacabum	27	Hibiscus fuscus	47	Tephrosia vogelii
8	Cassia didymobotriya	28	Hypoestes triflora	48	Tetradenia riparia
9	Cassia floribunda	29	Kalenchoe integra	49	Trema orientalis
10	Cassia occidentalis	30	Maesa lanceolata	50	Urera hypselodendron
11	Centella asiatica	31	Mycroglosa pyrifolia		
12	Clerodendrum myricoides	32	Ocimum gratissimum		
13	Clerodendrum rotundifolium	33	Olea europea var africana		
14	Clutia abyssinica	34	Pavonia urens var urens		
15	Colocasia esculenta	35	Plantago palmata		
16	Dodonea viscosa	36	Plecthranthus barbatus		
17	Dracaena afromontana	37	Polygonum pulchrum		
18	Dracaena steudneri	38	Prunus africana		
19	Euphorbia candelabrum	39	Pytolacca dodecandra		
20	Euphorbia hirta	40	Ranunculus multifidus		



MEDICINAL GARDEN

The medicinal garden will showcase indigenous and native plants that have been found to have medicinal value. This will provide a platform for visitors to learn about traditional medicine.



FAUNA

Birdlife and diverse butterfly species are thriving again in the wetland. Cranes and other bird species are increasing in the wetland



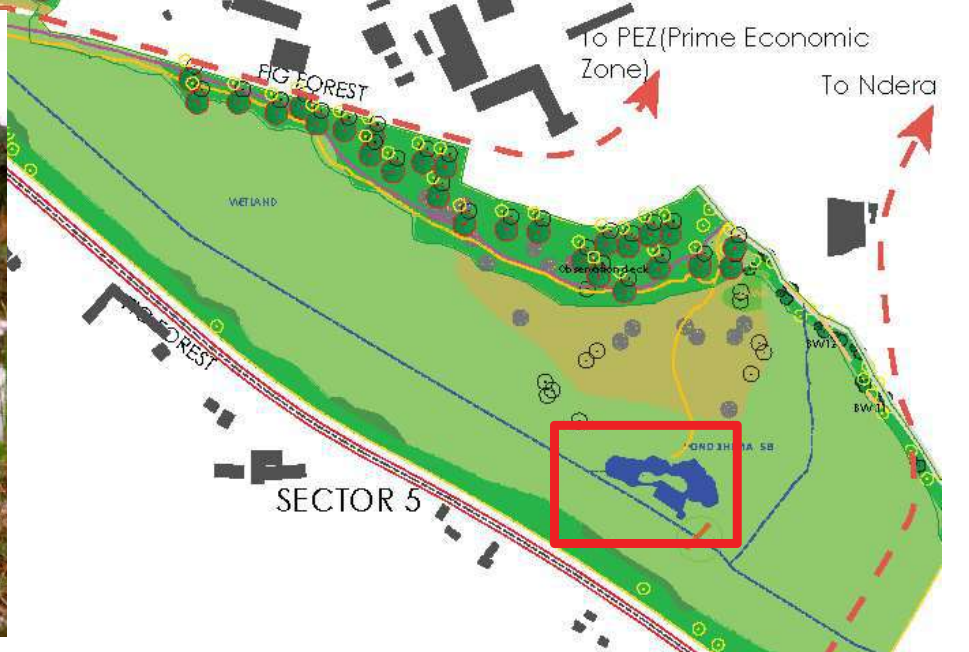
**Bird photography courtesy of Will Wilson.
@2wsphotography on twitter**

POLLUTION & FLOOD CONTROL

The introduction of filtration plants has also helped to rid the water of chemical and solid waste pollutants while at the same time slowing down the flow of water down stream thereby helping in the control of floods.

