



Co-Management Plan

Kala Oya Riverine Environmentally Sensitive Area
Ipalogama - Palagala Divisional Secretariat Divisions
Anuradhapura District
Sri Lanka

Local Management Committee
Ipalogama Divisional Secretariat Division



In Collaboration with

Enhancing Biodiversity Conservation and Sustenance of
Ecosystem Services in Environmentally Sensitive Areas
(ESA) Project.



Ministry of Environment and Wildlife Resources &
United Nations Development Programme



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Padmi Ranasinghe

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KalaOya – Walauwegama Riverine Environmentally Sensitive Area, Ipalogama - Palagala Divisional Secretariat Divisions

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Message form the LMC Chairperson

Abbreviation

BR	Breeding Residence
CBO	Community Based Organization
CR	Critically Endangered
CR/PE	Critically Endangered/Possibly Extinct
CWR	Crop Wild Relative (CWR)
DD	Data Deficient
DSD	Divisional Secretariat Division
DWC	Department of Wildlife Conservation
EN	Endangered
ESA	Environmentally Sensitive Area
ESA Project	Enhancing Biodiversity Conservation and Sustenance of Ecosystem Services in Environmentally Sensitive Areas (ESA) Project
FD	Forest Department
GND	Grama Niladhari Division
IAS	Invasive Alien Species
IUCN	International Union for Conservation of Nature
KOB	KalaOya Basin
LC	Least Concern
LMC	Local Management Committee
NAQDA	National Aquaculture Development Authority of Sri Lanka
NE	Not Evaluated
NT	Near Threatened
NTFP	Non Timber Forest Products
MASL	Mahaweli Authority Sri Lanka
PS	Pradeshiya Sabha
UNDP	United Nations Development Programme
VU	Vulnerable

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1.0. Introduction.

1.1. Introduction to the Environmentally Sensitive Area (ESA).

Sri Lanka, which is recognized as one of 34 'biodiversity hotspots' of global and national importance, is rich with a large proportion of endemic and threatened species. Giving reference to the National Red List (2012), the country profile of the Convention on Biological Diversity reports that Sri Lanka counts 253 land snail species, 245 species of butterflies, 240 birds, 211 reptiles, 748 evaluated vertebrates, 1,492 invertebrates, 336 pteridophyte and 3,154 flowering plants.

An area of land deemed to be dedicated to thrive on with the least disturbance for the purposes of conservation of biodiversity within their natural habitat have been declared as the Protected Areas and are administrated by Forest Department and Department of Wildlife Conservation of Sri Lanka with restrictions for human activities.

An Environmentally Sensitive Area (ESA) is a 'landscape element or an area, own by public or private entities, with high biodiversity value, located outside of a protected area, and which needs to be managed through a co-management modality to conserve biodiversity and sustain ecological, environmental and socioeconomic benefits to the local communities as well as the nation and the globe at large'.

The ESA can also be seen as an area that is vital for the long-term maintenance of biodiversity and its evolutionary potential and/or the productivity of water, soil and other natural resources that provide ecological, environmental, economic and/or cultural benefits/ services primarily to the local community which requires co-management as applicable.

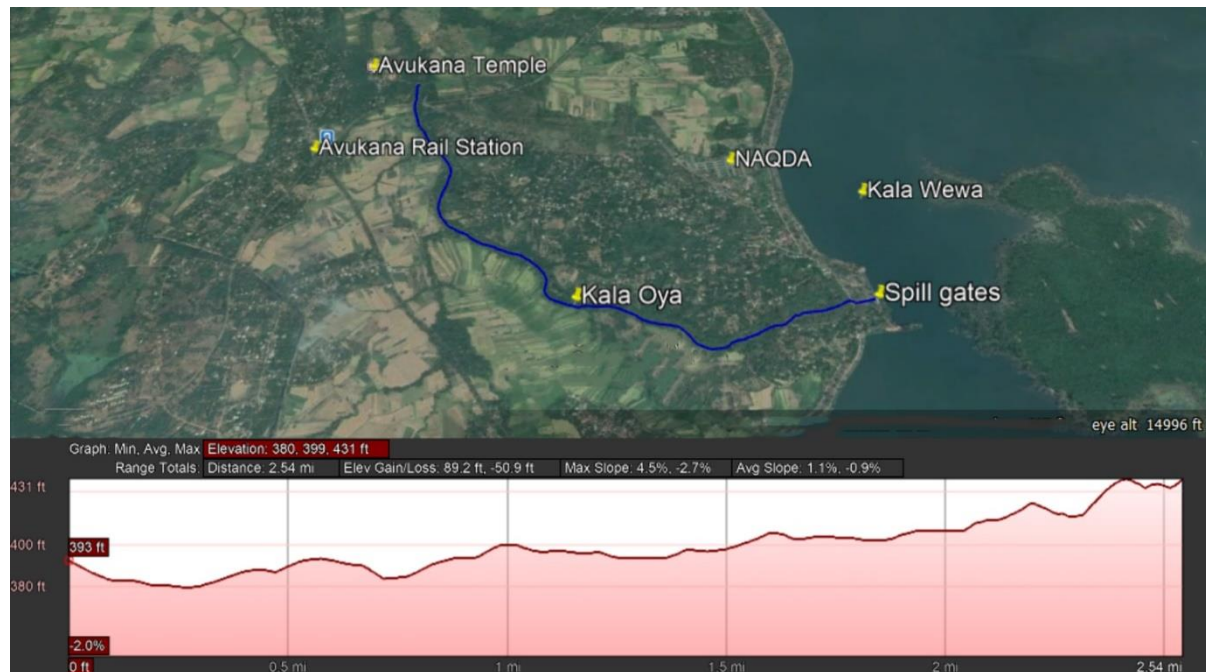
The primary goal of the ESA is to balance the common interest of development and biodiversity conservation and the ultimate goal is to ensure sustainable development through environmental sustainability. This includes shaping of human, social and natural capital and participatory natural resources management and incorporation of conservation of biodiversity into development agenda.

An ESA is identified by assessing of biodiversity data, ecosystem data and data on potential socioeconomic benefits as per the ESA selection criteria.

1.2. Kala Oya Riverine ESA.

The Kala Oya is the third largest river in Sri Lanka, starting from Dambulla and ending in Gagewadiya at Puttalam District crossing North Central, Central and North Western Provinces of the country. 76% of the Kala Oya basin is situated in the northwestern dry zone of Sri Lanka. The Kala Oya basin has been divided to (1) Upper region- the area above the Kala Oya, (2) Mid Region- Kala Wawa and Rajanganaya Wewa, and (3) the Lower region-the the area downstream to the Rajanganaya to the river mouth. The river is not a perennial river and dries out certain areas during the dry season. However, after receiving Mahaweli waters at the Bowatenna diversion, to the Kala Wewa reservoir, Rajanganaya receives adequate water and hence comparatively rich biodiversity in the riverine forests along the river. The elevation of the Kala Oya basin ranges from the sea-level to 600 m above the sea-level at its headwaters.

Map 1: Location and Elevation of Kala Oya in ESA.



Source: Google EarthPro

The Kala Oya Riverine ESA is located along with the mid region Kala Oya, starting from Kala Wewa spill and ending at the boundary of the Ipalogama Divisional Secretariat Division (DSD), and bordering Walauwegama GND (488) Grama Niladhari Division (GND) of Ipalogama DSD

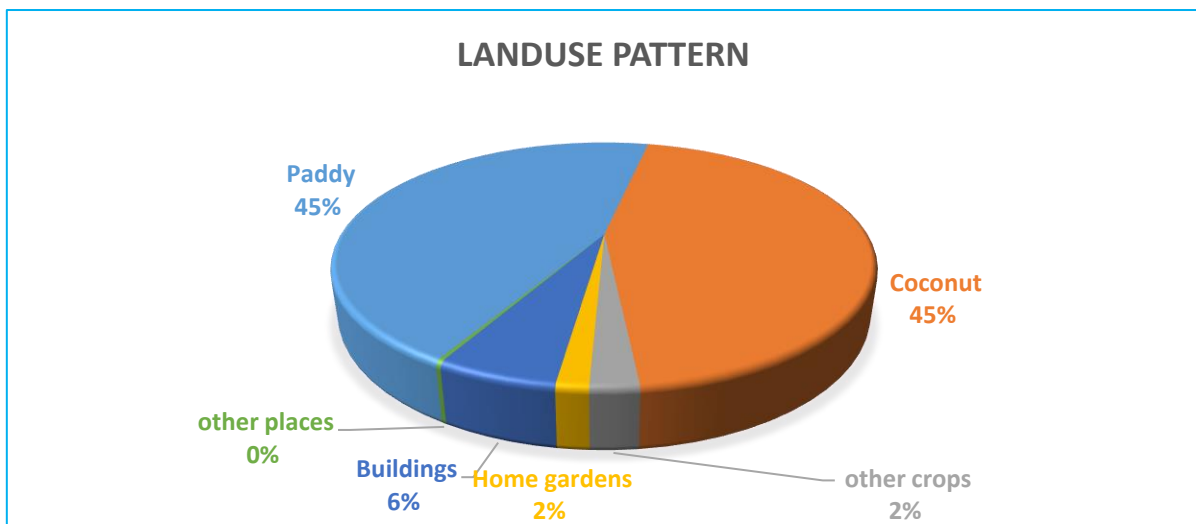
and Balaluwewa I (686), Balaluwewa ii (687), Nellyagama (688) and Pahalagama (689) GN Divisions (GND) of Palagala Divisional Secretary Division. The Kala Oya Riverine ESA boundaries of both the DSDs are established considering the Kala Oya reservation boundaries and influence/impact area of adjoining community occupied areas. The total extent of the ESA is 48 hectares (if the reservation is 60 meters one side for 4Km). The elevation of these 4 Km long Kala Oya in the riverine ESA is 380ft to 431ft.

1.3. Socioeconomic Status of the villages around Kala Oya Riverine ESA.

The total land extent of **Walauwegama** GND at the right bank of the Kala Oya which comprised with three villages namely, Walauwegama, Ukkumpallama and Kanakkammaduwa is 5.20 Km². The population of the GND is 2098 in 616 families, which is around 4.5% of the total population in the Ipalogama DSD and the population density is 403.46. The village called “Walauwegama” accommodate 83% of the total population of the GND. The following graph shows the population distribution in accordance with age level of the people. Around 28.2% of the total population has ended their education at grade 10 and 23.72% has reached only up to grade 5. The majority of the villagers engage in self-employments while reasonable numbers of people has not indicated any stable income source. Some work in the government sector as well as private sector while reasonable number (42 females) have migrated for employment. There is a high potential for local tourism related income generating opportunities due to Avukana statue and Kala Wewa.

There are 690 highland owners and 338 paddy land owners in the GND. Among the highland owners 78.5% have more than one acre and among paddy land owners 80% have more than one acre. As per the following figure, 94% of the land are agricultural land. There are five agricultural well in the GND. The resource profile data shows that most of the paddy farmers engage in paddy cultivation in both the seasons and the key supplementary crops are maize, chili, soya, undu and B onions.

Figure 1: Land use Pattern in Wallawwegama GND



Source: Resource Profile, 2019, Ipalogama Divisional Secretariat.

National Inland Fisheries and Aquaculture Training Institute (NIFATI) of the National Aquaculture Development Authority of Sri Lanka (NAQDA) which is the premier government sector training institute in Sri Lanka for inland fisheries and aquaculture is situated at the Walauwegama GND.

Balaluwewa 1 GND of Palagala DSD has two villages namely Dikediyaya and Balalugama and the total land extent of the GND is 6.62 Km². Total population of the GND is 1025 of 301 families and population density is 154.8. There are 36 widowed families and 67 families receives public relief assistance. In addition to them, there are five kidney patients and 8 families with persons with disabilities. 40% of the families in the GND receives Sumurdhi. In Dikediyaya is populated (69%) than Balalugama. Average education level of the GND is low and around grade 5, however there are numbers of graduates in the GND. In addition to the public and private sector employments, some villagers engage in fishing and cattle farming too.

The GND has only highland and majority of the land owners have less than 0.5 acres of land. The Balaluwewa I GND has the 29% of land extent of open forest in the area in the Palagala DSD and which is highest forest cover in the DSD. However, no thick forest or forest plantations are there. Dikendayaya wewa, with the capacity of 30 acre-foot provide water 32 acres in both Yala and Maha seasons for 50 farmers in addition to the 17 agro-wells in the GND. Some land (18 acres) are cultivated in Yala season with agro wells supplied water. Ladies fingers, pumpkin, cabbage are common vegetable in the GND. There are 12 different community-based organizations are in function.

