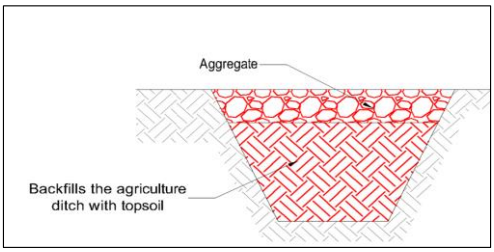
Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 5.RU	Name	Blocking of surface drains (agriculture ditch)
	Action target	Water filtration, Biodiversity
	Wetland	Rugenge-Rwintare

Location (map) RU02 - RU03 - RU04 - RU07

Photos / examples



Characteristics	Rough cost estimate	Priority	Objectives
RU02: backfill the agricultural drains with approximately 22 000 m3	97 500 USD	3 - Long-term 2050	- Limit the lowering of the groundwater - Increase the residence time of the water in the wetland - Homogenise the wetland ground - Enhance the storage capacity of the wetland - Reduce the water quantity and velocity downstream
RU03: backfill the agricultural drains with approximately 29 000 m3	131 400 USD	3 - Long-term 2050	
RU04: backfill the agricultural drains with approximately 5 600 m3	7 100 USD	1 - Short-term 2025	
RU07: backfill the agricultural drains with approximately 14 000 m3	63 800 USD	2 - Medium-term 2035	

Comments	- The existing water supply pipelines implemented into the wetland (RU02) will be included and considered during the further studies and works
Maintenance need	No needs
Management monitoring	No needs

Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 6.RU	Name	Planting of native plant species adapted to the wetland environment
	Action target	Biodiversity
	Wetland	Rugenge-Rwintare

Location (map) RU02 - RU03 - RU07

Photos / examples

Characteristics	Rough cost estimate	Priority	Objectives
RU02 Surface : 114 200 m²	399 700 US Dollar	3 - Long-term 2050	This action aims at recovering a herbaceous cover on all these surfaces, composed of a characteristic flora of wetlands and typical of Rwandan wetlands. For that, the first step consists in a preparation of the ground, with a decompacting of the ground in place on the first 15 centimeters in order to reactivate the seed bank and to support the rooting. The second step consists of planting with native species typical of local wetlands, such as Indian pennywort (*Centella asiatica*), Urugaga *(Cyperus dives*), Urukanganga/Epiphytic flatsedge (*Cyperus latifolius*), Carolina dichondra (*Dichondra micrantha*), Ubwungo/Heartleaf drymary (*Drymaria cordata*), Urufunzo/Papyrus (*Cyperus papyrus*), Umuberanya/Southern Cattail (*Typha domingensis*), Carex mildbraediana, Urukirakenja/Jointed flatsedge (*Cyperus articulatus*), Umujangaja/winged sedge *(Cyperus denudatus*), Carolina dichondra (*Dichondra micrantha*), Urujenone (*Enhydra fluctuans*), Gutwikumwe/Floating pennywort (*Hydrocotyle ranunculoides*), Ubusuna/Common rush (*Juncus effusus*), Urukembagufa/Cut grass (*Leersia hexandra*), Ikirogora (*Brillantaisia cicatricosa*), Umuzigangore (*Ludwigia abyssinica*), Igorogonzo/Watersmart weed (*Persicaria decipiens*), Igorogonzo/Watersmart weed (*Persicaria pulchra)*,

RU07 Surface : 80 200 m²	280 700 US Dollar	2 - Medium-term 2035	Urutaretare/ (*Pycreus macrostachys*). The plantings will aim to adapt the location of the species according to their need for water and the water conditions of the soil, in order to favour their development. The seedlings must come from a local source, which is necessary both ecologically and economically: ecologically, because the plants present in a given territory necessarily have the appropriate genetics for that land and are therefore adapted to local conditions, and economically, because local actors are more in demand than foreign suppliers. The planting will take place in December, once the rainy season is over. The clods will be installed in a hole made with a tiller, a planter or a pickaxe and carefully positioned in the hole thus made. Before planting, the plants will be soaked in water before installation and then packed in the soil. The plants in cups will be distributed by spots at a rate of 2 plants per m². All plants supplied by the landscaper shall be of the species and variety requested, free of wounds and pest attacks. They shall be separated by destination compartment and by species to facilitate distribution and verification. The plants must be replanted as soon as possible after delivery.
Comments			
Maintenance need	Annual management by mowing in August, before the rainy season.		
Management monitoring	Monitoring the evolution of the vegetation twice a year, during the dry seasons, by botanical expert, over 30 years (n+1, n+2, n+3, n+5, n+7, n+10, n+15, n+20, n+25, n+30).		