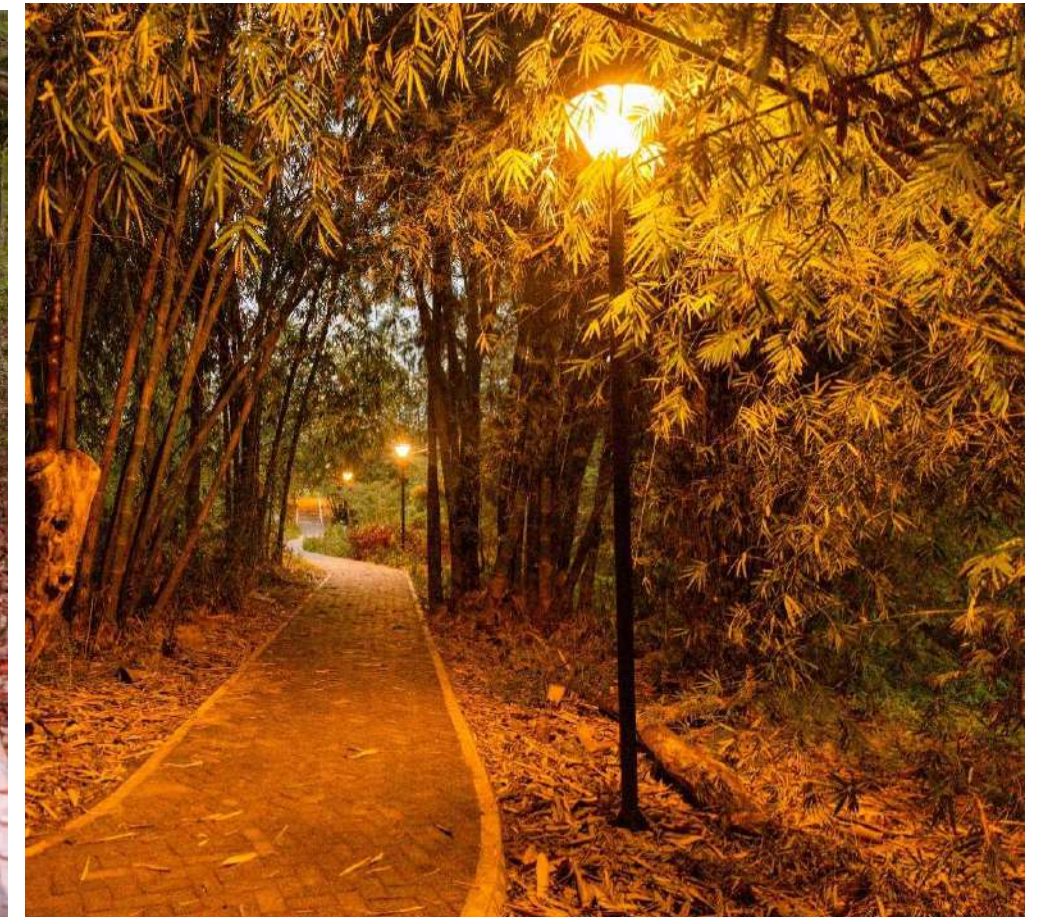