1510 persons in 379 families live in 2.06 Km² in **Balaluwewa ii**. The population density is 733 which is reported as the 3rd highest in the DSD. It can be see that elderly population is low in the GND and the highest number of age category is 10 -14 and 18 –25. 13% families are women headed families, 21 families who receives public relief assistance, and 26% receives Samurdhi. There are 8 Community Based Organizations in the GND.

Average education level of the villagers is Ordinary Levels and there are a considerable number of people whose age level is over 5 years and have never schooled. Majority of the GND involve in self-employment such as agriculture, animal husbandry, and fishing activities. While private sector employees not are not to be seen, many can be seen education sector. Around 50 have been migrated for employment and out of which 90% are male. Around 62% of the land owners of highland have less than 0.5 acres and 3% have more than 1 acres. Among the paddy land owners, 86% have 0.5 -1 acres and 3% more than 5 areas. Most significant fact is that no single hectare of forest or natural environment like water bodies in the GND.

Nelliyagama GND' total land extent is 2.77 Km² and the population density is 493.9. There are 1368 people live in 388 families. A slight trend to reduce the old age population can be identified in the GND and highest number of people belong to the age group 18-24. 5% of the villagers have never schooled. However, the GND shows high ratio of educated person in the DSD marking 4% of population is graduates.

The majority of the GND engage in self-employment, and highest numbers shows in agriculture sector and followed by animal husbandry sector. 68% of the government employers in the GND serve in the education sector. In the self-employee category, 320 people work as agricultural farmers and 51 as animal farmers. The highest number of migrant employees in the DSD are in Nelliyagama GND and 81% of them are males. The GND has paddy

land than the high lands, and, among the highland owners around 65% have less than 1 acre of land. 73% of the paddy landowners own 1 to 5 acres.

Irrespective of the high-level education, government sector employment and migrant workers, the GND shows the highest number of public relief assistance receivers in the DSD which is around 31%. 19% of the total families in the GND receives Samurdhi assistance while 7% are female headed families. There are significant number of kidney patients in the GND. There are six CBOs are in function in the GND. Nellyyagama GND too does not have forest land.

Pahalagama GND consists of two villages namely Pahalagama and Galketiyagala and the population is 837 resides in 257 families. The total land extent is 3.09 Km² and the population density is 270.9. The sex ratio of the GND is 113.52%. 25% of the total population in the GND receives Samurdhi while 14% receives public relief assistance. 15% are women headed families.

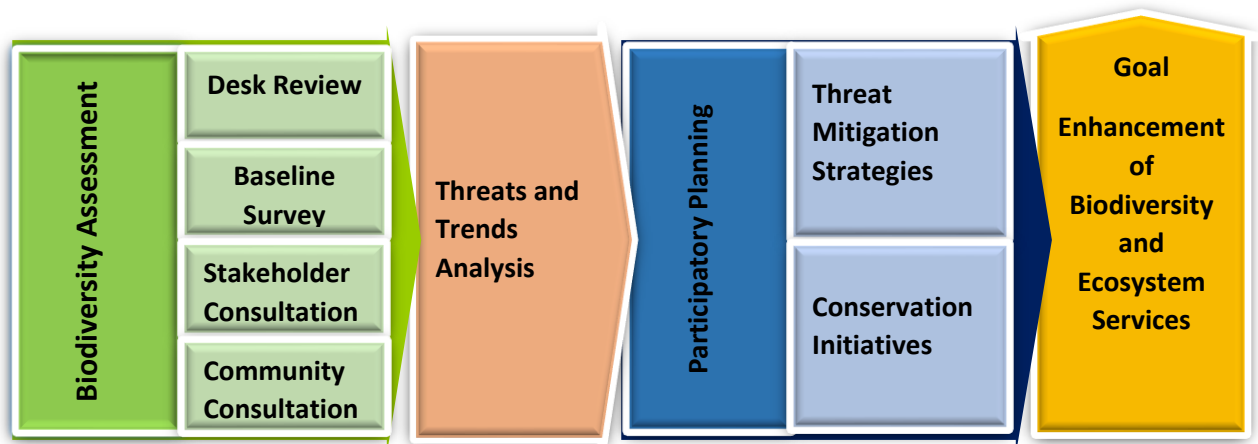
Among the persons above 5 years, 52% has obtained either O/L or above education qualification however, a considerable number of people has stopped their education between grades 1-5. Majority of the GND engage in self-employment, mainly in agriculture and animal husbandry sectors.

Around 67% highland owners have 0.5-1 acre of land and 71% of paddy land owners own 1-5 acres. Like other GNDs in the Palagala DSD, paddy cultivation is the fundamental agricultural activity of the villagers under major, minor irrigation facility and rain water. 28 agro-wells have been constructed in the GND area and around 40 acres are cultivated in Yala season under the water of agro-wells. Chena cultivation and home gardens are also at considerable level at the GND. There are 8 CBOs in the GND. No forest land in the GND.

1.4. Kala Oya Riverine ESA Co-Management Plan Development Process.

Based on the findings of the biodiversity assessment carried out by the Ministry of Environment in the year 2017, Ipalogama DSD was selected for the piloting phase and a Co-Management Plan for Conservation for Biodiversity was prepared for the Ipologama DSD following the process of biodiversity assessment, threats and trends assessment and planning in consultations of the community as well as relevant stakeholder institutions (participatory planning) as shown in the figure 1 below.

Figure 2: Co- Management Plan Development Process.



The biodiversity assessment was carried out in four stages, consisting of (i) the desk review – reviewing of various reports pertaining to the biodiversity in the area, (ii) the biodiversity baseline survey done by the biodiversity experts under the coordination of Biodiversity Secretariat, (iii) stakeholder consultations with government and non-government institutions, and (iv) community consultations.

During the community consultations held at the Walauwegama GND in June 2019, community explored the biodiversity at and its values of the first 4 kilometers of the Kala Oya which comes under the Ipalogama DSD and the community especially revealed about the endemic freshwater species in the riverine. Based on the community consultation, on July 2019, a biodiversity assessment, especially species diversity and richness to some extent were conducted with the leadership of relevant government institutions; Forest Department, Department of Wildlife Conservation (DWC) and National Aquaculture Development Authority of Sri Lanka (NAQDA). In addition to that, the community also carried out a study on medicinal plants at the Kala Oya riverine with the guidance of the Ayurvedic doctor of the area.

The Forest Department and the Wild life department officials were conducted the assessment with ESA consultants and community members. Both river banks were undergone for the assessment. Every 200m distance, data collection point was identified, and data collection points were taken as a zig-zag pattern, where one point is closer to the waterbody and the other one is 200m away from the water outward the riverine forest. Flora species were recorded within six-meter radius from the sampling locations. All Fauna species encountered throughout the field visit were recorded. Transact was carried out with the field officers and community members of adjoining GNDs in Palagala and Ipalogama DSDs and discussions were held with the Kala Oya adjoining farmer communities, especially with regards to the management of encroachment and sustainable agriculture practices.

Biodiversity assessment on fauna of Kala Oya was conducted by the NAQDA with participation of Walauwegama community during both the day and night times. Sampling locations were selected in flowing and slow flowing water than stagnated locations. Collected sampling species were verified at the National Inland Fisheries and Aquaculture Training Institute (NIFATI) of NAQDA, Kalawewa.

In 2020, on the request of the ESA Project, a Rapid Biodiversity Assessment was conducted by the International Union for Conservation of Nature (IUCN).

Both the natural and anthropogenic threats were identified in consultation with stakeholders and communities and based on the scientific review of existing data. The trend analysis was also carried out considering of the socioeconomic and environmental risk to the biodiversity and based on the changing community demands and practices. A planning session was held again with the relevant stakeholder institutions. The final Co-Management Plan was discussed with and validated by the community as well as member of the LMC in August 2020.



2.0. Introduction to the Environmentally Sensitive Area (ESA).

Proposed Kala Oya riverine landscape is located at the banks of the Kala Oya, and its tributaries of 4 km from the Spill over of the Kala Wawa reservoir. This strip of continues frost considered as a pilot of riverine forest conservation of the Kala Oya. The area characterized by multiple co-existing land uses, including riverine forest ecosystem, agricultural lands covering the banks of the river and providing vital environmental and economic importance.

Being highly sensitive to environmental changes, the riverine forest area holds high biodiversity, support maintenance and resilience of the area. Having profound effects on water quality and the hydrology of the Kala Oya, sustains agricultural activities of local communities and livelihoods along the third longest river of the country. The Kala Oya flows outside of the protected areas; hence the riverine forest and its associated flora and fauna species have not been protected under the protected area coverage.

Agriculture is the main income source of both the Ipalogama and Palagala DSDs. In divisional land use, the percentage of agricultural land is reported as 77% including of the 59% of paddy lands while forest has limited to 1%of the divisional land including of the agroforestry land. The balance land is being used for constructions, infrastructure facilities and water bodies, etc. In Palagala DSD, around 60% of the divisional land have been utilized for agricultural activities while 26% forest is there. This showcase the value of conservation of riverine forest.

In 1980, The Mahaweli Authority of Sri Lanka embarked the KalaOya Riverine forest 200 feet (60m) from the riverbank (MASL, 2020). The Riverine forest along the Kala Oya had been flourished all over the available land, where receives good supply of water for water loving trees until people started to clear the forest land and transformed to agricultural lands. Agriculture and cultivation further encourage the settlements in the forest area. Population incensement and cultivation resulted the segregation and fragmentation of continuous Kala Oya Riverine forest, which limited to the riverine forest tract today.

The Kala Oya riverine forest is environmentally sensitive, hold high ecological and environmental importance, however its ecological viability and productivity decreases due to socio- economical pressure, anthropogenic and natural threats and complications of climate

changing impacts. This leads to degradation of Kala Oya riverine forest and depletion of ecosystem and biodiversity. On the other hand, Riverine forest at the near the spill is critically important to survival of the surrounding area as it's in the flood zone.

Therefore, conservation of the riverine forest is censoriously needed.



2.1. Biodiversity Profile and Values.

2.1.1. Ecosystem Diversity.

Waterbody / Freshwater Stream Ecosystem.

Sri Lanka exhibits a wide array of ecosystems, ranging from forest to agricultural, aquatic and marine environments. The several climatic zones that exist in the country are characterized by specific forest types, including rainforests, mountain cloud forests, dry zone monsoon forests and arid thorn scrub forests.

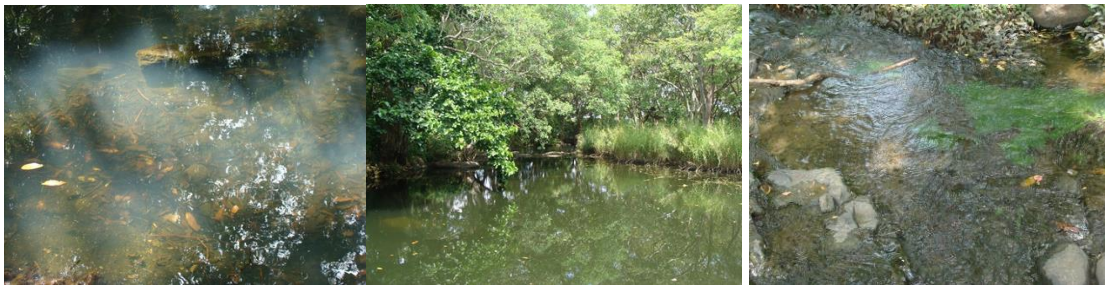
First 4km of the Kala Oya riverbanks thick and continues riparian vegetation is present, especially at the right bank. In some areas limited sunlight reaches to the forest floor and hence the understory is also limited. Dominant species of the riparian vegetation was Kumbuk and many other fauna species are anchored in the area.

The first 4km of Kala Oya, water depth was less than 1 feet and many fish species were also observed in the stream. Therefor bottom feeders, freshwater mussels, crustaceans, worms, snails, insects, fish species, larvae of insects, early life stages of amphibians often concealed in rocks and shallow water. Snakes, geckos, lizards, frogs and toads are stationed near water in the stream in search of food, shelter and breeding.

Color of the water was visibly green in stagnant water puddles/areas and those are the only considerably deep (~5ft max) and other areas relatively shallow during the spill is not opened or during the dry season. Without spill water or north eastern monsoon rain water, throughout the year, normal water flow of the Kala Oya first 4km shows moderate velocity in most areas, but isolated water puddles or stagnated water due to rocky formations also visible.

Different sized rock boulders are common in the area, and during the rainy season many rocky formations are submerged by water, creating continues, steady water flow.

Due to this kind of morphology of the waterbody, it supports different types of aquatic fauna species' survival, roosting and as a breeding site. Slow water flow and stagnated water provide protection for eggs, leave and early development stages of aquatic, amphibian and insect species. Long period of the year, low water level and dump environment, protection providing from rock formations support survival of fauna species further. Water flow works as medium for seed transport and support growth of rich plant population.