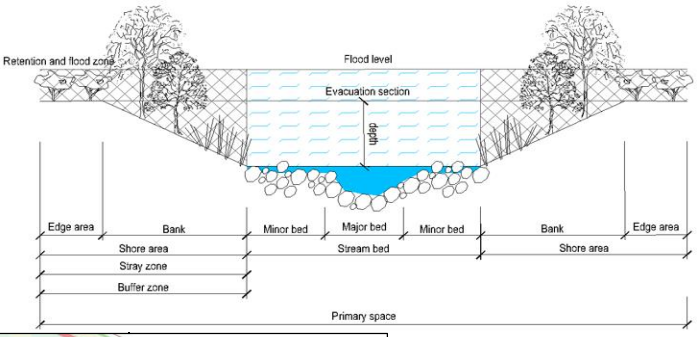
Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

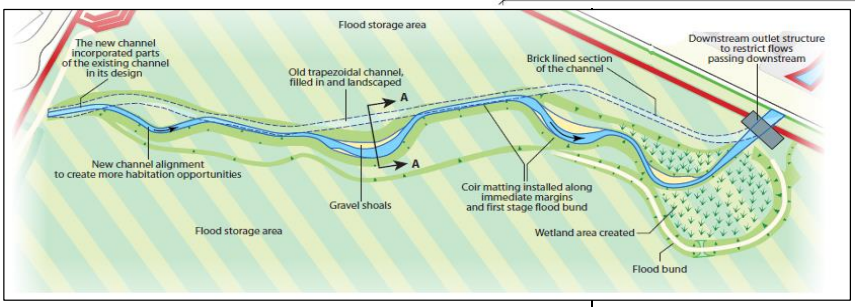
Action sheet

Action 7.RU	Name	Re-profiling of the river with the creation of meanders and banks with different levels
	Action target	Water filtration, Biodiversity
	Wetland	Rugenge-Rwintare

Location (map) RU5

Photos / examples





Characteristics	Rough cost estimate	Priority	Objectives
RU05 : Creation of meander and banks along 1 100 m	69 200 USD	2 - Medium-term 2035	- Improve the water quality and decrease the water quantity flowing downstream (slowing the flow) - Improve the biodiversity - Promote recreational area

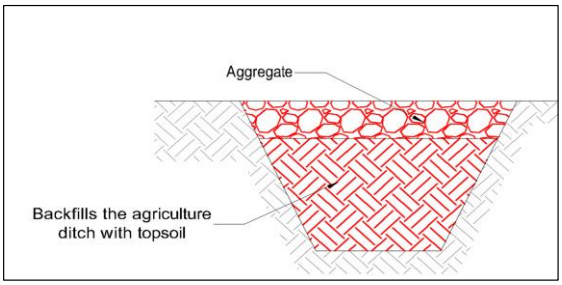
Comments	
Maintenance need	Needs to be defined according to the monitoring management report
Management monitoring	The work will be the subject of a technical file of the works carried out with the plans of the built installations. A follow-up of the profile of the restored banks and the minor bed will be carried out 6 months after the end of the work and then the year that follows. The frequency will be adapted according to the possible disorders observed and the results of this follow-up. On the basis of the technical file, the following will be identified - Possible movements, departures or contributions of blocks; - All possible traces of erosion, scouring on the resumed zones as well as on the transition zones and the zones peripheral to the development not impacted by the works. All the elements of this follow-up will be recorded in a report. In conclusion, recommendations will be made on possible rework, the frequency of monitoring, and on future developments.

Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet		
Action 8.RU	Name	Recharge of the river bed with aggregate
	Action target	Water filtration, Biodiversity
	Wetland	Rugenge-Rwintare

Location (map) RU05

Photos / examples



Characteristics	Rough cost estimate	Priority	Objectives
RU05: filling the watercourse with aggregates of different diameter and topsoil	91 900 USD	2 - Medium-term 2035	- Recover a space favorable for planting - Development of natural habitats

Comments	
Maintenance need	Needs to be defined according to the monitoring management report
Management monitoring	The work will be the subject of a technical file of the works carried out with the plans of the built installations. A follow-up of the profile of the restored banks and the minor bed will be carried out 6 months after the end of the work and then the year that follows. The frequency will be adapted according to the possible disorders observed and the results of this follow-up. On the basis of the technical file, the following will be identified - Possible movements, departures or contributions of blocks; - All possible traces of erosion, scouring on the resumed zones as well as on the transition zones and the zones peripheral to the development not impacted by the works. All the elements of this follow-up will be recorded in a report. In conclusion, recommendations will be made on possible rework, the frequency of monitoring, and on future developments.