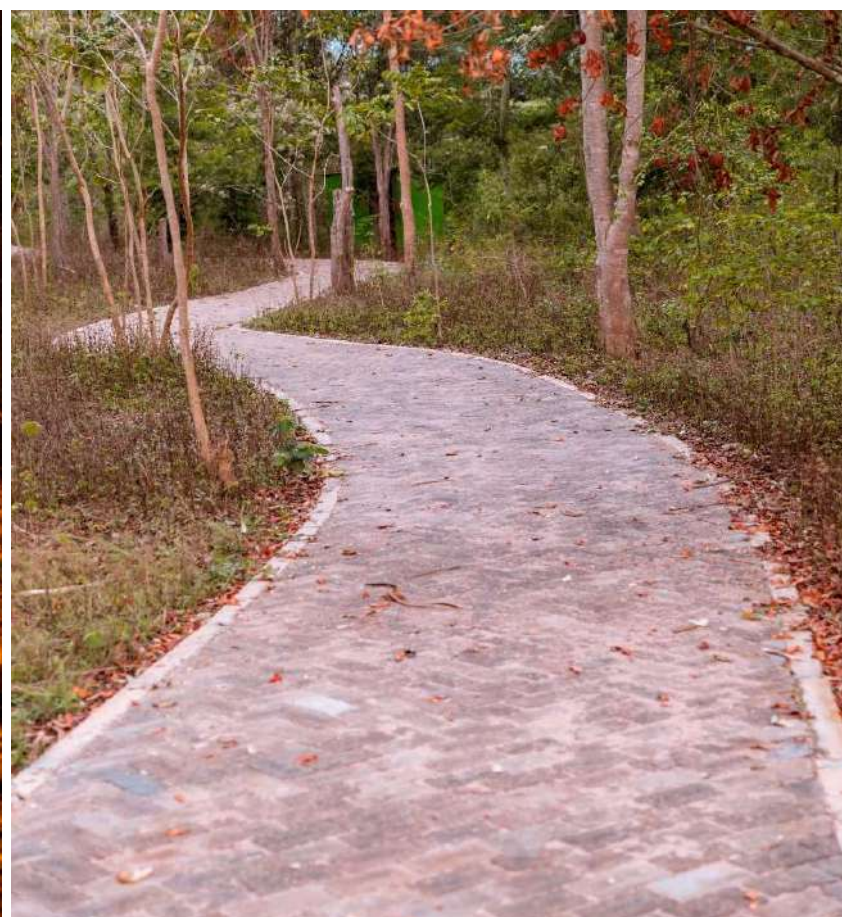
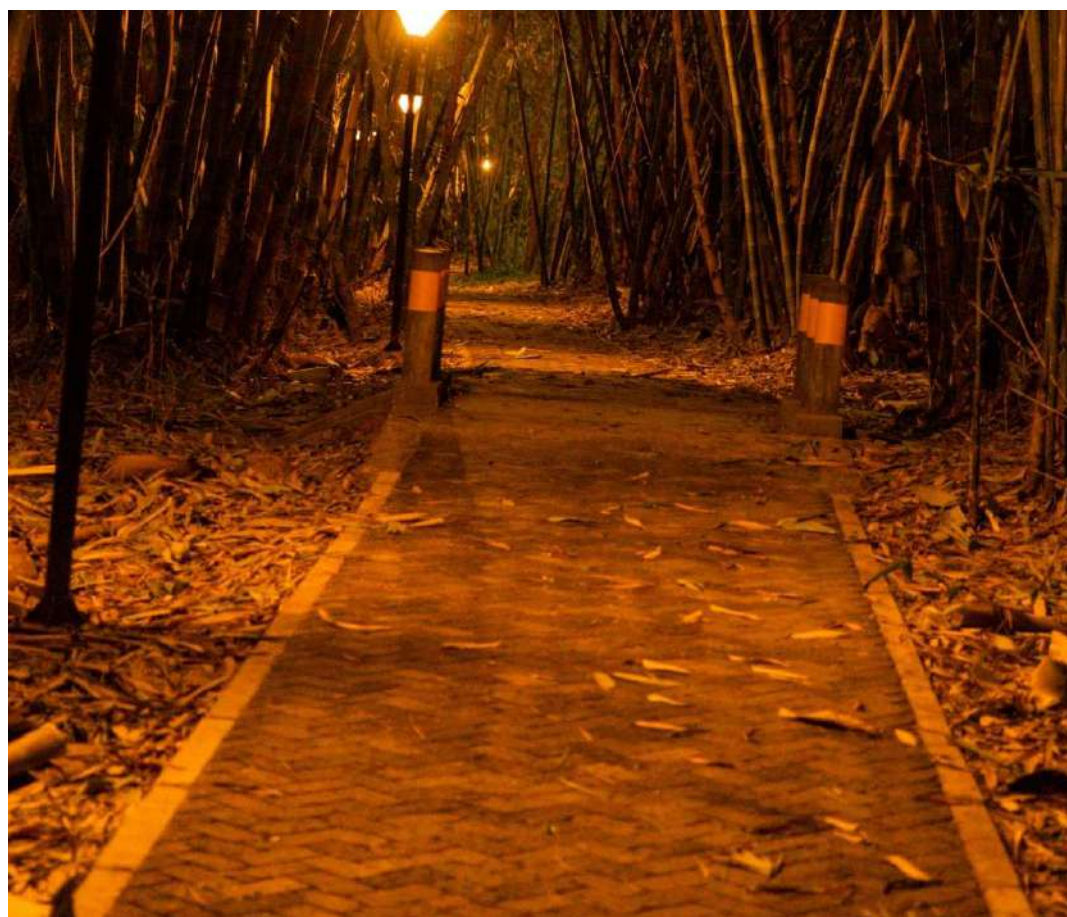