Examples of different habitats for freshwater fish species in Kala Oya: Slowflowing shallow water with debries, Deep pools, Moderate flowing water

Tributaries in the catchment area of the first 4km of the river is easy to identify, and water drained through tributaries from nearby agricultural lands. Due to siltation, visibility of water has been reduced and some soil depositing areas are in both side of the river. Siltation on the water body mainly occurred due to riverbank encroachment in creation areas of the water body.

The riverbanks are full with decayed leaves and tree debris provide habitats for decomposers and support chemical recycling process, one of the major sources of self-fertilization of forest soil. Tree leaves on the forest floor adding nutrition and moisture to the soil, reduce soil erosion and support material recycling, and increase water retention in the waterbody. Muddy and soggy forest floor very next to the water body allowed amphibiotic plants to grow and also provides nutrients for phytoplankton (microscopic plants) in the near the surface of river water and Freshwater zooplankton.

The thick canopy of woody plants covers the Kala Oya and support water retain in this perennial waterbody in the dry zone of Sri Lanka, where high temperature and evaporative conditions are uniformly high. These tree species adding aesthetic benefits to the landscape.

Bamboo species and Kumbuk trees dominated the riparian vegetation along the riverbanks, tree rood work as a natural barrier, reduce soil erosion, bank erosion and provide habitats for some crustaceans and other aquatic species.

Riverine Forest Ecosystem.

Riverine forest or riparian forest is a type of forest ecosystem that dominates along the waterways and one of the distinct ecosystems in Sri Lanka. Usually found in the lower flood plains along the river edges, and laying as an interface between aquatic and terrestrial ecosystems, and regulate energy transfer between two systems. Further, it provides insolation for the aquatic systems by controlling evaporation from reducing direct sunlight reaching to the forest floor and the water body.

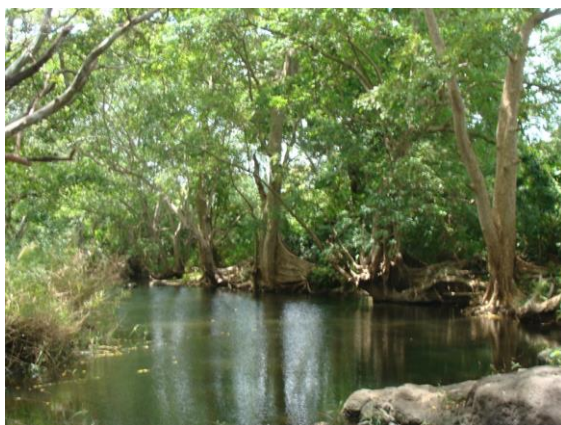
Riverine forests are ecologically important as it offers complex eco systems dominated by trees and its environmental components. Like any, riverine ecosystem functions as chain or web, where biotic and abiotic factors play a key role for the balance of the ecosystem.

Riverine forests provide important habitats or wildlife, including mega herbivorous to microscopic fauna species, including lichens. One of the major importance of riverine forest is, it provides bounty of habitats for terrestrial flora and fauna, aquatic flora and fauna and different macro to micro eco systems. Many flora and fauna species are abundant in this unique hybrid eco-system (aquatic and terrestrial), and may not be able to thrive in other dry Zone eco-systems. Due to availability of water and other resources in riverine forests, it supports high biodiversity and productivity within the area.

Further, these riverine ecosystems shelter a wide diversity of invertebrates when compared to other dry zone forest ecosystems. The area is home to rare and commonly seen, least concern vertebrate species. Fish, amphibian, reptiles, birds and mammal's species found in the Kala Oya riverine ecosystem has been listed under the species diversity and the complete database as an annexure. There is no doubt, that many flora and fauna species in the area are still need to be identified.

Riverine Forest along the water body provides bouncy for ecological connectivity as the forest act as the ecological corridors due to the liner shape of the continuous forests land. This ecological connectivity maintains multiple interactive pathways across the riverine landscape. Ecological connectivity and complexity of ecological and environmental interactions within the riverine forest leads to broad scale patterns and processes which responsible for high levels of biodiversity, then many other ecosystems in the dry zone of Sri Lanka.

Inundation nourish and support tree growth and existence of the vegetation. Further, riverine forests provide nutrients, control soil erosion and sedimentation by maintaining riverbanks,



Kala Oya riverbank stabilization by root systems

control siltation of the water beds, absorbs high nutrients and pollutants and hence it purifies water. Controlling of siltation impact on the water quality and maintain the rhythm of natural water flow of the water body.

Manmade / Altered Ecosystems

Abundant Chena cultivations, paddy field and home gardens provide habitat to several flora and fauna species. Beside thick rich continuous riverine forest patch, succession stages of abundant paddy fields, Chena cultivation and home gardens, can or cannot support to increases species diversity within the area. Many species are found in manmade eco systems consists of exotic species, which are not a threat to native species. However, there is a possibility that some of exotic species (IAS) may offer negative consequences to native riverine forest species.



Paddy and chena cultivation adjacent to Kala Oya

2.2.

2.2.1. Species Diversity.

A. Floral Diversity: Terrestrial Flora.

Both non-vascular (Bryophyta-mosses, green algae etc.) and vascular plants (ferns, angiosperms (flowering plants) harbored at the first 4 Km of the Kala Oya riverine forest. In further, grasses, herbaceous plants, woody shrubs, vines and trees decorate and live in harmony at the forest area. In addition to, wide array of species diversity, high species composition is also visible.

The Kala Oya riverine forest According to the two short field studies carried out in 2019, the Forest Department and the community identified more than 90 flora species, out of which 7 (8%) are endemic and 44 natives. There are more than 30 species of woody trees, a large number of shrubs, climbers and vines, bushes, and small plants.

Forest department identified endemic species are Ceylon reed-bamboo (*Ochlandra Stridula*) and Galseru (*Diplospora Erythrospora*). Endemic species of Makulla (*Hydnocarpus venenata*), Kaleya (*Litsea longifolia*), Ulkenne (*Polyalthia cerasoides*), Dummala (*Shorea oblongifolia*),

Pupula (Vernonia zeylanica) Walkarapincha (*Micromelum minutum*) are endemic species with medicinal value and were identified by the community.

Ochlandra Stridula is an endemic species of bamboo in the grass family, protect the riverbanks from riverbank erosion due to its crowded clumps. The mentioned bamboo species have social and economic importance as community members used it as a building material for wattle-and-daub walls and fences and wove mats, window blinds, screens, etc. Besides, *Ochlandra stridula* species, Kaha Una (*Bambusa vulgaris*) spotted along the riverbanks and protect riverbank erosion and provide breeding and roosting sites for various fauna species. Galseru (*Diplospora Erythrospora*), is an endemic plant species in the family *Rubiaceae* and has medicinal value.

These trees species within the riverine forest are reduce atmospheric Carbon naturally through carbon sequestration, and provide habitats for wildlife in highly agricultural areas, as the only leftover forest patch in the area.

Most of these plant species have high timber value, medicinal value, and provide habitats. Kumbuk (*T. arjuna*) and many tree species are prohibited from logging and highly protected under the law on illegal logging and timber due to its environmental value. As an example, a collection of gigantic Kumbuk tree plays a very important role in the riverine ecosystem by affording protection to the banks of rivers, and water purification capability with their root systems. Due to high environmental importance, logging of Kumbuk is banned in Sri Lanka. Kumbuk Tree roots have the detoxification capability and therefore purify water as it moves through. Countless community members in the Kala Oya basin in the Anuradhapura district, suffer from Chronic Kidney Disease (CKD) as a result of drinking highly toxified water. Kumbuk (*T. arjuna*) and Ranawara (*Senna surattensis*) has been identified as a potential tree Species as a Source of Air filter to capture particulate matter in the atmosphere, hence reduce air pollution caused by dust particles (Pallawala,2013).

Undoubtedly, the first 4km of the riverine forest at the Kala Oya is the home to many native plant species.

Especially, water-loving, gigantic angiosperm species like Kumbuk (*Terminalia Arjuna*) highlighted as the prominent tree species in the area. Those gigantic trees added extraordinary value to the riverine forest in the area, bringing environmental, ecological, authentic value and scenic view. Beside that Helaba (*Mitragyna parviflora*), Bakmee (*Nuclea orientalis* (n)), Thibiri (*Diospyros malabarica* (n)), Attikka (*Ficus racemosa* (n)), Ahatu/Nuga (*Ficus benghalensis var. benghalensis*), Karanda (*Pongamia pinnata* (n)), Kohoba (*Azadirachta indica* (n)), Nethulla (n), Ahu (*Morinda citrifolia* l.), Mee (*Madhuca longifolia* (n)), Welan (*Pterospermum suberifolium* (n)) and Galkone/Kone (*Schleichera oleosa*) are adding invaluable importance to the area.

The community in Walauwegama, with the guidance of the Ayurvedic Doctor in the area, have identified more than 64 medicinal plants within the 4km area and out of which 5 are endemic and they are *Litsea longifolia* (කැලිය), *Polyalthia cerasoides* (උල්කෙන්නිද), *Hydnocarpus venenata* (මකුල්ල), *vernonia zeylanica* (පුපුල) and *Shorea oblongifolia* (දුම්මල).

Athividiya (*Aconitum heterophyllum*), patta ul kenda (*Polyalthia cerasoides*), and Ekaveriya (*Rauwolfia serpentine*) plants have high medicinal properties. Abundant medicinal valued trees/bushes are common in the Kala Oya riverine forest. The Kala Oya riverine forest is a heaven of medicinal plants, where almost every plant can be identified as

a medicine for various diseases, injuries, trauma, etc. Rathmal (*Ixora coccinea* (L.) is native species, Ranawara (*Senna auriculata* (L.) roxb, Yakinaran (*Atalantia ceylanica* (arn.) oliver, Kaila (*Phyllanthus reticulatus* (n) species are highly visible in the area.

According to the community assessment, commonly seen herbal plant species are Thumba (*Leucas zeylanica*), Pila (*Fluggea leucopyrus*), Penela (*Cardiosprmmum halicacabum*), Kiri aguna (*Tylophora pauciflora*) Kowakka (*Coccinia grandis*), Yakinaran (*Atalantia ceylanica*), Rathmal (*Ixora coccinea*), Demata (*Gmelina asiatica*), Damba, Thimiri (*Gmelina asiatica*), Lunuwila (*Bacopa monnieri*), Attikka (*Ficus racemosa*), Bumi (*Hempedu bumi*), Rukattana (*Alstonia scholaris*), Walkothamali (*Oldenlandia herbacea*), Hik (*Chukrasia tabularis*), Pawatta (*Adhatoda vasica*), Thol kola (*Ipomea triloba*), Karanda (*Pongamia pinnata*), Igini (*Strychnos potatorum*), Iramusu (*Hemidesmus indicus*), Milla (*Olox zeylanica*), Bala thana (*Eleusine indica*), Nilawariya (*Indigofera tinctoria*), Kalu olida (*Psydrax dicoccos*), and Galseru (*Diplospora erythrospora*).

Table 1: Total Endemic Flora Species Reported in Riverine ESA.

No	Species Name	No	Species Name
1	<i>Canthium campanulatum</i>	8	<i>Hydnocarpus venenata</i>
2	<i>Cryptocoryne wendtii</i>	9	<i>Litsea longifolia</i>
3	<i>Derris parviflora</i>	10	<i>Ochlandra stridulathw</i>
4	<i>Diospyros ebenoides</i>	11	<i>Polyalthia cerasoides</i>
5	<i>Diplodiscus verrucosus</i>	12	<i>Shorea oblongifolia</i>
6	<i>Diplospora erythrospora</i>	13	<i>Vernonia zeylanica</i>
7	<i>Glossocarya scandens</i>	-	



Examples of a few Flora species

Among the Exotic tree species in Kala Oya ESA, widespread invasive plant species such as Guinea grass/Maana (*Panicum polygamum*), Illuk (*Imperata cylindrical*), Kuratiya (*Phyllanthus polyphyllus*), Sudda/Podichichomarng (*Austroeupatorium inulaefolium*), and *Eupatorium inulifolium*, Ipil-Ipil (*Leucaena glauca*) have been identified as exotic and invasive plants. Rather considering invasive plant species as a part of species diversity, these species are a threat to other plant species in the area. Water hyacinth/Japan Jabara (*Pontederia crassipes*) is widely spread, floating aquatic, and an invasive plant.

According to the IUCN biodiversity assessment carried out in 2020, 169 flora species have been noted and out of which 8 are endemic species. The identified endemic species are *Canthium campanulatum*, *Cryptocoryne wendtii*, *Derris parviflora*, *Diospyros ebenoides*, *Diplodiscus verrucosus*, *Glossocarya scandens*, *Hydnocarpus venenata*, and *Vernonia zeylanica*. The IUCN, as well as the community, have identified two common endemic medicinal plant species; *Hydnocarpus venenata* and *Vernonia zeylanica*.