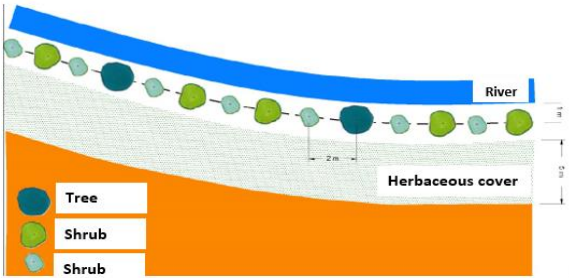
Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 9.RU	Name	Planting the banks with native plant species
	Action target	Biodiversity
	Wetland	Rugenge-Rwintare

Location (map) RU04 - RU05

Photos / examples



Characteristics	Rough cost estimate	Priority	Objectives
RU03 Surface : 38 400 m²	134 400 US Dollar	2 - Medium-term 2035	This action aims at recovering a herbaceous cover composed of a flora characteristic of wetlands and typical of Rwandan wetlands on all the banks and edges of the main rivers. To do this, the first step consists of soil preparation, with decompaction of the soil in place on the first 15 centimeters to reactivate the seed bank and promote rooting. The second step consists of planting native species typical of local wetlands, matching the water requirements of these species with the water conditions of the soil or the frequency of overflowing of the stream (depending on the stream levels). The species planted could be : Indian pennywort (*Centella asiatica*), Urugaga (*Cyperus dives*), Urukanganga/Epiphytic flatsedge (*Cyperus latifolius*), Carolina dichondra (*Dichondra micrantha*), Ubwungo/Heartleaf drymary (*Drymaria cordata*), Urufunzo/Papyrus (*Cyperus papyrus*), Umuberanya/Southern Cattail (*Typha domingensis*), Carex mildbraediana, Urukirakenja/Jointed flatsedge (*Cyperus articulatus*), Umujangaja/winged sedge (*Cyperus denudatus*), Carolina dichondra (Dichondra micrantha), Urujenone (*Enhydra fluctuans*), Gutwikumwe/Floating pennywort (*Hydrocotyle ranunculoides*), Ubusuna/Common rush (*Juncus effusus*), Urukembagufa/Cut grass (*Leersia hexandra*), Ikirogora (*Brillantaisia cicatricosa*), Umuzigangore (*Ludwigia abyssinica*), Igorogonzo/Watersmart weed (*Persicaria decipiens*), Igorogonzo/Watersmart weed (*Persicaria pulchra*), Urutaretare/ (*Pycreus macrostachys*). In addition, on the banks, it will be possible to plant shrub or tree species, adapted to wetlands, in order to form a rypisilve along the stream. This will stabilize the banks and strengthen the ecological corridor. This riparian buffer will be created on one side of the stream only, in order to maintain sufficient light and facilitate stream maintenance. The plants must come from a local source, which is necessary both ecologically and economically: ecologically, because the plants present in a given territory necessarily have the appropriate genetics for that land
RU04 Surface : 23 800 m²	83 300 US Dollar	1 - Short-term 2025	