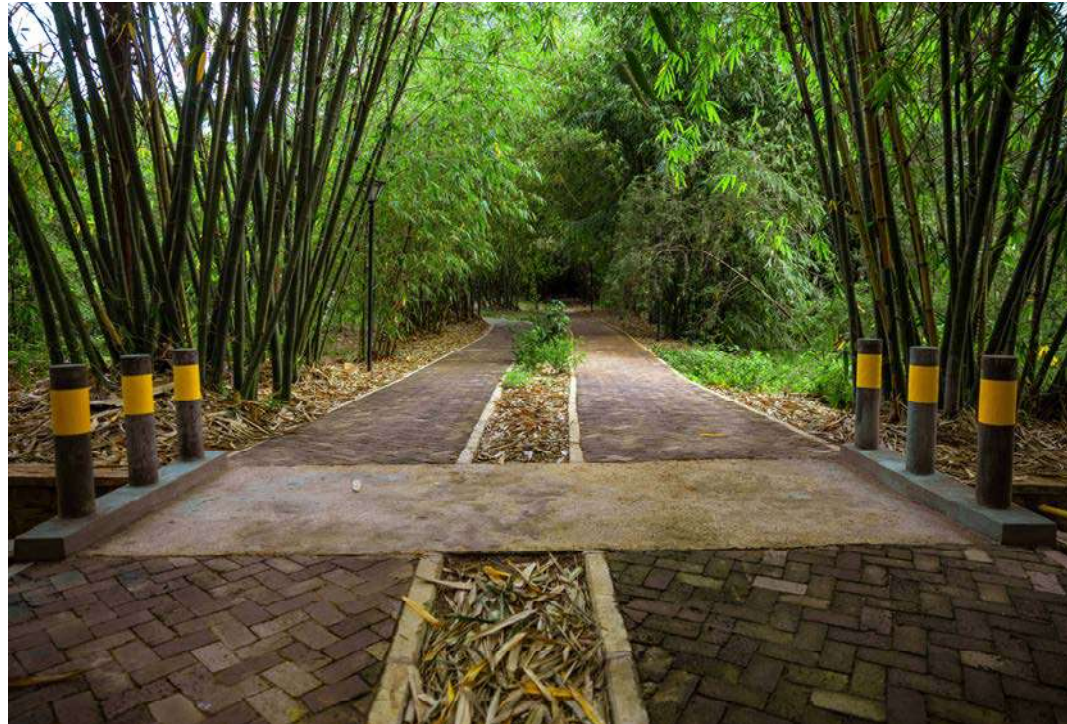