B. Floral Diversity: Aquatic Flora.

Biodiversity in the area was enriched by sedges and common other aquatic plants. Water lily *sps.* (*Nymphaoides spp.*), Kekatiya (*Aponogeton spp*) floating on the water surfaces. Submerged aquatics like Hornworts (*Ceratophyllum demersum*) and *Hydrilla verticillate* can be seen in shallow water.



Aquatic Flora species

C. Fauna Diversity: Terrestrial Fauna

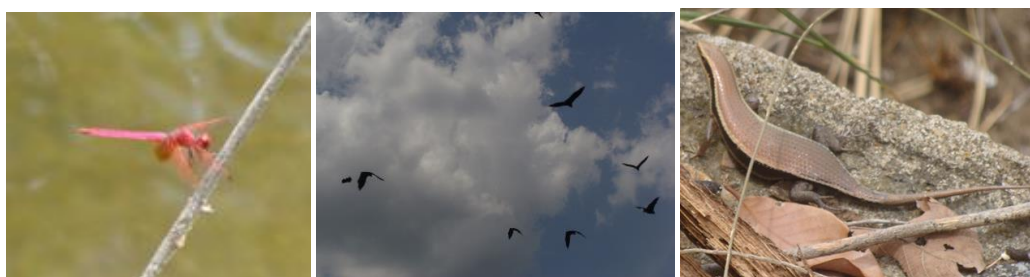
According to the 2020 IUCN checklist, thirty-three (33) endemic fauna species have been identified in the area from total of 263 species identified. Among that, 120 species considered as indigenous species. The assessment carried on butterflies and dragonflies as invertebrates and vertebrates included fish, amphibians, reptiles and mammals. For relevant each taxonomy groups above mentioned, respectively it's about, 4% endemism of total Sri Lankan dragonflies species, 4% endemism of Amphibians, 5% of total Sri Lankan endemic reptiles, 26% of total endemic Sri Lankan avifauna and 10% of total Sri Lankan Mammal endemism harbored just within the first 4km Kala Oya riverine forest ESA site.

In detail, there were 61 Butterfly species have been identified; 60 indigenous species and one endemic species. Two endemic and seventeen indigenous dragonfly species have been reported. Twenty-two indigenous species of reptiles were recorded. Snakes, turtles, Lizards, ground monitor and crocodiles are found in the area, include the Parker's black turtle (*Melanochelys trijuga*), two species of lizard, two species of ground and water monitor, three gecko species Four-claw gecko (*Gehyra mutilate*), Common house-gecko (*Hemidactylus frenatus*), Spotted house gecko (*Hemidactylus parvimaclatus*). Among 6 species of snakes, more than half are venomous.

Table 2: Species Recorded in Kala Oya riverine ESA, IUCN.

Animal Group		Recorded from Sri Lanka		Recorded in the Kala Oya ESA site						
		Total	Endemic	Species Status			Conservation status			
				Total (%)	Endemic (%)	Indigenous	CR	EN	VU	NT
Insects	Dragonflies	122	53	19 (16)	2 (4)	17		-	1	4
	Butterflies	245	26	61 (25)	-	61		-	2	1
Amphibians		119	103	12 (10)	4 (4)	8		-	-	1
Reptiles		214	126	22 (10)	6 (5)	16		-	1	-
Birds		492	34	87 (18)	9 (26)	-		-	-	4
Mammals		108	21	25 (23)	2 (10)	18		1	2	2
Total		-	-	226	23	120	0	1	6	12

Source: IUCN Biodiversity Assessment at Kala Oya ESA site, 2020



Examples of a few Fauna species

D. Fauna Diversity: Aquatic Fauna Species.

An assessment carried out by the National Aquaculture Development Authority of Sri Lanka (NAQDA) on freshwater biodiversity within 4 Km of the Kala Oya in 2019 reported, 26 fish species with 5 endemic and 19 indigenous species. Five endemic fish species are Sri Lanka filamented Barb/Damkola Salaya (*Dawkinsia singhala*), Gangetic mystus/Path ankutta (*Mystus cavasius*), Sri Lanka Stone sucker/ Galpandiya (*Garra ceylonensis*), Sri Lanka Giant Snake Headed (*Channa ara*), Dryzone Butter Catfish/kokassa (*Ompok ceylonensis*). Damkola Salaya has been spotted commonly in the water body and seventeen indigenous species and 4 endemic species had been spotted at one sampling location.

Yellow eel /Andaa (*Anguilla bicolor*), Magura/Walking Catfish, (*Clarias brachysoma*), Stiging Catfish/Hunga (*Heteropneustes fossilis*), Orange Chromid/Kaha Koraliya (*Etroplus maculatus*), Green Chromid/Mal Koraliya (*Etroplus suratensis*), Marbled Spiny Eel/GanTheliya (*Mastacembelus armatus*), Murrel/Loola (*Channa striata*), Butter Catfish/Walapotta (*Ompok bimaculatus*), Giant Danio/Rath kailaya (*Devario malabaricus*), Sri Lanka filamented Barb/Damkola Salaya (*Dawkinsia singhala*), Common Rasbora/Dandiya (*Rasbora dandia*) have been identified within the area through the assessment conducted by NAQDA.



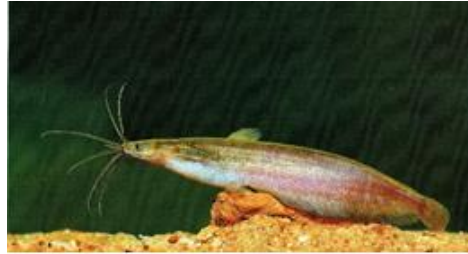
Channa ara (Ganara)



Mystus cavasius (Path ankutta)



Dawkinsia Sinhala (Dankola salaya)



Ompok ceylonensis ()



Garra ceylonensis (Galpadi)

Photo credits: Internet sources

Further, freshwater bivalves and freshwater Moluccas also be present in the area. Freshwater shrimp species and freshwater crustaceans/freshwater Crab sp. were also recorded as shown in following pictures.



Examples of a few aquatic Fauna species

During the community consultation and transect walk, the Community in Walauwegama stated that they have seen Yellow eel /Andaa, Magura/Walking Catfish, (*Clarias brachysoma*), Stinging Catfish/Hunga (*Heteropneustes fossilis*), Orange Chromid/Kaha Koraliya (*Etroplus maculatus*), Green Chromid/Mal Koraliya (*Etroplus suratensis*), Marbled Spiny Eel/Gan

Theliya (*Mastacembelus armatus*), Murrel/Loola (*Channa striata*), Butter Catfish/Walapotta (*Ompok bimaculatus*), Giant Danio/ Rath kailaya (*Devario malabaricus*), Sri Lanka filamented Barb/Damkola Salaya (*Dawkinsia singhala*), Common Rasbora/Dandiya (*Rasbora dandia*), Long Snouted Barb/Katu Pethiya (*Puntius dorsalis*), Common Labeo/Hiri Kanaya (*Labeo dussumieri*), Spotted snakehead/Mada Kanaya (*Channa punctate*), Striped Dwarf Catfish/Iri Ankutta (*Mystus vittatus*), Climbing Perch/Kaavaiya (*Anabas testudineus*), Level-finned Eel/Mada Anda (*Anguilla bicolor*), Silver Barb/ Podi pethiya (*Puntius vittatus*), etc and out of which (4) Sri Lanka Walking Catfish (*Clarias brachysoma*), Orange chromide (*Etroplus maculatus*), Sri Lanka dwarf catfish (*Mystus ankutta*) and Martenstyni's Goby (*Stiphodon martenstyni*) are endemic.

The IUCN 2020 reports that 37 freshwater species were in the area and among them 10 are endemic. There are 141 freshwater species are in Sri Lanka. Out of which 64 are endemic. Accordingly, 26% of fish species of Sri Lanka have been reported within the ESA with 16% of endemic fish species.

2.2.2. Gene Diversity.

Within the area there are many species that can be identified as gene diversity. However, proper assessment has not been conducted, hence given the names of the species are limited at the moment due to the data gap. However, there are many woody plant species shows gene diversity than the vascular plant species. Continuous strip of trees support the gene diversity through pollination of trees via wind, water flow and animals and fauna gene diversity through mutation among the species considered the riverine as their habitat.

2.3. Conservation Status of Species in Riverine ESA.

Even the conservation status of some of the flora and fauna species identified by all above mentioned studies in the area have not been evaluated yet, conservation status of many species varies from least concern to critically endangered /possibly extinct (CR/PE).

Among the total number of flora species identified by the Forest Department one (1) species is an endangered and three (3) species are vulnerable. Out of them, *Diplospora erythrospora* is an endemic species at vulnerable conservation status. Three (3) endangered and six (6) vulnerable flora species were within the medicinal species that were identified by the community. Two (2) of them are globally threatened. While the national conservation status of endemic medicinal plant *Shorea oblongifolia* as vulnerable, its global conservation status is reported as the critically endangered (possible extinct). In similar to that even if the national conservation status of endemic species *Litsea longifolia* is reported as least concern, its global conservation status is vulnerable.

Meanwhile, the IUCN study reports that 4 identified flora species are threatened and 6 are vulnerable. Among the threatened species *Diospyros ebenoides* is endemic tree species and others (*Polyalthia suberosa*, *Diospyros ebenum* and *Dendrolobium triangulare*) are native. Among the vulnerable species *Cryptocoryne wendtii* is endemic.

This indicates that among the total flora species identified by all the studies (259), two are globally threatened, 8 are endangered including of two endemic species, and 14 are

vulnerable. The list of vulnerable flora species are attached as annexure A. The table below shows the conservation status of endemic flora species.

Table 3: Conservation Status of Endemic Flora Species.

Scientific Name	Species Status	Conservation Status		Value of Flora	Identified By
		National	Global		
<i>Diplospora erythrospora</i>	Endemic	VU			FD/ESA
<i>Litsea longifolia</i>	Endemic	LC	VU	Medicinal Plants	Community & Confirmed by Ayurvedic Dr
<i>Polyalthia cerasoides</i>	Endemic	EN		Medicinal Plants	Community & Confirmed by Ayurvedic Dr
<i>Shorea oblongifolia</i>	Endemic	VU	CR	Medicinal Plants	Community & Confirmed by Ayurvedic Dr
<i>Cryptocoryne wendtii</i>	Endemic	VU		Aquarium Plants	IUCN
<i>Diospyros ebenoides</i>	Endemic	EN			IUCN



Litsea longifolia



Diplospora erythrospora



Diospyros ebenoides



Shorea oblongifolia



Polyalthia cerasoides



Cryptocoryne wendtii

Photo credits: internet sources

There are around 13 nationally threatened fauna species reported from the area and out of which four (4) freshwater species (*Garra ceylonensis*, *Channa ara*, *Mystus ancutta* and *Stiphodon martenstyni*), one dragonfly (*Libellago adami*) and one reptile (*Eutropis madaraszii*) are endemic. In further classification, *Garra ceylonensis* and *Elephas maximus* are globally threatened. In addition to this list, *Manis crassicaudata* and endemic *Macaca sinica* are globally threatened but not nationally.

Martenstyni's Goby (*Stiphodon martenstyni*) that had been identified by the community is a critically endangered fish species. Among the 26 fresh water fish identified by NAQDA, two endemic fish species (*Garra ceylonensis* and *Channa ara*) and an indigenous species (*Pethia ticto*) are nationally threatened species. By expanding the threatened species list, the IUCN reports that global conservation status of *Wallago attu* is vulnerable even its national conservation status is near threatened. Further, the IUCN report reveals that among five

nationally and globally near threatened fish species *Clarias brachysoma*, *Garra ceylonensis* and *Laubuka lankensis* are endemic.

Conservation noted that the national conservation status of *Geochelone elegans* in the ESA is vulnerable. IUCN has traced 22 reptiles within the area and among them the conservation status of endemic *Eutropis madaraszi* is reported as vulnerable.

Among 61 Butterfly species reported Banded peacock (*Papilio crino*) and Large Guava Blue (*Virachola perse*) are vulnerable species and Smallest Swift (*Panara bada*) hold near threaten statues. Endemic dragonfly Marsh Skimmer (*Orthetrum luzonicum*), and indigenous species of Pink Skimmer (*Orthetrum prunosum*), Paddyfield Paraspl (*Neurothemis intermedia*), Dancing Dropwing (*Trithemis pallidinervis*) have the near threaten conservation statues and Adam's Gem (*Libellago adami*) hold vulnerable status.