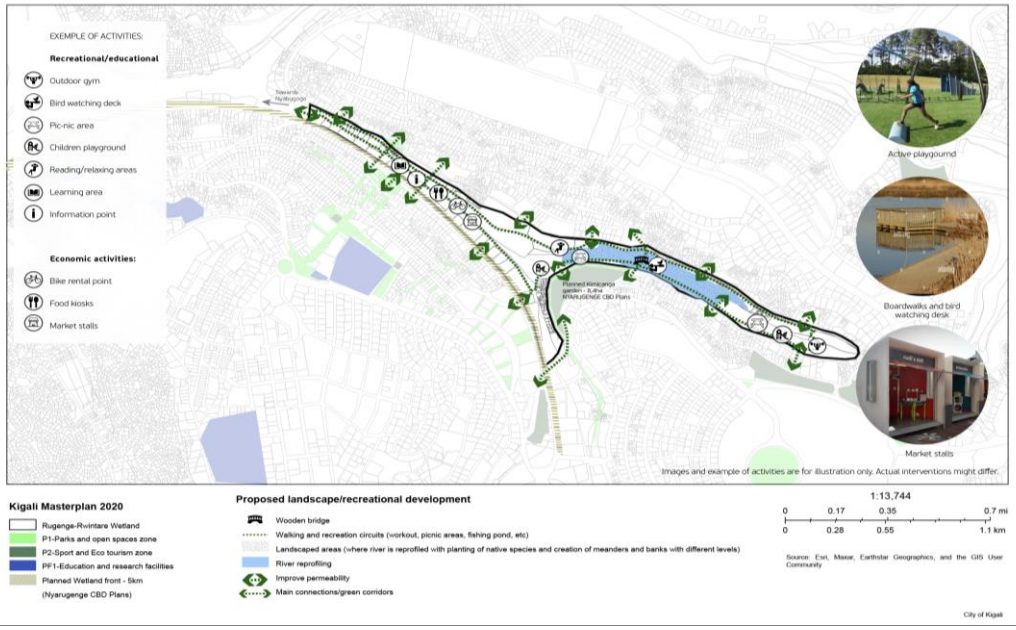
RU05 Surface : 119 900 m²	419 700 US Dollar	2 - Medium-term 2035	and are therefore adapted to local conditions, and economically, because local actors are more in demand than foreign suppliers. The planting will take place in December, once the rainy season is over. For the herbaceous species, the clods will be installed in a hole made with a rototiller, a planter or a pickaxe and carefully positioned in the hole thus made. Before being planted, the plants will be soaked in water before being installed, then tamped into the soil. The plants in the cups will be distributed in patches at a rate of 2 plants per m². For trees and shrubs, plants shall be placed in a hole at least 40 cm deep and staked. All plants supplied by the landscaper must be of the species and variety requested, free of wounds and pest attacks. They shall be separated by destination compartment and species for ease of distribution and verification. Plants shall be replanted as soon as possible after delivery.
Comments			
Maintenance need	Annual management by mowing in August, before the rainy season. Maintenance of the rypisilve every year : removal of dead wood, pruning as needed, …		
Management monitoring	Monitoring the evolution of the vegetation twice a year, during the dry seasons, by botanical expert, over 30 years (n+1, n+2, n+3, n+5, n+7, n+10, n+15, n+20, n+25, n+30).		

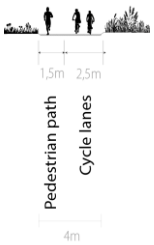
Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 17.RU	Name	Possible development of recreational activities: Creation of pedestrian/cycling circuits
	Action target	Landscape / Recreational activities
	Wetland	Rugenge-Rwintare

RUGENGE-RWINTARE WALKING AND RECREATION CIRCUITS





Characteristics	Rough cost estimate	Priority	Objectives
RUGENGE-RWINTARE WETLAND CENTRE			To create an attractive walking/cycling circuit that promotes awareness of natural habitats and an active lifestyle. Economic activities managed by private operators are included in the programme in order to contribute to the sustainability and durability of investments.
Package 1: Creation of walking/cycling circuits - Pedestrian/cycling circuits 4m wide (5km linear) - Benches every 500m (10x) - Accessible pedestrian bridge - Solar light poles every 20m (250x) - Planting of native species (5km linear) - Interpretation trail (natural habitat awareness signage)	**USD 1 200 000,00** **RWF 1 224 996 000,00**	1 - Short-term 2025	
Package 2 : Economic activities (attracting private actors) - Playgrounds (3x) - Bike rental kiosk - Picnic tables (10x) - Food kiosks (3x) - Toilets - Visitor information kiosk	**USD 400 000,00** **RWF 408 332 000,00**	2 - Medium-term 2035	
Package 3 : Boosting attractiveness and quality of spaces - Water activities - Bird watching deck - Outdoor gym circuits (3x) - Landscaped areas (1000m2 planted with native species)	**USD 200 000,00** **RWF 204 166 000,00**	3 - Long-term 2050	

Comments	See detailed plan provided in annex
Maintenance need	Annual for equipments and infrastructures and quarterly for green spaces with nature evolution
Management monitoring	Involvement of private operators for the day-to-day management of certain facilities (restaurant/cafe, bike rental kiosk, etc). Involvement of public players (site cleanliness, waste collection and management, etc.), to manage and enforce contracts, ensure coordination for the management of the site (internal regulations) and ensure security of the site

Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 11.RU	Name	Riprap at the outlet of urban discharge
	Action target	Flood control / Water filtration
	Wetland	Rugenge-Rwintare