PONDS

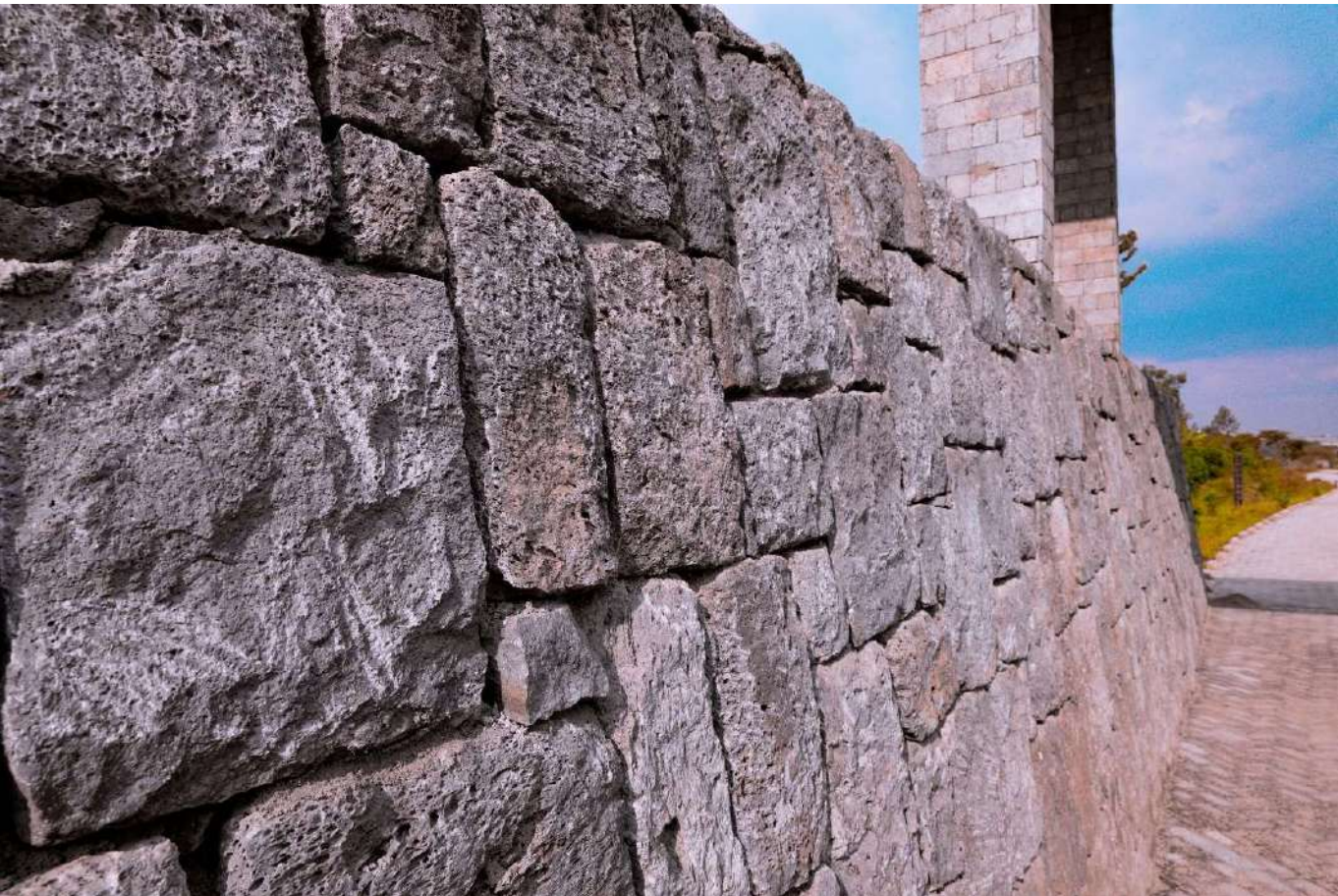


WALKWAYS AND CYCLE LANES

The project includes 8km of walkways and cycling lanes. This will provide visitors with opportunities to walk, jog or cycle as they enjoy the natural environment.



ENTRANCES STRUCTURE



INFORMATION CENTER

Information about the park as well as other environmental information for visitors will be accessed here, thereby enhancing the educational function. It's the starting point for visitors coming for a tour around the wetland.