There were 12 amphibian species; 8 indigenous species and 4 endemic species, and 4 species are hold near threaten status; Red narrow mouth frog (*Microhyla mihinthalai*), Rohan's pug snout frog (*Uperodon rohani*), Skipper frog (*Euphlyctis mudigere*), Common paddy field frog (*Minervarya Agricola*).

This area host residence over 87 bird species and provides habitat for significant numbers of migratory and resident birds. Among them, IUCN reveals that the area is a beading residence for near threatened birds of Banded Bay Cuckoo (*Cacomantis sonneratii*), Oriental Honey-buzzard (*Pernis ptilorhyncus*), Grey-headed Fish eagle (*Ichthyophaga ichthyaeetus*), Thick-billed Flowerpecker (*Dicaeum agile*).

Among twenty-five mammals reported in the ESA conservation status of *Pipistrellus coromandra* and *Lutra lutra* is vulnerable and the conservation status of Pangolin (*Manis crassicaudata*), and Barking deer (*Muntiacus malabaricus*) is near threatened. The list of endemic threatened species reported is shown below.

There are three (3) mammals, two (2) fish species and one reptile species in the ESA are globally threatened and among them, Sri Lanka Stone (*Garra ceylonensis*) and Sri Lanka toque monkey (*Macaca sinica*) are reported as the globally threatened endemic species in the ESA.

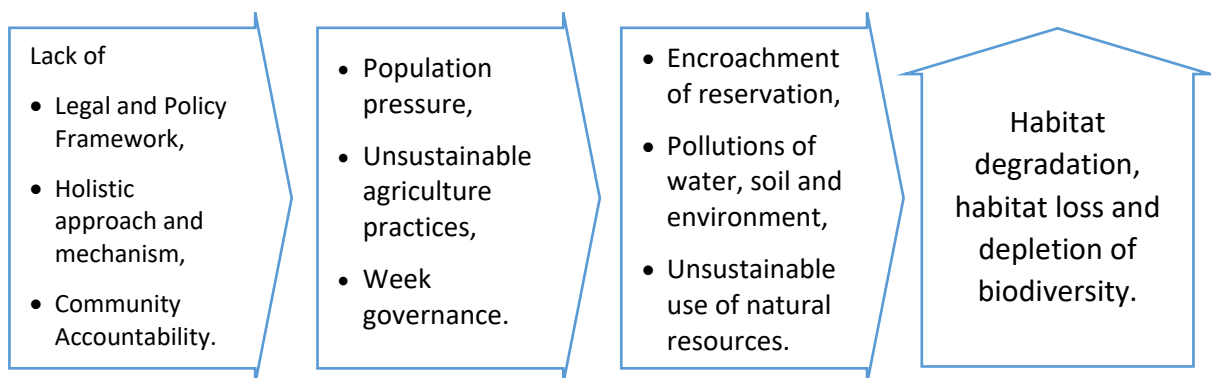
Table 4: List of Threatened Endemic Fauna Species in the ESA.

Categories	Scientific Name	Conservation Status (CoS) Na/GI	Identified By
Fish (Freshwater)	<i>Garra ceylonensis</i>	VU/EN	NAQDA
Fish (Freshwater)	<i>Channa ara</i>	EN/NT	NAQDA
Fish (Freshwater)	<i>Mystus ankutta</i>	EN	Community
Fish (Freshwater)	<i>Stiphodon martenstyni</i>	CR(PE)	Community
Dragonflies	<i>Libellago adami</i>	VU	IUCN
Reptile	<i>Eutropis madaraszi</i>	VU/NE	IUCN

2.4. Threats to Biodiversity in Riverine ESA.

The threats to Kala Oya riverine biodiversity vary from natural to anthropogenic due to various immediate, intermediate and underline causes. The key threats are the fragmentation, habitat degradation, habitat loss and depletion of biodiversity.

The immediate causes of are the encroachment, pollutions of water, soil and environment, and unsustainable use of natural resources. The intermediate causes are population pressure, unsustainable agriculture practices and week governance including of lack of monitoring. Lack of effective legal and policy framework in sustainable management of Kala Oya riverine forest to increase the ecological, environmental as well as socioeconomic productivity of the riverine forest, absence of integrated and holistic approach and mechanism on conservation of riverine biodiversity including of biodiversity integrated land use policy and planning, lack of community environmental accountability, etc., was encountered as the underline cases of the threats to the biodiversity in Kala Oya riverine.



Largely anthropogenic factors, then natural factors and climatic change impacted on degradation of riverine forest ecosystem and its terrestrial biodiversity. The Kala Oya aquatic ecosystem/ river ecosystem regulated by the riverine forest ecosystem, therefore depletion of the forest ecosystem by above mentioned factors, it directly and indirectly caused for depletion of aquatic biodiversity.

Ecosystem functions as a Chena or mostly as a web of interconnectivity with biotic and abiotic factors for the balance of any ecosystem. Due to anthropogenic, natural or climatic factors altered system, disturbance exceed at the tipping point of the balance of the system, equilibrium demolished. Higher the frequency of the disturbance causes high impact and complexity of biodiversity depletion. The most vulnerable component of the ecosystem is, its living organism both terrestrial and aquatic.

2.4.1. Anthropogenic Threats to Biodiversity in Riverine ESA.

A. Population Pressure.

Under the administrative categorization, Kala Oya first 4km is considered as moderately rural area with open to the developments in North Central Province. In the first 4km of Kala Oya riverine forest, within 200 m from the right riverbank, there are around 25 % of the householders. Ipalogama divisional resource profile indicates that no vacant lands available

in the Walauwegama GND for new settlements or cultivation for new generation. There are many housing constructions within the area of potential reservation starting from the Kala Oya – Anuradhapura main road.

On the other hand, people living in Kala Oya first 4km directly and indirectly depend on the riverine forest ecosystem, including their domestic needs such as food sources, herbal medicine, wood as building materials and fuel wood, etc. Even at present, certain percentage of tree species are being damaged in order to meet the need of domestic fuel wood. Selected live trees have been burnt at the first phase to take them later as fuel wood. It was observed during the transect walk that young mature trees are the most vulnerable for being burnt. Illegal harvest of mature tree species for wood purposes damages the forest and its canopy cover, reduces the regeneration (fruit and seed production). Removal of large canopy area in riverine forest causes higher evaporation of the water in the Kala Oya (upper stream) and increases soil erosion.

More than 90% of the population of the area solely depend on agriculture as their main source of income, and followed by fishing while some depend on both agriculture and fishing. Among the agriculture sector, the majority engage in Chena and seasonal crops which has direct pressure on the survival of the riverine forest and decline of biodiversity. Encroachment of reservation can be seen in both the left and right riverbanks for agriculture activities and uncontrolled expansion has already reached to the immediate riverbank of the river, leaving no trees to one isolated tree line. Due to deforestation, land morphology has been changing, converting the lush forest land to bare lands. There is no doubt that deforestation of riverine forests, especially on the left bank of the river, had occurred a few years back. Those deforested lands have been converted to farm land.



*Illegal settlements within Riverine forest reservation, close to river bank
Burning of trees for fuel wood
Deforested/bare lands*

Encroachment results to total distraction of biodiversity in the Kala Oya riverine in many ways; habitat depletion, destruction of floodplain, damaging of interconnection of ecosystems, and decreasing of critical ecosystem services such as soil quality, erosion control and water quality, etc. Lost of wildlife habitats causes dispersal of some species and at the end, it decreases the gene pool of the eco system.

In Kala Oya, not like many other rivers starting from the lavish hill country, due to the Kala Wawa reservoir continues water supply has been disturbed. Watershed of the starting point of the Kala Oya, therefore has low water level except for North Eastern monsoon season. For maintain the current river flow, riverine forest vegetation in the watershed offer boundless support in both drought and wet season.

Unbearable socio-economic pressure on the riverine eco system, resulted clear reduction of both indigenous flora and fauna species reductions and biodiversity depletion. At the same time usage of agrochemicals for high yield, directly and indirectly impacted on the biodiversity depletion in both terrestrial and aquatic species. Habitat destruction, habitat fragmentation, habitat degradation and habitat loss are the major biodiversity threat occurred as a result of anthropogenic activities.

B. Unsustainable Agriculture Practices.

• Overuse of Agrochemicals.

Pesticides, herbicides and synthetic fertilizer usage is the major threat to both terrestrial biodiversity on riverine forest and the aquatic river ecosystem. It has not only a point specific impact, widespread and long-term impact. Farmer use larger quantity than the recommended level of fertilizers for high yield within short period of time, excess agrochemicals washed back to the waterbody easily through surface runoff by the excess water usage for the chena cultivation.

Except from the agrochemicals leaching and adding through surface runoff, water pollution occurred by the cleaning of agrochemical machines at the Kala Oya. This is a common practice of farmers in the area, where they just dump diluted agrochemical directly to the waterbody.

There is no doubt, accumulation of agrochemicals changes the water quality of the Kala Oya. When excess nutrients in water body, eutrophication process can occur easily, especially at stagnated water areas. Where excess phosphate and nitrate retain in the water bodies allowing faster algal blooms to reduce oxygen availability to the aquatic species. Except for the rainy season, water body is not flush out those excess nutrients rich water downstream, hence enhances the eutrophication conditions and caused aquatic biodiversity depletion in the Kala Oya at a faster rate. When the eutrophication occurs, it impacts on the fresh water aquatic species as it altered their habitats and feeding mechanism. High Nitrate and Phosphate in the water, increases invasive aquatic plants such as Giant Salvinia (*Salvinia molesta*), and Japan Jabara/ Water hyacinth (*Eichhornia crassipes*) There are couple of stagnated water puddles at the first 4Km of the kala Oya river and it is visible that, the area has undergone the eutrophication.

Further, heavy metals and others synthetic chemicals travel through the food chain and therefore bioaccumulation occurs at the higher level of the food chain. Bioaccumulation causes changes of early development stages of avifauna species, hence it impacted on the species survival.

Empty agrochemical bottles, Polyethylene and non-degradable covers of agrochemicals just leave at the riverbanks and when the water level changes. Agrochemical containers just floating or sinking in to the river floor. Different life stages of aquatic, amphibians and terrestrial animals depend on the water for their early stage of life cycle. As such changes in water quality impact on survival rate of animal species at their early life stages. Agrochemicals cause for increase of salinity of the water bodies in the area.

Over usage of fertilizers definitely impacted on soil quality. Excess nutrient to in the surrounding areas of farm lands, offer opportunity to grow of invasive species such as Guinea grass (*Megathyrsus maximus*), podisingomarang (*Chromolaena odorata*) and ipil ipil (*Leucaena leucocephala*). This scenario, further decreasing the biodiversity as it over-competes the resources with other native species.



- **Chena Cultivation.**

Chena cultivation is commonly seen adjoining of both riverbanks. Slash burning, high usage of agrochemicals and improper management of agrochemical waste, over extraction of water by using water pumps aggressively and continuously from nearby water bodies like Kala Oya and no soil conservations practices cause negatively Kala Oya riverine biodiversity.



Chena Cultivation upto the edge of the kal oya

- **Tobacco Planation.**

Accelerate the negative impact to the riverine ecosystem, Chena farmers shifting to mono cropping Tabaco cultivation. Due to less required labour, diseases, insects and other animal attacks, as well as encouragement and incentives of private sector such as providing of seed, fertilizers, technical support and access to the market, Chana and vegetable farmers have vastly shifted to Tobacco cultivation in the area.

However, high usage of agrochemicals, especially fertilizers, poor soil conservation practices and high usage of water extraction for tobacco plantation leads to ecological disruptions and cause for a loss of biodiversity, ecosystem services, and food resources. However, these biophysical changes of the riverine forest have social and economic impact to the communities who depends on agricultural land as their main sources of income.



Fast spreading Tobacco cultivation

- **Unsustainable Water Management.**

Even if the divisional data shows that agro wells are available, no agro wells were found in farm lands that close to the riverbanks. Further, no rainwater harvesting measures have been taken. It was observed that most of the farms lands in both sides pump water from the Kala Oya and let water rushing for a considerable time throughout the day. Excess water, which mixed with both fertilizers and other agrochemicals drain directly back to the Kala Oya through the steep slope of the farmlands, which also resulted soil erosion and soil bank erosion in the area.



- **Unsustainable Soil Conservation.**

Nutrient rich top soil being removed and soil become less fertile and demolishing humans generating species, long term, and soil need to consistence fertilized.

Soil erosion in the area has been increased as more machinery usage for land preparation, tilling than tradition methods. As a consequence of land preparation of large areas by those methods, when rained, it causes washed off soil to the lower area of the terrain, where ended up in the Kala Oya bed.

Lack of forest cover in the riverbanks, enhance soil erosion and increases sediment flowing in to the river bed, altered river bed and impacted on the water quality. Sedimentation on the river bed, not only altered fresh water aquatic specie's habitats (shallow slow-moving clear water, dark, leaf deposited areas), but also breeding and feeding patterns.