Location (map) RU01 - RU06

Photos / examples

Characteristics	Rough cost estimate	Priority	Objectives
RU01 Number of riprap : 5 Volume : 250 m3	11 250 US Dollar	1 - Short-term 2025	This action consists of placing boulders just at the outlet of the urban drains, in order to break the incoming flow and improve the diffusion of water towards the downstream wetland and other hydraulic outlets. These riprap will be made of stones of size between 200 and 1000 mm, depending on the flow of water arriving and the speed of flow, so that they can ensure their anti-erosion role. For each riprap, it will be used stones of different dimensions so that the small stones occupy the empty spaces between the larger stones. They will be placed one on top of the other, so as to form a homogeneous entity and in phase with the width of the drains. The installation of the riprap will take place in dry periods, outside of rainy periods.
RU06 Number of riprap : 8 Volume : 400 m3	18 000 US Dollar	2 - Medium-term 2035	

Maintenance need	/
Management monitoring	Visual inspection of riprap twice a year and removal of any waste or plant debris that may be present.

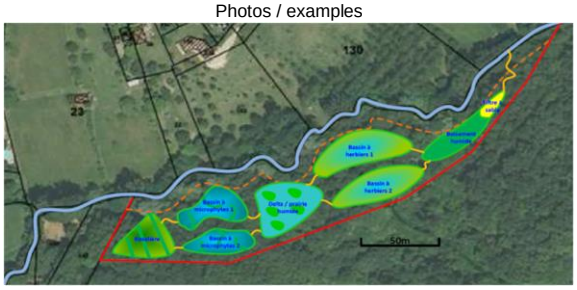
Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 12.RU	Name	Creation of a constructed wetland - buffer zone
	Action target	Biodiversity and Water Quality
	Wetland	Rugenge-Rwintare

Location (map) RU01 - RU06

Photos / examples



Characteristics	Rough cost estimate	Priority	Objectives
RU01 Total surface : 10 000 m²	185 000 US Dollar	1 - Short-term 2025	The design approach of the buffer wetland leaves an important part to the study of the contributing watershed in order to know precisely the characteristics of the incoming effluents and of the contributing watershed (flow rate, surface of the watershed, quality, frequency of feeding...). This ecological engineering project is based on different components such as hydraulics, purification, wetlands ecology and plant engineering.
RU06 Surface : 1 200 m²	22 200 US Dollar	2 - Medium-term 2035	In summary, the creation of a wetland buffer zone is carried out in 3 stages - Feasibility study to identify the environmental issues and take them into account in the design: topographic surveys, soil studies, hydraulic studies of the watershed... - Design study including: execution plans of the wetland buffer zone compartments, ecological engineering design, hydraulic sizing of the works and integration of educational supports... - Works and follow-up of the construction site requiring the intervention of qualified partners for the realization of the civil engineering (earthworks to create the various compartments, the overflows...), ecological engineering (choice of materials, planting of the vegetable species...) and a qualified site manager. A safety margin of 0.30m (minimum difference between the highest water level and the top of the compartment crest) is provided for during periods of maximum compartment filling. To achieve this objective, overflows will be installed at the top of the compartment crest.

Comments	"- The wetland buffer cannot be effective if it collects untreated wastewater. - Maximum depth of the compartments fixed at 1,20m

Maintenance need	Annual management by mowing in August, before the rainy season A wetland buffer reproduces, on a smaller scale, mechanisms that occur naturally in the natural environment. The evolution of the habitats and the sustainability of the objectives targeted by the wetland buffer (purification, biodiversity, education, etc.) are directly linked to the quality of its management from the moment it is put in water. The management of the buffer wetland leads to be vigilant on the following hydraulic phenomena - Creation of hydraulic plugs at the level of the hydraulic structures that can lead to overflows (loading of the system) and a reduction in the residence time. - Reduction of the residence time and the treatment capacity of the system by short-circuits and filling of the volume of the basins. - Risk of invasive plants or plant dieback. A management plan also has the following objectives - Ensure the cutting of plants with export of green waste - Maintain a high level of biodiversity in the water compartments by applying a differentiated vegetation management method. - To perpetuate the landscape quality of the site and its potential to welcome the public.
Management monitoring	Monitoring of the evolution of vegetation and hydraulics twice a year, during dry and rainy seasons, by an expert in ecological engineering, for 30 years (n+1, n+2, n+3, n+5, n+7, n+10, n+15, n+20, n+25, n+30)

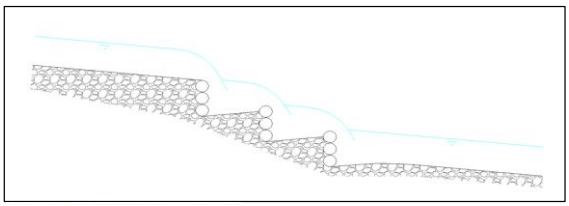
Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 13.RU	Name	Re-profiling of the hydraulic outlets from the discharge
	Action target	Water filtration, Biodiversity
	Wetland	Rugenge-Rwintare

