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**FINAL**

**METRO COLOMBO WETLAND MANAGEMENT STRATEGY**

signes

Landscape and Urban design office \_ FRANCE

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**LIST OF ABBREVIATIONS**

ADD	Agrarian Development Department
CEA	Central Environment Authority
CMR	Colombo Metropolitan Region
CBD	Convention on Biological Diversity
CBO	Community-based Organization
CC&CRMD	Coast Conservation and Coastal Resources Management Department
CMR	Colombo Metropolitan Region
CZM	Coastal Zone Management
CZMP	Coastal Zone Management Plan
DRR	Disaster Risk Reduction
DWLC	Department for Wildlife Conservation
EFL	Environmental Foundation Limited
EIA	Environmental Impact Assessment
EMP	Environmental Management Plans
EPL	Environmental Protection Licence
FAO	Food and Agriculture Organization
GIS	Geographical Information System
GM	Green Movement
HGM	Hydrogeomorphic
IEE	Initial Environmental Examination
IMCC	Inter-Ministerial Co-coordinating Committee
ITPSL	Institute of Town Planners Sri Lanka
IUCN	International Union for Conservation of Nature
LA	Local Authority
MFF	Mangroves for the Future
MCUDP	Metro Colombo Urban Development Project
NARA	National Aquatic Resources Agency (now called National Aquatic Resources Research and Development Agency)
NARESA	Natural Resources, Energy and Science Authority (now called National Science Foundation)
NCB	National Coordinating Body
NEA	National Environmental Act
NGO	Non-governmental Organization
NPP	National Physical Plan
NPPC	The National Physical Planning Council
NPPD	The National Physical Planning Department
NPPP	National Physical Planning Policy
NSC	National Steering Committee
NWPS	National Wetland Policy and Strategy
NWSC	National Wetland Steering Committee
PAA	Project Approving Agencies
PRA	Participatory rural appraisal
RSC	Regional Steering Committee
RMWE	RM Wetlands & Environment Ltd
SAM	Special Area Management
SEA	Strategic Environmental Assessment
SLLRDC	Sri Lanka Land Reclamation and Development Corporation
UDA	Urban Development Authority
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
WI	Wetlands International
WMS	Wetland Management Strategy
WMD	Wetland Management Division

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# COLOMBO

# WETLAND MANAGEMENT STRATEGY

## KEY POLICY AND COMMUNICATION MESSAGES

### **Importance of wetlands**

**Colombo is a city built on and around wetlands.** Despite progressive and degradation, wetlands still cover some 20 km<sup>2</sup> of the Colombo Metropolitan Region.

**The wetlands are fundamental to the well-being of the people of Colombo.** All of the wetlands, even the most degraded ones, provide a range of benefits which contribute to human well-being in the city. Of all the benefits provided by the wetlands, over 90% of these benefits remain within Colombo Metropolitan Region.

**The wetlands significantly benefit the urban poor.** The income for households in and around the wetlands is less than 40% of the average income for the Metropolitan Colombo Region. Over 60% of these local households directly benefit from livelihoods and products derived from the wetlands and 100% will be receiving indirect benefits from flood mitigation, climate cooling and pest regulation.

**The wetlands assist in delivering food security.** Rice cultivation in the paddy lands is a long-established practice in the Colombo Metropolitan Region. However, in addition to rice the wetlands provide a range of other formally cultivated foodstuffs including vegetables such as brinjal, long yard bean and gourds, eggs and poultry, and milk from cattle, as well as native plants which are foraged. Fishermen are also active in the wetlands across the city. Over 87% of all the wetland areas currently provide food to the citizens of Colombo contributing to food security across the city.

**The wetlands provide the citizens of Colombo with traditional medicines.** The people of Colombo have long-benefitted from their knowledge of the curative powers of local plants. It is estimated that almost 80% of the wetland areas provide local communities with traditional natural medicines which are harvested and foraged for at no or limited cost to the individual households.

**The wetlands provide effective protection from flooding.** During intensive rainfall events, the wetlands are able to store several tens of million cubic meters of water (up to 68 Mm<sup>3</sup> for the 100 year return period flood or the equivalent of more than 27,000 Olympic sized swimming pools).

**The wetlands can reduce extreme air temperatures and make the city more liveable.** Due to evaporative cooling, the wetlands can reduce air temperatures, the effect of which can extend into areas up to 100m away from the wetlands' physical boundaries. This means that over 65 km<sup>2</sup>, or more than 50% of urban Colombo, benefits from this natural air conditioning.

**The wetland soils are mitigating global climate change.** Estimates suggest that the wetland soils contain approximately 1.43million metric tons of carbon; the equivalent of almost 90% of the annual carbon emissions from CMR.

**The wetlands are protecting the health of citizens.** Four out of five of the wetland areas in Colombo buffer the negative impacts of airborne pollutants on air quality. Through the trapping and removal of particulate matter the wetlands are reducing the incidence of cardiopulmonary and respiratory diseases, coughing, bronchitis, and lung cancer, as well as premature deaths from these diseases resulting from elevated concentrations of ambient particulate matter.