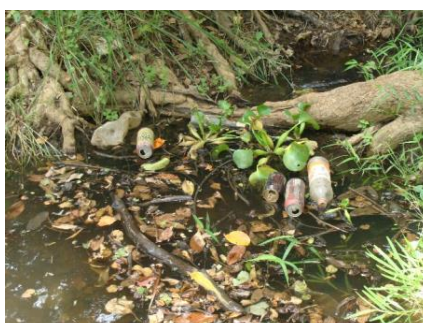
C. Point Source and Non-Point Source Pollution.

Other observed community practice was point and non-point source water pollution and adding chemicals in the water body. Chemicals use for cleaning purposes, especially vehicle washing, petroleum residues from the roads also contributed for water pollution of the Kala Oya.

Solid waste deposal of households added non degradable compounds to the riverine ecosystem causes soil pollution.

It was reported that over 1000 persons per month visits Avukana minimally and most of them use to have bath close to the bathing place near to the rail track and the main road, about 4Km away from the spill gates which has become a famous tourist destination. Tourists and or local community dump polyethene, plastics and glass bottles in to the riverine forest. Empty alcoholic bottles are scatted in the riverine forest.

It is suspicious that there are some signs of producing of illicit arrack near the Waul kale area and evidence of polythene packages of illicit arracks are commonly seen throughout the first 4Km of the Kala Oya riverine forest.



When it considers pollution (point source and non-point source), soil, water and air pollution at one place differently impact to other areas easily, as administrative boundary is not capable of manage or control the wide spreading of those chemicals in to one area to other in special geographical context. As a simple example, mixing of agrochemical with wind or water can travel many kilometers away from the source of apply.

D. Unsustainable Use of Natural Resources.

- **Wildlife Pooching and Hunting.**

Villagers place traps to catch animal or use other killing method including of gunshots to catch small mammals like rabbits, deer species, wild boar, etc. Bird catching also was reported in the area as a separate activity for meet or as a part of religious activities to release them back.

- **Over Extraction and Overharvesting.**

The Kala Oya riverine forest is rich in ayurvedic plants. It was reported that over extraction of medicinal plants/herbs for both medicine purposes and commercial purposes and it has impacted on the reduction in plant population and some verities. Overexploitation of fishing species through distractive fishing techniques also reported.

- **Overgrazing.**

Livestock freely roaming in the riverine forest area for free fodder from the natural forest. Overgrazing in lands leads to soil erosion by the wind and water during the rainy reason. Eroded water with sediments deposited in the reservoir beds and water capacity of the reservoirs are reducing. Nevertheless, aquatic biodiversity is depleting due to habitat destruction by the siltation and soon drying out of reservoirs during the non-rainy season.

E. Spreading of Exotic and Invasive Species.

Exotic flora and fauna had been introduced to the Kala Oya riverine ecosystem, directly and indirectly. Among exotic species, some species has been identified as Invasive species. Both the biodiversity assessments done in 2019 and 2020 have been identified 21 native and exotic invasive alien flora species and 8 fauna species. The list is enclosed as Annexure X.

Invasive plants reduce richness and abundance of native species by preventing seedling growth and development, modifying pollination attractions, increasing competition for resources, interbreeding with native species. Further, these species modify ecological process and physical resources off the eco systems such as nutrient recycling, sedimentation and distribution (Ranwala & Thushari, 2012). Invasive plants and animals are threats to native and endemic species, habit and ecosystems and considered as one of the major concerns of biodiversity depletion factor in Ipalogama.

Guinea Grass/Manna (*Panicum maximum*) widely spread throughout in Ipalogama DS Division. These aggressive invasive grass species can be found in the reservoirs and attract elephants as a food source at the early growing stage of grass. But when the grass become mature, no animals (elephants, domestic cows, etc.) are depend on it.

Except for Guinea Grass (*Panicum maximum*), Gandapana (*Lantana camara*), Podisingnomarang (*Chromolaena odorata*), and ipil –ipil (*Leucaena leucocephala*) are only a few of invasive plants, among a collection of IASs within the area). Open forest areas have the

high density of invasive plants, where dense forest is able to defer the spread of invasive plants. Open forest is occurred as a result of deforesting natural forest and allowing Chena cultivation and later abundant.

Widely spread *Salvinia* (*Salvinia molesta*), Japan Jabara (*Eichhornia crassipes*) are the most common Invasive aquatic flora. It grows as a thick matt on the surface of the water, and hence control sunlight penetrate through the water body prohibits photosynthesis activities of aquatic plants. Being on the surface, controls the oxygen exchange through the surface either. This reason causes to rapid habitat changes.

Invasive aquatic fauna, Tank cleaner/Vermiculated sailfin catfish (*Pterygoplichthys disjunctivus*) and human introduced fish species, Tilapia (*Oreochromis mosambicus*) directly and indirectly impact on indigenous and native fresh water fish species by increasing competition for resources, and feeding on developmental stages of indigenous fish species.



2.4.2. Natural Threats to Riverine Biodiversity.

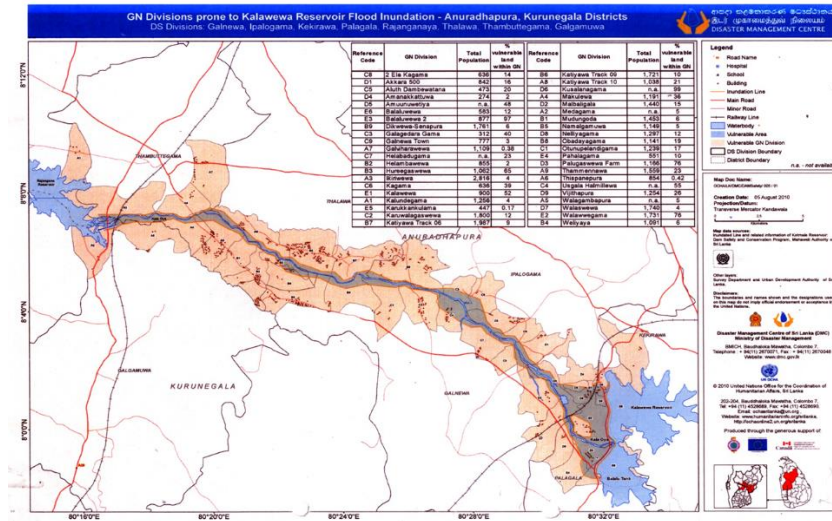
Identified natural hazards in the Kala Oya riverine is flooding from Kala Wewa spill water and seasonal to pro-long droughts. These natural hazards have negative impact on biodiversity in the area. Large portion of the riverine forest is inundated during the North Eastern monsoon season. When the Kala Wewa reservoir spill gates are usually open at least 7 to 10 days per year, released water from the Kala Oya creates local flooding and according to community members, water level reaches to more than 10 -15 feet.

Without spill water from the Kala Wewa, Kala Oya is maintaining its water flow and its own aquatic biodiversity with a rich of fish. Kala Oya watershed is nourished with the water from its watersheds and sub water sheds, where water is accumulating at the Kala Oya. Access water in the Kala Oya leading to displacement of fish and amphibian population. On the other hand, flooding also helping to translocation from one sub basin to another. Some aquatic species including freshwater mollusc are coming with reservoir spill water to the Kala Oya, later making the kala Oya as their new habitat.

Flooding is also causing invasive species translocation and non-point source pollution adding to the water body, causing depletion of biodiversity in the Kala Oya. Point source pollutant and non-point source pollutant, including agrochemicals, fuel residues from the vehicles, other house hold chemicals, human waste, toxic chemicals with heavy metals, and solid waste has been easily adding to the water body during flooding. This toxic, pollutant water considers as the one of the major reasons for water quality depletion, aquatic biodiversity loss and spreading of water born disease in the area.

When the water level has reached high, terrestrial level wildlife may not be able to survive under submerging of water, especially resting and early development age of animal species are more vulnerable and chance of survival is less. Riverine forests offer habitats, roosting site, breeding site to many fauna species, flooding resulted sudden decrease of population of selected fauna species associated with the riverine forests.

Map 2: Flood Inundation of Kala Oya.



Source: Disaster Management Centre, Anuradhapura

As a located in the dry zone of the area, prolong drought is common natural hazard in the Ipalogama area. Water scarcity is the main natural hazard for both human and wildlife. Human activities, including hunting in drought season is another human practice reported.

Climate change significantly impacted on the survivals of flora and fauna species especially in the riverine forests and freshwater ecosystems. Water yield of the waterbody is depending on the climatic and weather pattern.

Prolong draughts causes discontinuation of water waterbody. Kala Oya is not a perineal river and it's already in the dry zone. When the waterbody is dried our especially freshwater species cannot move to one place to other and increases the predation.

Riverine flora species are highly sensitive to wet, humid environment and long-term drought can impact on the seed dispersal, maintenance and survival of species.

As explained earlier, frequent flooding rush down the fauna species downstream. When the terrestrial system submerged by the water for many days, higher mortality in slow movement fauna and saplings of terrestrial flora species is common.



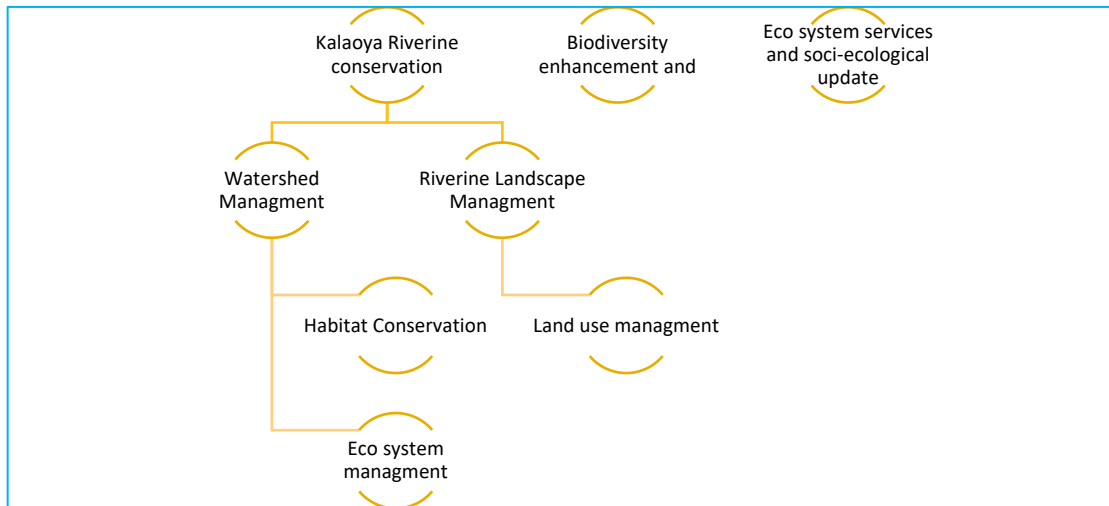
3.0. Managing Together Biodiversity in Riverine ESA.