Location (map) RU01 - RU06

Photos / examples



Characteristics	Rough cost estimate	Priority	Objectives
RU01: Riprap at the outlet with creation of different river bed ground level over 300 m	7 900 USD	1 - Short-term 2025	- limit erosion - enhance biodiversity with diversification of natural habitats
RU06: Riprap at the outlet with creation of different river bed ground level over 500 m	12 800 USD	2 - Medium-term 2035	

Comments	
Maintenance need	- Maintenance of the outlets (provent from solid waste accumulation): twice per year (including one before the rainy season) - Other needs to be defined according to the management monitoring report
Management monitoring	The work will be the subject of a technical file of the works carried out with the plans of the built installations. A follow-up of the profile of the restored banks and the minor bed will be carried out 6 months after the end of the work and then the year that follows. The frequency will be adapted according to the possible disorders observed and the results of this follow-up. On the basis of the technical file, the following will be identified - Possible movements, departures or contributions of blocks; - All possible traces of erosion, scouring on the resumed zones as well as on the transition zones and the zones peripheral to the development not impacted by the works. All the elements of this follow-up will be recorded in a report. In conclusion, recommendations will be made on possible rework, the frequency of monitoring, and on future developments.

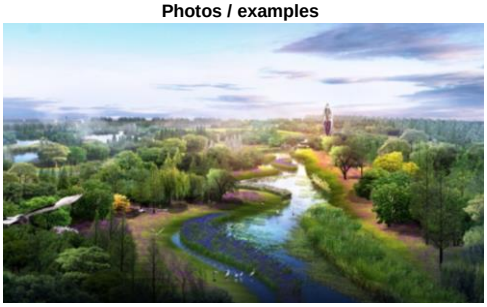
Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

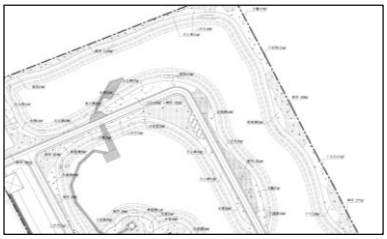
Action sheet

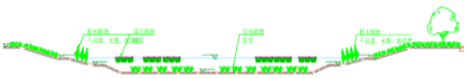
Action 18-RU	Name	Creation of a depression disconnected from the river
	Action target	Biodiversity and Water Quality
	Wetland	Rugenge-Rwintare

Location (map) RU2

Photos / examples







Characteristics	Rough cost estimate	Priority	Objectives
RU02 Half of the total area developed for the creation of depressions Surface : 55 000 m²	440 000 US Dollar	2 - Medium-term 2035	Before carrying out the earthworks, a design study phase will be necessary to refine the works to be carried out. These studies will make it possible to respect the following principles: - The arrival of water from urban drains must be accompanied by riprap to limit erosion in the depression; - The "project elevation" (longitudinal profile) must be determined on the basis of a good knowledge of the level of the river and of the water table (and its variations); - The slopes of the banks must be as low as possible; - The arm/depression can be materialized by multiple basins; - The recreation will not be uniform; - Excessive excavation may result in lowering of the water table (drainage). It can also cause a pollution of the water table by feeding with water of bad quality. These earthworks will have for objective to respect the criteria specified above. The use of mechanical shovel, bulldozer is necessary. The work must be carried out in such a way as to limit the compaction of the land: use machines with good bearing capacity ("marsh" shovels), avoid driving with the machines on the talweg, decompact the soil at the end of the work... The period of execution of the work is largely conditioned by hydraulic constraints (low water). It is important to underline the importance of the quality of the company and the project management in this type of work. It is advisable to choose companies that have already carried out this type of work, and to provide for very regular monitoring of the site by an ecologist. A safety margin of 0.30 m (minimum difference between the highest water level and the top of the compartment crest) is

Comments	"- The depression cannot be effective if it collects untreated wastewater. - Maximum depth of the compartments fixed at 1,20m
Maintenance need	Annual management by mowing in August, before the rainy season The management of depression to be vigilant on the following hydraulic phenomena - Creation of hydraulic plugs at the level of hydraulic structures that can lead to overflows (loading of the system) and a reduction in residence time. - Reduction of the residence time and the treatment capacity of the system by short circuits and the filling of the volume of the basins. - Risk of invasive plants or plant dieback. A management plan also aims to - Ensure the cutting of plants with export of green waste - Maintain a high level of biodiversity in the water compartments by applying a differentiated vegetation management method. - Perpetuate the landscape quality of the site and its potential to welcome the public.