**The wetlands contribute to a city rich in biodiversity.** Over 250 plant species, including nine endemic, nine nationally threatened and 11 nationally near threatened plant species of plant are present in the wetlands. Almost 280 species of animals, including 32 endemic species, are present in these urban wetlands.

**The wetlands support a critically endangered plant species.** The wetlands support the native Critically Endangered plant species, the tree climber *Aganope heptaphylla*. This plant is only recorded at three sites in Sri Lanka, two of which are the urban wetlands of Beddagana Biodiversity Park and Kolonnawa Marsh.

**The wetlands support endangered animals.** Altogether 20 critical species inhabit the wetlands of Colombo. These include four species of dragonfly, two species of butterfly, four species of land snails, two species of freshwater fish, two species of amphibian, two species of reptile and four species of mammal, including two endangered species: the Fishing cat *Prionailurus viverrinus* and the Otter *Lutra lutra*.

## **Wetland loss and degradation**

**Wetland loss and degradation continues across Colombo today.** Despite all the benefits that the wetlands provide, wetlands continue to be completely lost or progressively degraded. Whilst rates of loss vary across the city, peer-reviewed, published information suggest that in some areas of the city the rate of loss since the 1980s has been as high as 60%.

**Infilling of wetlands is increasing flood risks across the city.** The current rate of wetland loss in the Colombo Metropolitan Region is approximately 1.2% per annum. If this trend continues, the area of wetlands would be reduced by one third by 2038 and by half by 2070. This will also produce a proportional decrease in flood storage capacity. If all the wetlands were infilled flood water levels would increase by two meters during the most severe rainfall events resulting in devastation across the city.

**The water quality in the wetlands is severely degraded.** Currently the water quality can be considered to bad or very bad in 64% of the wetland areas. This means that the ecological functioning and consequently the range of benefits being provided will be compromised in at least two thirds of the wetland areas.

**The water quality in the catchments supplying the wetlands is also degraded.** When considered at the catchment scale, the water quality is bad or very bad for half of all the sub-catchments in the Metropolitan Colombo Region. This will not only be compromising the ecological functioning of the wetlands but will impact on others uses or services such as recreation, crop irrigation or water for livestock.

**Domestic waste water is significant factor in the degradation of water quality.** The main critical water quality parameters are turbidity, ammonium and phosphate. These components suggest that the cause of the problem is mainly from domestic waste water.

**The water quality situation has been critical since 2010.** Historical water quality issues have existing for decades, however the degradation has become more widespread and acute during the last five last years. The Colombo wetlands have remained resilient but an ecological threshold was crossed in 2010 and the changes in functioning may be permanent

**Some wetlands are permanently degraded.** For instance, Beira Lake is an example of very bad water quality with a permanent algal bloom present and numerous fish kills reported. These negative conditions are maintained by a combination of perpetual inputs of nitrogen and phosphorus from the catchment and by the nutrient stock persisting in the sediment water.

**Canal maintenance activities are degrading the ecological functioning of the wetlands.** The routine dredging of sediment from the canals and its deposition on the adjacent banks reduces the ingress of water to wetlands, remobilises contamination and pollutants and accelerates hydrological conveyance reducing the residence time of water in the wetlands. This in turn can change the abundance and composition of species that inhabit the wetland which can change the usage of these wetlands by more mobile species such as birds that feed on aquatic species. Further increased drainage of wetlands can also make them more susceptible to invasion by alien invasive species such as *Annona glabra* as has been observed in Talangama tank and Bellanwila-Attidiya Sanctuary.

**Alien invasive species present a significant threat to the native biodiversity of the city.** Eleven species of alien invasive plants are currently known to be present in the wetlands including *Eichhornia crassipes*, which is widespread and chokes canals and waterways, and *Annona glabra* which occurs in almost every wooded wetland in the city and results in significant changes in the native ecological character of the wetlands.

**The impacts on wetlands undermine the well-being of the urban poor.** The continued loss and degradation of wetland does not only impact on the native fauna and flora but human well-being suffers significantly. The impacts are most acutely felt by the relatively less well-off citizens who live in around the wetland areas and depend on them directly for their livelihoods and indirectly for the overall well-being.

## **Some actions to secure a sustainable future**

**The goal of the Wetland Management Strategy is the wise use and sustainable management of all wetlands within the Colombo Metropolitan Region.**

**There should be no further wetland loss.** All wetlands need to be protected and zonation, as currently described under the Guidelines for Western Province Wetland Zoning, needs to be replaced with a single wetland zone which prohibits any loss of extent or loss of functioning (ecosystem services).

**A new management and governance process needs to be implemented to oversee the Wetland Management Strategy.** A Colombo Wetlands sub-committee needs to be constituted under the National Wetland Steering Committee (NWSC). This needs to define the roles of different

organisations to ensure that there is clarity with regard to responsibility for harmonisation, planning, regulation and management.