3.1. Co-Management for Conservation and Development.

- For purpose of the managing the Kala Oya riverine ESA, this Management Plan sees the co-management as the culture and practices of management and sharing of accountabilities in conservation of biodiversity of Kala Oya riverine ESA by increasing environmental, ecological and economic benefits to the community, by all relevant entities; public, private and communities with sheared responsibilities, to meet commonly agreed goals and while contributing to the sustainable development goals.
- The management shall recall the responsibilities of the Government of Sri Lanka to increase the forest cover up to 32% by year 2030 as per the Paris Agreement of UNFCCC and also to reduce 10% of its GHG emissions from the sectors of transport, waste, industry and forestry as per the submitted Nationally Determined Contributions (NDCs), Sri Lanka.
- The riverine landscape implies geomorphic characteristics, which extensively interconnected with abiotic environment and, biotic communities. Riverine forests maintain multiple connectivity across the riverine landscape and broad scale patterns of disturbance changed the environmental and ecological equilibrium at the Kala Oya Riverine eco system. Therefore, no further explanations are needed to acknowledge that the Kala Oya riverine forests supports to flow regulation of Kala Oya (maintain the water carrying capacity /flow characteristics/purify water), maintenance water budget of the watershed, bank stabilization, reduce natural disturbance and physiological stress to the species, carbon sequestration, and promote seed dispersal.
- Landownership of the Kala Oya watershed also plays a critical role. Two major landownership types are public ownership and private owned. Kala Oya provide eco-

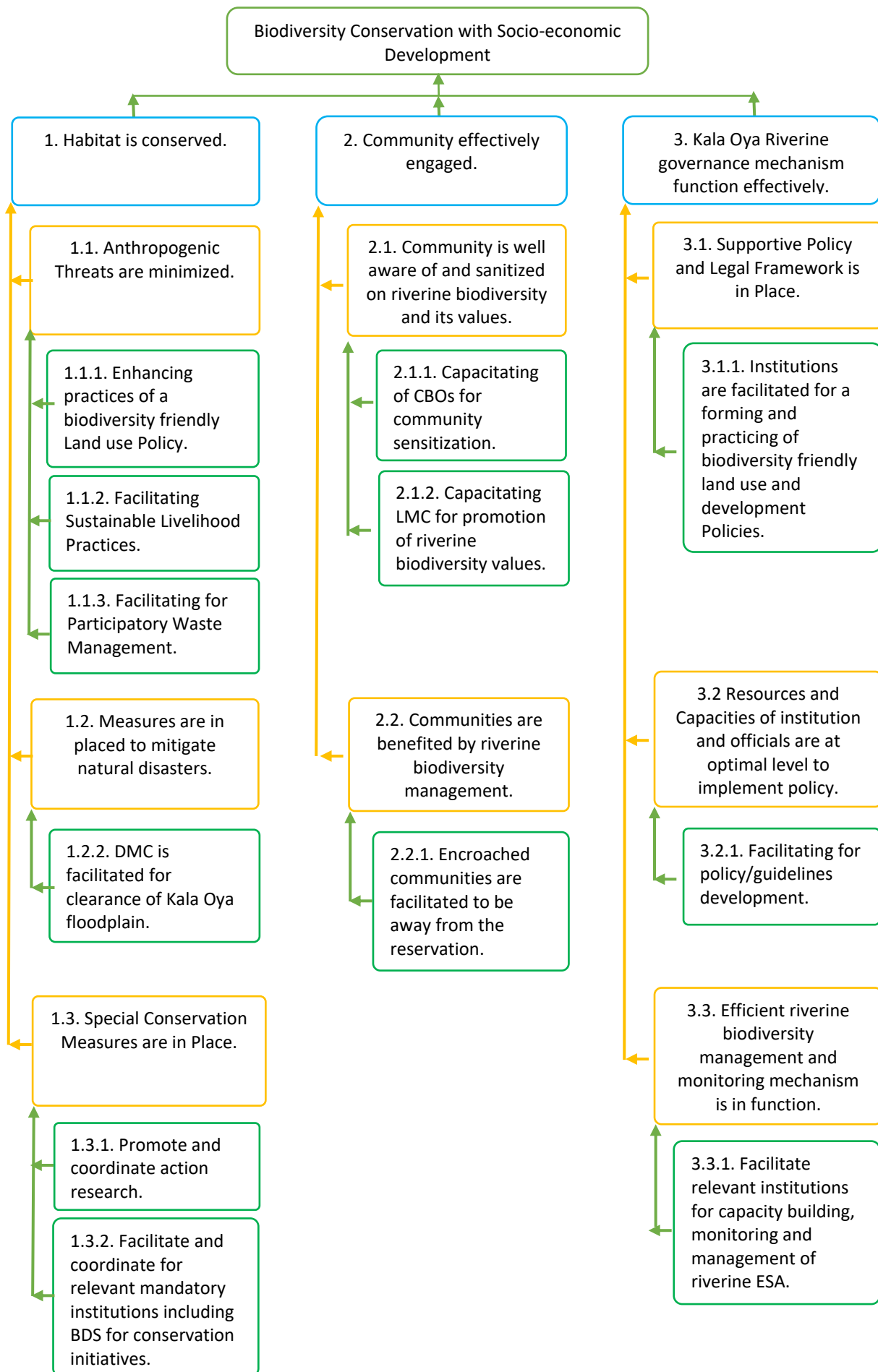
system services benefitting its rural community too. But the Kala Oya riverine faces a wide range of pressure that threaten the biodiversity in the ecosystem. Further, it reduces the ecological stability, ecosystem services, impact on the gene pool of the ecosystem. On the other side, it impacts on socioeconomic benefits that healthy riverine and aquatic ecosystem can provide.

- Therefore, in order to maintain lush aquatic and terrestrial eco-systems and conservation of its biodiversity at the Kala Oya riverine, watershed management/river basin management and riverine forest landscape management will be the best approach as shown below. It will have effective and productive collaborative outcomes, while riverine biodiversity conserve and manage through eco-system-based watershed management approach.



Source: Author

3.2. Theory of Change.



3.3. Proposed Governance Mechanism.

- There are several government agencies have direct and connected mandate for the conservation Kala Oya riverine biodiversity. The Kala Oya comes under the purview of the Mahaweli Development Authority and the riverine forest is fallen under the mandate of Forest Department. While Department of Wildlife Conservation has the powers for conservation of scheduled species even if it is outside the Protected Areas, the National Aquaculture Development Authority of Sri Lanka has empowered with conservation of freshwater fauna species. The Department of Agriculture and Department of Agrarian Services has wider range of powers and functions for ensuring sustainable agriculture and the Divisional Secretary is accountable for coordination and management of divisional development, including of leading the divisional committees such as Divisional Disaster Management Committee, Divisional Agriculture Committee, and Divisional Environmental Committee. While, the Divisional Secretary is obliged to develop the socioeconomic status of the community in the division, the Divisional Secretary coordinates the divisional development. While the Pradeshiya Saba is mandatory for waste management, protection of environment, constructions and maintenance of local infrastructures, regulation of businesses, etc., the Pradeshiya Saba has the power to pass by-laws to regulate matters comes under the purview of local government authorities.
- The Local Management Committee for conservation of biodiversity in ESAs engage in planning, implementation and monitoring of biodiversity conservation projects and coordinate inter-institutional initiatives for integrating of conservation initiatives.
- There are several Community Based Organizations in function in all the Kala Oya adjoining GNDs, however, no environmental conservation CBOs are in the area.
- In the background, it is proposed to have a Committee on Conservation of Kala Oya, under supervision of the ESA Local Managing Committee and with the participation of FD, DWC, NAQDA, DAD, DS, PS and Chairmen of Farmer's Associations in adjoining GNDs, and shall act as the convener of the Committee.
- The key functions of the Committee shall be planning, implementation, monitoring and reviewing of the conservation initiatives. This includes coordination for integration, stakeholder coordination and resourcing, etc.
- The Committee shall have regular meetings as appropriate, however not later than three months for a duration, and shall report the details of performance and the outcomes of the conservation initiatives to the ESA Local Management Committee.

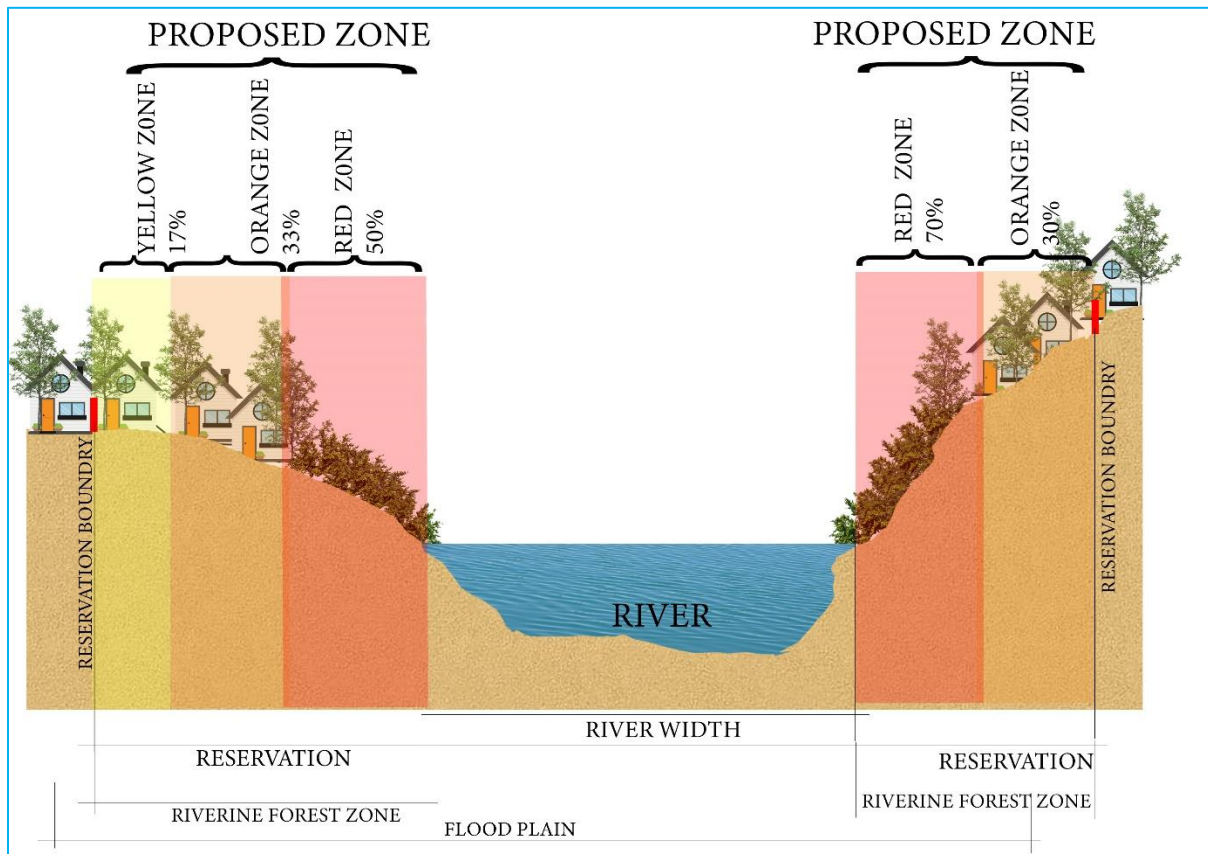
3.4. Proposed Land use Policy Framework.

Acknowledging the ecosystem services provide by the Kala Oya riverine ESA, and its environmental, ecological and economical values for the communities around and the Country,

Understanding that the neighboring communities may have encroach the Kala Oya reservation without their consent and for economic gain, and therefore, it is essential to

sensitize the community for improving community environmental accountabilities instead of legal measures, following policy principles are proposed to adhere in land use planning, development planning and biodiversity conservation with the objective of balancing interest of conservation and development.

Figure 3: Proposed Zonation for Minimizing of Anthropogenic Threats.



- The Kala Oya basin, riverine area as well as the Kala Oya flood plain shall be integrated into land use maps with a high priority, and shall be inform all relevant stakeholders for considering in development planning and implementation work.
- Kala Oya reservation shall be surveyed and demarcated with the knowledge and participation of the adjoining communities.
- Based on the guidance of biodiversity expert's, the community shall be made aware and sensitized on the riverine biodiversity and its values, and if possible, community demarcations shall be carried out if the riverine biodiversity is threatened by the factors beyond the Kala Oya reservation boundaries.
- In any case, if communities have encroached the Kala Oya reservation, after demarcation of the reservation, a zonation-based removal of community activities in the reservation shall be take place.
- For that, three zones shall be introduced; the red zone as the prohibited area, the orange zone as the restricted area and the yellow zone as the limited access area. The

number of zones and the width of the zone shall be determine based on the riverbank slope.

- In any case, if community occupation is there in the red zone, community shall be removed immediate effect.
- If community occupy the orange zone, and if there are temporary or permeant constructions, community shall be given a reasonable period – however not later than one year – to remove all constructions. If the community engage in agricultural activities other than animal husbandry, after informing the community, the community shall be given a reasonable period – however not later than end of the season if it is seasonal crops- to vacate the orange zone. For vacating of the orange zone, community shall be facilitated including of restarting a new and similar economic activity.
- In any case, if the community occupy the yellow zone, and if there are constructions, a reasonable period – however not later than one year - shall be given to remove the construction and if necessary, the community shall be supported for resettlement. If the community engage in agriculture activities, community shall be facilitated for initiate an alternative income sources and shall facilitate to transfer the occupied yellow zone as an agroforestry land that could provide income opportunities.
- After demarcation of the reservation boundaries, selected fruit and food trees shall be planted as a co-management activity to establish a natural tree boundaries, and shall allow the neighboring communities to enjoy the economic benefits.

3.5. Proposed Development Framework.

Considering of the ecosystem diversity, species diversity and gene diversity, and the endemic species and nationally and globally conservation status of the species in the Kala Oya riverine, following principles shall be adopted in development activities of private and public entities.

- The Pradeshiya Saba shall pass relevant by-laws to regulate biodiversity friendly development activities, including of the infrastructure development activities.
- The Department of Agriculture and Department of Agrarian Services shall promote and facilitate for sustainable agriculture.
- The financing institutions shall ensure that green financing principles will be adhere when providing of financial facilities for agriculture and development sector.
- All relevant stakeholders shall call for environmental assessment reports for development activities closer to the reservation boundaries.



3.6. Project Log Frame.

Annexures.