Management monitoring	Monitoring of the evolution of vegetation and hydraulics twice a year, during dry and rainy seasons, by an expert in ecological engineering, for 30 years (n+1, n+2, n+3, n+5, n+7, n+10, n+15, n+20, n+25, n+30)

Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 19-RU	Name	Diversification of natural habitats typical of wetlands
	Action target	Biodiversity
	Wetland	Rugenge-Rwintare

Location (map) RU02

Photos / examples

Characteristics	Rough cost estimate	Priority	Objectives
RU02 Half of the total area developed for the creation of depressions. Therefore, the area to be vegetated is the same. Surface : 55 000 m²	220 000 US Dollar	2 - Medium-term 2035	This action aims at recovering a herbaceous cover composed of a flora characteristic of wetlands and typical of Rwandan wetlands on all the depressions up to the banks. To do this, the first step consists in preparing the soil, with decompacting the soil in place on the first 15 centimeters to reactivate the seed bank and promote rooting. The second step is to plant native species typical of local wetlands, matching the water needs of these species with the water conditions of the soil. Indeed, in order to accelerate the vegetation, it will be interesting to plant semi-aquatic and aquatic plants: sedges, reeds...In time, the planted plants will be more or less completed/replaced progressively by species spontaneously colonizing the site. The zones regularly in water will generally be well colonized by natural vegetation; it is thus little useful to sow them. This will involve proposing an adapted plant life with the following plant species: Centella asiatica (Centella asiatica), Urugaga (Cyperus dives), Urukanganga/Cyperus latifolius (Cyperus latifolius), Carolina Dichondra (Dichondra micrantha), Ubwungo/ Drymaria cordata (Drymaria cordata), Urufunzo/Papyrus (Cyperus papyrus), Umuberanya/Southern cattail (Typha domingensis), Carex mildbraediana, Urukirakenja/Cyperus articulatus, Umujangaja/Cyperus denudatus, Dichondra Carolina (Dichondra micrantha), Urujenone (Enhydra fluctuans), Gutwikumwe/ Hydrocotyle ranunculoides, Ubusuna/ Common rush (Juncus effusus), Urukembagufa/ Cutting grass (Leersia hexandra), Ikirogora (Brillantaisia cicatricosa), Umuzigangore (Ludwigia abyssinica), Igorogonzo/Water weed (Persicaria decipiens).

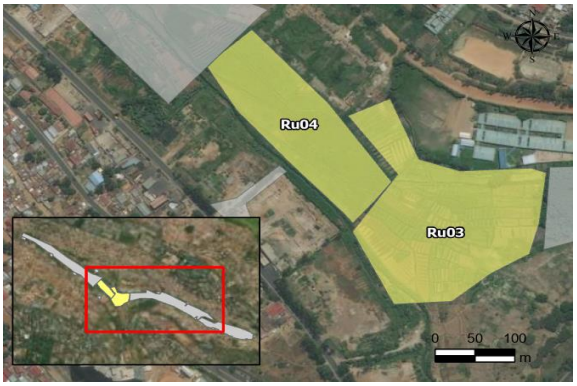
Comments	"- Developments must be carried out outside of rainy periods to avoid soil compaction and degradation caused by erosion (uprooting of plantations, seeds washed away by runoff...) - It is imperative to carry out the revegetation as soon as the earthworks are completed at the favourable period in order to avoid the proliferation of invasive species invasive species and erosion by runoff
Maintenance need	"- Annual management by mowing in August, before the rainy season - Ensure the cutting of plants with export of green waste
Management monitoring	Monitoring the evolution of the vegetation twice a year, during the dry seasons, by botanical expert, over 30 years (n+1, n+2, n+3, n+5, n+7, n+10, n+15, n+20, n+25, n+30).

Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

Action sheet

Action 20-RU	Name	Stream protection zone with a vegetated riparian buffer
	Action target	Biodiversity and Water Quality
	Wetland	Rugenge-Rwintare

Location (map) RU03 - RU04



Photos / examples

Characteristics	Rough cost estimate	Priority	Objectives
RU03 Vegetated buffer strip of approximately 25m wide on each side of the watercourse, i.e. an area of approximately : 10 000m² for a total of 200m	37 500 US Dollar	2 - Medium-term 2035	In order to limit the transfer of pollutants to the watercourse via runoff, vegetated buffer strips are positioned between agricultural plots and the watercourse network. In this action sheet, a vegetated buffer strip is defined as any vegetated surface that intercepts diffuse or concentrated surface runoff and therefore reduces the transfer of pollutants and/or sediments. These vegetated buffer strips are translated as grassy strips, permanent grasslands, fallow land, hedges, woods or copses. Their implementation requires : - Tillage to level and decompact the land; - Revegetation, which is either seeding of grassland or planting of shrubs/trees; - A choice of local plant species. This vegetated buffer strip, whose width will have to be refined according to the intercepted watershed, will also be a support for the migration of animal species.
RU04 Vegetated buffer strip of approximately 25m wide on each side of the watercourse, i.e. an area of approximately : 13 750m² for a total of 275m	51 600 US Dollar	1 - Short-term 2025	

Comments	Developments must be carried out outside of rainy periods to avoid soil compaction and degradation caused by erosion (uprooting of plantations, seeds washed away by runoff...)
Maintenance need	Annual management by mowing in August, before the rainy season
Management monitoring	Monitoring the evolution of the vegetation twice a year, during the dry seasons, by botanical expert, over 30 years (n+1, n+2, n+3, n+5, n+7, n+10, n+15, n+20, n+25, n+30).

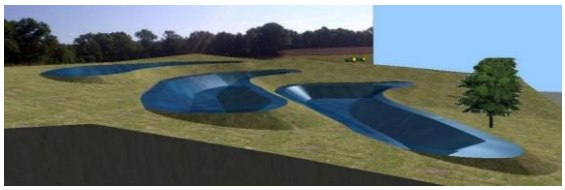
Feasibility study, baseline studies and detailed designs for wetland rehabilitation in the city of Kigali

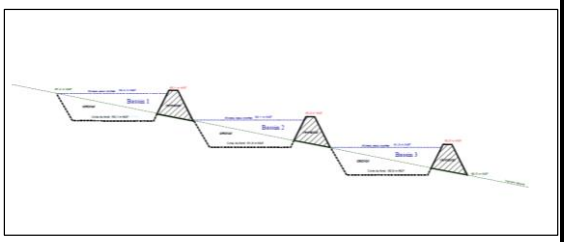
Action sheet

Action 21.RU	Name	Natural weirs in cascade
	Action target	Flood control / Water filtration
	Wetland	Rugenge-Rwintare

Location (map) RU07

Photos / examples





Characteristics	Rough cost estimate	Priority	Objectives
RU07 A quarter of the surface was considered for this action Surface : 2 ha	370 000 US Dollar	2 - Medium-term 2035	This action consists of creating cascading water retention areas along the flow axis of the hydraulic outfalls. These retention areas will be in the form of basins, with a water surface area of less than 500 m² and a maximum depth of 1.5 m. Before carrying out the earthworks, a design study phase will be necessary to refine the works to be carried out. The basins will be positioned in such a way that the first basin is fed directly by the upstream water (arrival of water), then the others fed successively by overflow of the previous one. Once the water has passed into the last basin, the water will then be directed towards the wetland. Each basin will have a dike to maintain a water level before overflowing to the downstream basin to ensure their watertightness and the dikes will be anchored to the compact and impermeable substratum. They will therefore be made with waterproof materials (clay, etc.) and then recharged with a layer of topsoil to encourage vegetation. The basins will be positioned according to the topography of the sector, but it will be important that the banks are gently sloping (20%) to promote the development of a hygrophilic plant cover and the reception of fauna (amphibians, insects, ..). A safety margin of 0.30m (minimum difference between the highest water level and the top of the basins crest) iwill be provided for during periods of maximum basins filling. To achieve this objective, overflows will be installed at the top of the basins crest. The work will have to be carried out in dry periods and avoid rainy periods.

Comments	The basins cannot be effective if it collects untreated wastewater.
Maintenance need	Cleaning of the ponds every 5 years, during the dry season. Removal of floating materials (waste, plant debris) in the ponds. It will also be necessary to be vigilant about the appearance of any invasive plant species or plant dieback. A management plan also aims at - Ensure the cutting of plants with export of green waste - Maintain a high level of biodiversity in the water compartments by applying a differentiated vegetation management method - To perpetuate the landscape quality of the site and its potential to welcome the public.
Management monitoring	Monitoring of the evolution of vegetation and hydraulics twice a year, during dry and rainy seasons, by an expert in ecological engineering, for 30 years (n+1, n+2, n+3, n+5, n+7, n+10, n+15, n+20, n+25, n+30).