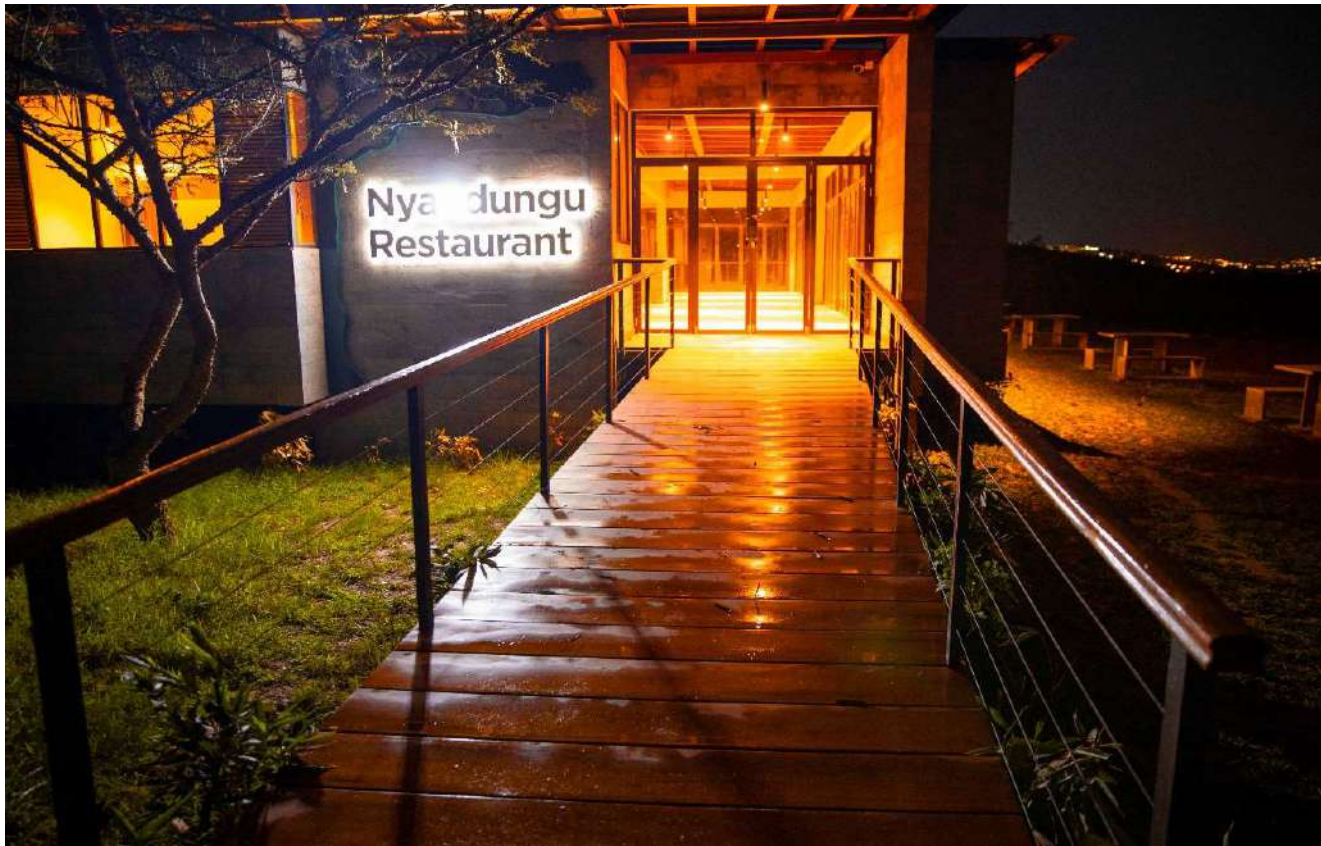
RESTAURANT



It will provide a comfortable place for visitors to take a healthy break amidst the serene natural environment. The building itself is designed to capture maximum daylight, removing the need for artificial lighting during the day. The glass and sliding doors are used to have an open view to the expansive landscape over the wetland

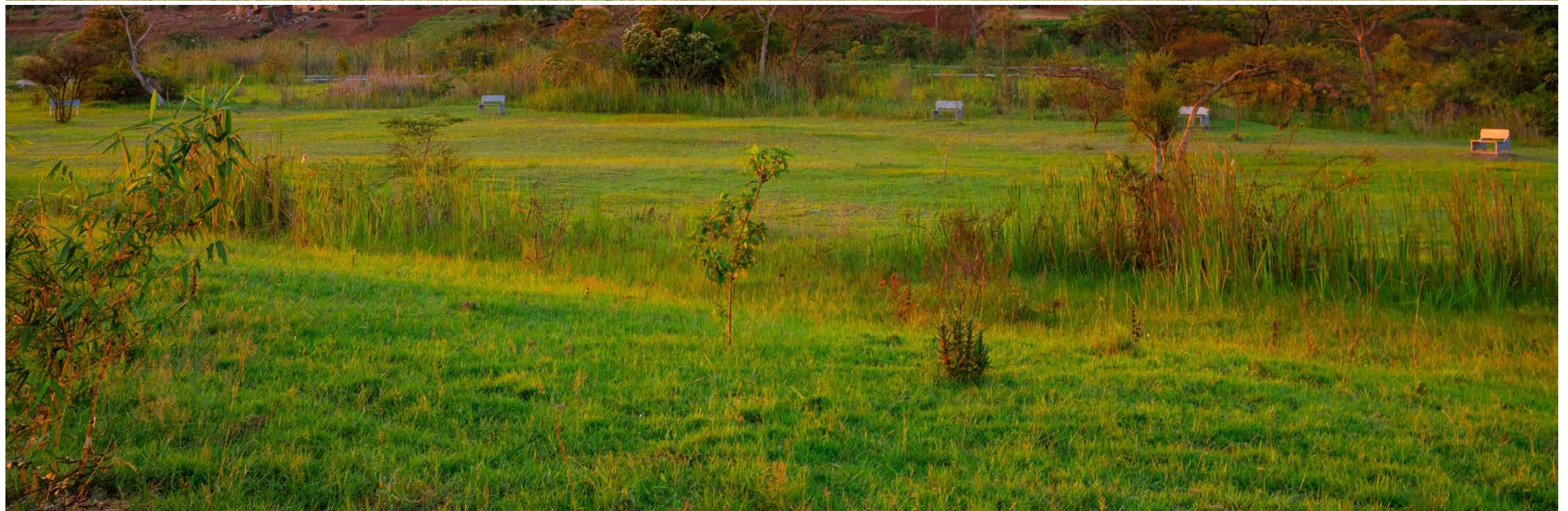
RESTAURANT Cŭ'd

Night time view of the Restaurant.