1. List of Endemic Species in Kala Oya Riverine

Categories	Family	Scientific Name	Sinhala Name	Conservation Status (CoS) Na/GI
Flora Species	Poaceae	Ochlandra stridulathw	බට විශේෂ	
Flora Species	Rubiaceae	Diplospora erythrospora	ගල්සේරු	VU
Flora Species	Lauraceae	Litsea longifolia	කැලිය	LC/VU
Flora Species	Annonaceae	Polyalthia cerasoides	උල්කෝන්ද	EN
Flora Species	Flacourtiaceae	Hydnocarpus venenata	මකුල්ල	NE
Flora Species	Asteraceae	vernonia zeylanica	පුපුල	
Flora Species	Dipterocarpaceae	Shorea oblongifolia	දුම්මල	VU/CR
Fish (Freshwater)	Cyprinidae	Dawkinsia Sinhala	දන්කොල ජාලයා	LC/LC
Fish (Freshwater)	Cyprinidae	Dawkinsia Sinhala	දන්කොල ජාලයා	LC/LC
Fish (Freshwater)	Cyprinidae	Garra ceylonensis	ගල්පාඩි	VU/EN
Fish (Freshwater)	Cyprinidae	Dawkinsia Sinhala	දන්කොල ජාලයා	LC/LC
Fish (Freshwater)	Cahannidae	Channa ara	Ganara	EN/NT
Fish (Freshwater)	Siluridae	Ompok ceylonensis	කෝකස්සා	LC/NT
Fish (Freshwater)	Bagridae	Mystus cavasius	පන් අන්කුට්ටා	LC
Fish (Freshwater)	Cyprinidae	Dawkinsia Sinhala	දන්කොල ජාලයා	LC/LC
Fish (Freshwater)	Clariidae	Clarias brachysoma	තාරකා ඉබ්බා	NT
Fish (Freshwater)	Cichlidae	Eetroplus maculatus	කටුපෙනියා	LC
Fish (Freshwater)	Bagridae	Mystus ankutta	කහ ආදා	EN
Fish (Freshwater)	Gobiidae	Stiphodon martenstyni	කාච්ඨියා	CR(PE)
Butterflies	Nymphalidae	Mycalesis patnia	Visithuru panduru-dumburuwa	LC
Dragonflies	Cholorocyphidae	Libellago adami		VU
Dragonflies	Platycnemididae	Prodasineura sita		LC
Fish (Freshwater)	Bagridae	Mystus nanus	Iri ankuṭṭa	LC/LC
Fish (Freshwater)	Bagridae	Mystus zeylanicus	Pat ankuṭṭa	LC/LC

Fish (Freshwater)	Channidae	<i>Channa marulius</i>	Gan ara	NE/LC
Fish (Freshwater)	Clariidae	<i>Clarias brachysoma</i>	Magura	NT/NT
Fish (Freshwater)	Cyprinidae	<i>Amblypharyngodon grandisquamis</i>	Soraya	LC/LC
Fish (Freshwater)	Cyprinidae	<i>Garra ceylonensis</i>	Gal pandiya	NT/NT
Fish (Freshwater)	Cyprinidae	<i>Laubuka lankensis</i>	Lanka kara-aedaya	NT/NT
Fish (Freshwater)	Cyprinidae	<i>Pethia melanomaculata</i>	Depulliya	LC/LC
Fish (Freshwater)	Cyprinidae	<i>Puntius thermalis</i>	Kota petiya	LC/LC
Fish (Freshwater)	Cyprinidae	<i>Systemus spilurus</i>	Mas petiya	LC/LC
Fish (Freshwater)	Siluridae	<i>Ompok ceylonensis</i>	Valapotta	LC/LC
Amphibians	Microhylidae	<i>Microhyla mihinthalai</i>	Ratu muwapatu madiya	LC/NE
Amphibians	Microhylidae	<i>Uperodon rohani</i>	rohange motahombu madiyas	LC/NE
Amphibians	Rhacophoridae	<i>Polypedates cruciger</i>	Sulaba pahimbu gas madiya	LC/LC
Amphibians	Ranidae	<i>Hydrophylax gracilis</i>	Lanka bandi madiya	LC/LC
Reptile	Trionychidae	<i>Lissemys ceylonensis</i>	Kiri ibba	LC/NE
Reptile	Gekkonidae	<i>Hemidactylus depressus</i>	Hali gehuna	LC/LC
Reptile	Scincidae	<i>Eutropis madaraszi</i>	Pulli hikanala	VU/NE
Reptile	Scincidae	<i>Eutropis tammanna</i>	Tammanna hikanala	LC/NE
Reptile	Scincidae	<i>Lankascincus fallax</i>	Sulaba lakhiraluva	LC/NE
Reptile	Natricidae	<i>Fowlea asperimus</i>	Diya bariya	LC/NE
Birds	Phasianidae	<i>Gallus lafayettii</i>	Sri Lanka Vali-kukla	LC/LC
Birds	Columbidae	<i>Treron pompadora</i>	Sri Lanka Batagoya	LC/LC
Birds	Picidae	<i>Dinopium psarodes</i>	Sri Lanka Ginipita Pili-karela	LC/LC
Birds	Megalaimidae	<i>Psilopogon rubricapillus</i>	Sri Lanka Kottoruwa	LC/LC
Birds	Bucerotidae	<i>Ocyrceros gingalensis</i>	Sri Lanka Alu Kandaththa	LC/LC
Birds	Vangidae	<i>Tephrodornis affinis</i>	Sri Lanka Wana-saratiththa	LC/LC
Birds	Hirundinidae	<i>Cecropis hyperythra</i>	Sri Lanka Laklihiniya	LC/LC
Birds	Pycnonotidae	<i>Pycnonotus melanicterus</i>	Sri Lanka Kalu Isasi Kondaya	LC/LC
Birds	Pellorneidae	<i>Pellorneum fuscocapillus</i>	Sri Lanka Boraga Piri-demalichcha	LC/LC
Mammal	Cercopithecidae	<i>Macaca sinica</i>	Sri Lanka Rilawa	LC/EN
Mammal	Tragulidae	<i>Moschiola meminna</i>	Sri Lanka Meminna	LC/LC
Flora Species	Achariaceae	<i>Hydnocarpus venenata</i>	Makulu	LC
Flora Species	Araceae	<i>Cryptocoryne wendtii</i>	Athiudayan	VU
Flora Species	Asteraceae	<i>Vernonia zeylanica</i>	Papula	LC
Flora Species	Ebenaceae	<i>Diospyros ebenoides</i>	Kalu-habaraliya	EN
Flora Species	Fabaceae	<i>Derris parviflora</i>	Kala-wel	LC

Flora Species	Lamiaceae	<i>Glossocarya scandens</i>		NT
Flora Species	Malvaceae	<i>Diplodiscus verrucosus</i>	Dikwenna	LC
Flora Species	Rubiaceae	<i>Canthium campanulatum</i>		NT

2. List of Threatened Species.

Categories	Family	Scientific Name	Sinhala Name	Species Status (SpS)	Conservation Status (CoS) Na/GI
Flora Species	Acanthaceae		Roxb		EN
Flora Species	Loganiaceae	<i>Strychnos potatorum</i>	ඉඟිනි	Native	VU
Flora Species	Rubiaceae	<i>Psydrax dicoccos</i>	කලුඹලීඳ	Native	VU
Flora Species	Rubiaceae	<i>Diplospora erythrospora</i>	ගල්සේරු	Endemic	VU
Flora Species	Ranunculaceae	<i>Aconitum heterophyllum</i>	අනිවිඬයන්		EN
Flora Species	Lauraceae	<i>Litsea longifolia</i>	කැලිය	Endemic	LC/VU
Flora Species	Fabaceae	<i>Tephrosia purpurea</i>	පිල	Native	VU
Flora Species	Annonaceae	<i>Polyalthia cerasoides</i>	උල්කෝන්ද	Endemic	EN
Flora Species			කලුඹලීඳ	Native	VU
Flora Species	Apocynaceae	<i>Rauvolfia serpentina</i>	ඒකාචේරිය	Native	EN
Flora Species	Loganiaceae	<i>Strychnos potatorum</i>	ඉඟිනි	Native	VU
Flora Species	Fabaceae	<i>Dalbergia lanceolaria</i>	කලවැල්	Native	VU
Flora Species	Santalaceae	<i>Santalum album</i>	සුදු හඳුන්		VU
Flora Species	Dipterocarpaceae	<i>Shorea oblongifolia</i>	දුම්මල	Endemic	VU/CR
Fish (Freshwater)	Cyprinidae	<i>Pethia ticto</i>	නින්පෙනිය	Indigenous	VU/NE
Fish (Freshwater)	Cyprinidae	<i>Garra ceylonensis</i>	ගල්පාඩි	Endemic	VU/EN
Fish (Freshwater)	Cahannidae	<i>Channa ara</i>	<i>Ganara</i>	Endemic	EN/NT
Fish (Freshwater)	Cyprinidae	<i>Pethia ticto</i>	නින්පෙනියා	Indigenous	VU/NE
Fish (Freshwater)	Testudinidae	<i>Geochelone elegans</i>	කිරිවච්චා		VU
Fish (Freshwater)	Bagridae	<i>Mystus ankutta</i>	කහ ආඳා	endemic	EN
Fish (Freshwater)	Gobiidae	<i>Stiphodon martenstyni</i>	කාවඨියා	endemic	CR(PE)
Reptile	Testudinidae	<i>Geochelone elegans</i>			VU
Butterflies	Papilionidae	<i>Papilio crino</i>	Monara papilia	Indigenous	VU
Butterflies	Lycaenidae	<i>Virachola perse</i>	Maha Pera-nilaya	Indigenous	VU
Dragonflies	Cholorocyphidae	<i>Libellago adami</i>		Endemic	VU
Reptile	Scincidae	<i>Eutropis madaraszi</i>	Pulli hikanala	Endemic	VU/NE
Mammal	Vespertillionidae	<i>Pipistrellus coromandra</i>	Indu Koseta-vavula	Indigenous	VU/LC
Mammal	Cercopithecidae	<i>Macaca sinica</i>	Sri Lanka Rilawa	Endemic	LC/EN
Mammal	Mustelidae	<i>Lutra lutra</i>	Diya-balla	Indigenous	VU/NT
Mammal	Elephantidae	<i>Elephas maximus</i>	Aliya	Indigenous	EN/EN
Flora Species	Annonaceae	<i>Polyalthia suberosa</i>	Kalati	Native	EN
Flora Species	Araceae	<i>Cryptocoryne wendtii</i>	Athiudayan	Endemic	VU

Flora Species	Ebenaceae	<i>Diospyros ebenoides</i>	Kalu-habaraliya	Endemic	EN
Flora Species	Ebenaceae	<i>Diospyros ebenum</i>	kaluwara	Native	EN
Flora Species	Fabaceae	<i>Dendrolobium triangulare</i>		Native	EN
Flora Species	Loganiaceae	<i>Strychnos nux-vomica</i>	Goda-Kaduru	Native	VU
Flora Species	Loganiaceae	<i>Strychnos potatorum</i>	Ingini	Native	VU
Flora Species	Phyllanthaceae	<i>Margaritaria indica</i>	Karaw	Native	VU
Flora Species	Rutaceae	<i>Chloroxylon swietania</i>	Burutha	Native	VU
Flora Species	Sapotaceae	<i>Manilkara hexandra</i>	Palu	Native	VU

3. List of Invasive Alien Species

Categories	Family	Scientific Name	Sinhala Name	Species Status (SpS)
Flora Species		<i>Panicum polygamum</i>	ගිනියා නණකොළ/මාන	Invasive spp
Flora Species	Poaceae	<i>Panicum jumentorum</i>		Invasive spp
Flora Species	Poaceae	<i>Imperata cylindrical</i>	ඉලුක්	Native (IAS)
Flora Species	Euphorbiaceae	<i>Phyllanthus polyphyllus</i>	කුරපිය	Native (IAS)
Flora Species	Asteraceae	<i>Austroeupatorium inulaefolium</i>	සුද්ද/පොඩිව්වොමරං	Invasive spp
Flora Species	Asteraceae	<i>Eupatorium inulifolium</i>		Invasive spp
Flora Species		<i>Leucaena glauca</i>	ඉපිල් - ඉපිල්	Invasive spp
Flora Species	Pontederiaceae	<i>Pontederia crassipes</i>	ජපන් ජබර	Invasive spp
Flora Species	Asteraceae	<i>Mikania cordata</i>	Gam palu	Ex-IAS
Flora Species	Poaceae	<i>Panicum maximum</i>	Ginikeeressa	Ex-IAS
Flora Species	Pontederiaceae	<i>Eichhornia crassipes</i>	Japan-jabara	Ex-IAS
Flora Species	Salvinaceae	<i>Salvinia molesta</i>		Ex-IAS

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