FUNCTION GROUNDS

There are open grounds that can be used to host events for groups of people



POPE'S GARDEN

The pope's garden is named to so to commemorate the visit by the pope in 1990. It's a historical event relevant to the location.



SITE FURNITURE

The project has incorporated site furniture to encourage visitors to pause and interact as they enjoy being one with the natural environment.



GREEN INFRASTRUCTURE AND SERVICES

The project has incorporated utilities, services and infrastructure that is environmentally friendly. Strategies to go for green energy, saving and recycling water, use of local and natural materials as well as architectural designs that maximize natural lighting and ventilation have been deployed.



ENERGY

The project currently provides for hybrid power. Power from the grid is complemented with solar power. There is provision to scale up the use of renewable energy in future phases.

WATER

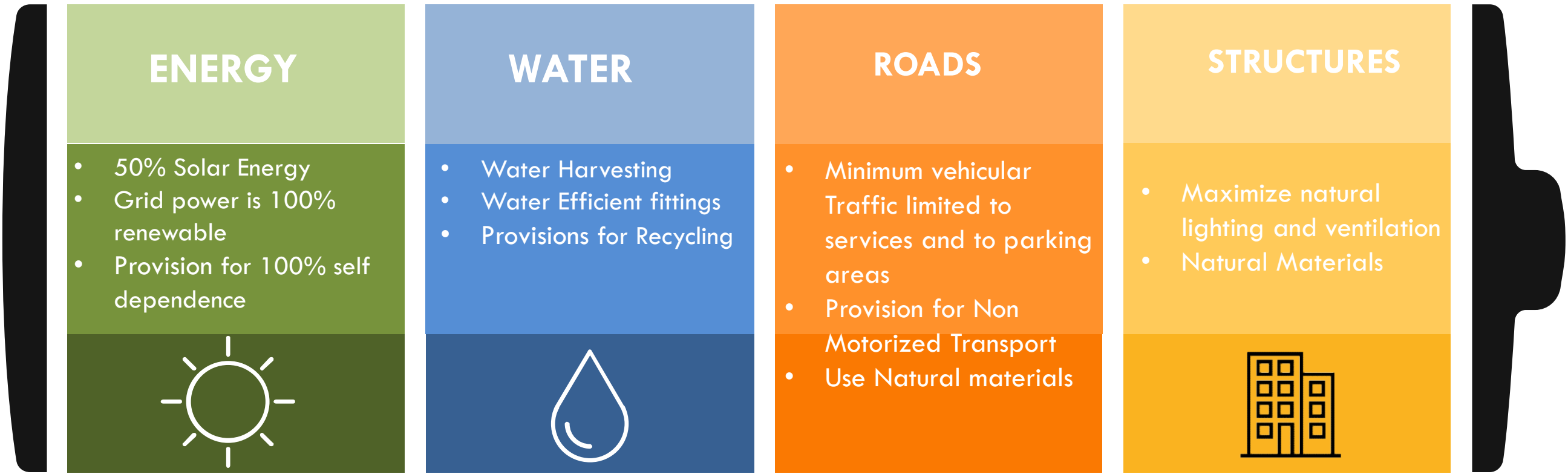
The project has made provisions for storm water harvesting from all buildings. The plumbing fittings are also water saving with low flow fittings and accessories.

ROADS AND PARKING

Vehicular movement around the site has been minimized. However basic infrastructure for car parking and servicing the restaurant have been included. These have been constructed in natural amakoro pavers (Volcanic stone) that are locally sourced and are more pervious to allow water to percolate underground.

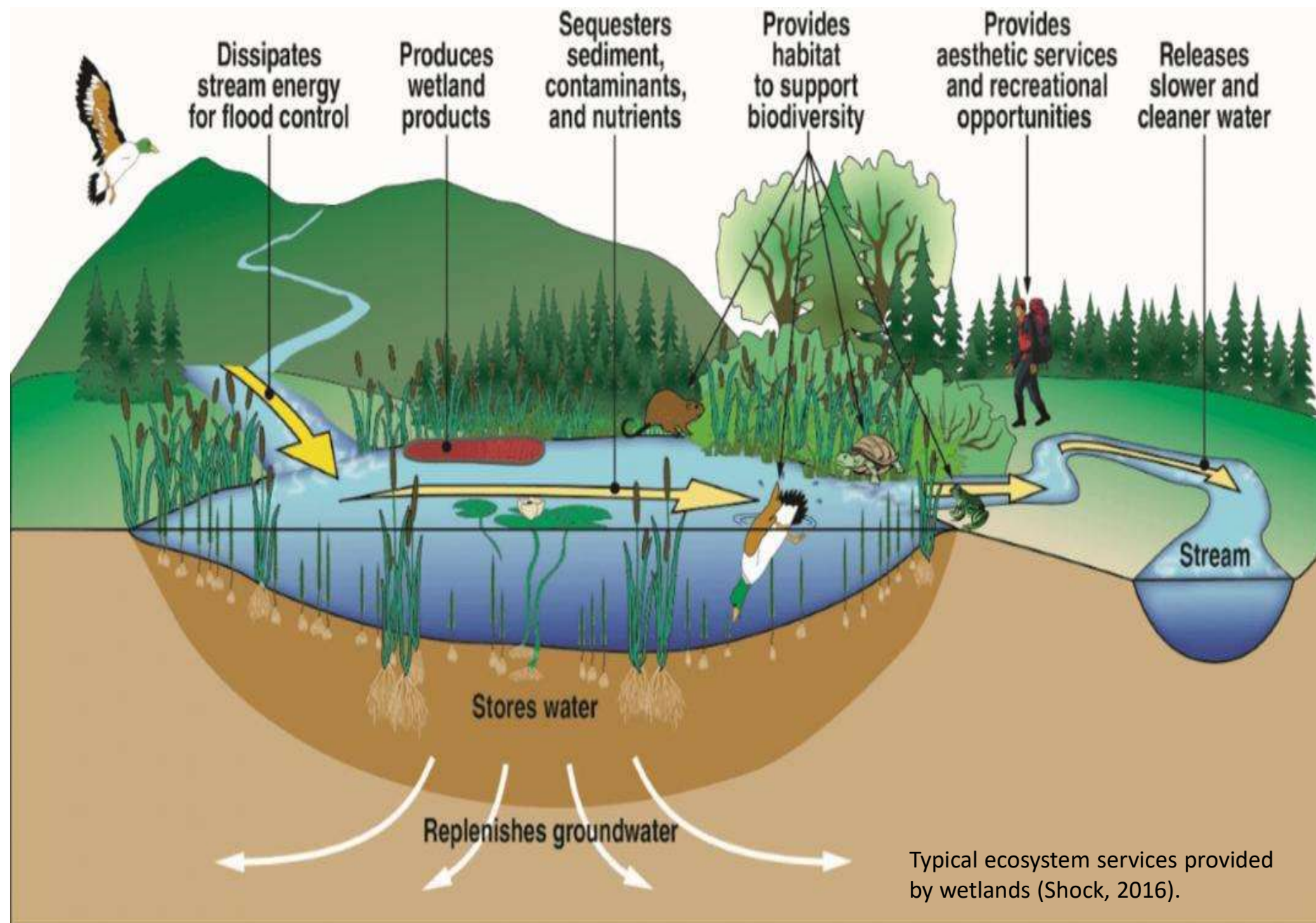
STRUCTURES

Architectural design maximizes natural lighting and ventilation. This has been deployed in all structures on site including the lavatories, maintenance building, restaurant, information center and the entrance structure



SUSTAINABLE MODEL FOR WETLAND RESTORATION

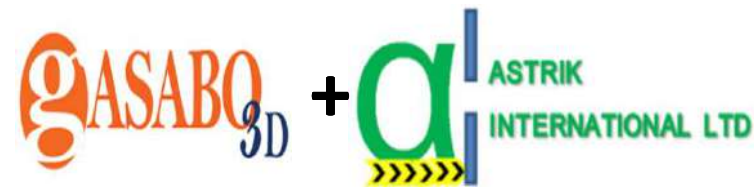
Wetlands have a variety of ecosystem services, like water purification, sediment and nutrient retention, groundwater recharge, maintenance of biodiversity, water quality regulation, storm protection, carbon sequestration, recreation and ecotourism, provide materials for consumption and use, local temperature reduction in urban settings, and cultural values.



CLIENT



CONSULTANTS



CONTRACTOR



NYANDUNGU URBAN WETLAND ECO-TOURISM PARK