**New guidelines on wetland zonation and no net loss should be developed and rigorously implemented.** The new guidelines should reflect the principles adopted by Sri Lanka as a contracting party to the Ramsar Convention under Resolutions XI.9 *An Integrated Framework for avoiding, mitigating, and compensating for wetland losses* and Resolution XI.11 *Principles for the planning and management of urban and peri-urban wetlands*. Both of these Resolutions seek to avoid impacts, mitigate impacts and compensate for residual impacts. The emphasis should also be changes in both wetland extent and the benefits the wetlands are providing to human society.

**Integration with the Ministry of Megapolis & Western Development is vital.** The success of the Wetland Management Strategy will depend on full integration with the ‘megapolis’ project. The wise use of wetlands is fundamental to achieving the sustainable urban outcomes promulgated in the Megapolis Development Plan. Early engagement and meeting with the proponents of the ‘megapolis’ project is crucial if the long-term future of wetlands in the Colombo area is to be secured.

**Harmonisation of legal frameworks is essential.** The establishment of a Megapolis Authority under an act of parliament, the updating of the National Environmental Act and proposed changes to the National Wetland Policy all need to seek to harmonise actions and regulations to deliver the wise use of wetlands.

**The benefits wetlands provide must be integrated into urban policy and planning.** Wetlands are key solution providers with the urban landscape. The harmonization of urban and environmental planning should provide opportunities and formal legal mechanisms to embed biodiversity conservation into the design, building codes, zoning schemes, spatial plans, strategic choices, and enforcement of city management.

**Good environmental governance must seek to engage with a diversity of stakeholders.** There is thus a need for experimenting and fostering a diversity of institutions and approaches, and generating more knowledge about governance of wetland biodiversity as well as urban ecosystem services. Such governance structures should not rely solely on traditional market and government interventions, but on other institutional arrangements. Often, local citizens make can these arrangements themselves, and involve private, common, and public land to protect ecosystem services that can not always be expressed as monetary values. There is also an urgent need to create governance mechanisms that facilitate the dynamic exchange of knowledge and resources. Such exchanges can generate innovative solutions for urban biodiversity especially at the local level.

**Biodiversity, and the benefits it provides, is essential to the sustainable future of Colombo.** To assist with protecting and promoting wetland biodiversity, more sites should be developed which encompass both traditional approaches to biodiversity conservation but also secure the benefits nature provides human society. For instance, Malabe, Mulleriyawa and Kolonnawa wetlands have rich biodiversity and therefore form a good base for developing further demonstration sites.

**Sustainable management of wetlands will make a positive contribution to climate change mitigation and adaptation.** Through the storage and sequestration of carbon the wetlands of Colombo currently contribute to global climate change mitigation. Through local climate control the wetlands can be reducing dependence of energy consuming air conditioners. The role of wetlands in climate change mitigation and adaptation strategies needs to be pursued and embedded.

**Decisions need to reconcile landfilling versus flood protection.** The progressive loss of wetlands results in a constantly increasing need for engineered flood protection solutions. The implementation of classic, expensive and non-environmental-friendly engineering solutions such as dredging, creating new outlets and channels, reinforcing and expanding the existing pumping stations will all be necessary to contend with increased flood risk. These approaches will inevitable result progressively in the creation of a complex flood protection system that could fail resulting in a potential disaster. The precedent for such failure exists, for example in the city of New-Orleans which in 2005 suffered widespread devastating flood damage as a result of hurricane Katrina.

**There is a need for a better understanding of the links between hydraulics and ecological issues.** The hydraulic functioning of the Colombo catchments is complex and determines the hydro-ecological functioning of the wetlands and their typology. A better comprehension of the link between hydraulics and ecological issues would allow better protection of the diversity and richness of the values of the wetlands that are particularly fragile and valuable for the city.

**A balance should be made between the hydraulic gains and the ecological impacts in order to protect the wetlands.** Significant consideration must be given to assessing the potential ecological impacts of any hydraulic works which seek to reduce flood risk and enhance the hydraulic conveyance of the channels. The systematic implementation of this kind of measure often results in a significant decrease in long-term daily water levels for dry, average and wet years. This can negatively impact the wetlands by lowering the average water level and altering the hydroperiod.

**Wetland creation or restoration should be considered in order to treat polluted water.** Water pollution is undermining the ecological functioning of wetlands across the city and negatively impacting human health. Wetlands offer a range of opportunities to be used as natural infrastructure to reduce the impacts of a variety of pollutants including domestic waste water, industrial effluents and road storm run-off.

**The collection and treatment of waste water and solid waste across the Colombo area is essential to prevent the continued impacts on wetlands.** An integrated waste disposal action plan needs to be developed rapidly.

**All fragmented wetlands should be connected through a network of ecological corridors.** In order to optimize ecosystem functioning connection of wetlands and other natural ecosystems should be part of strategic urban planning. This action will increase ecological functionality as a whole and assist in optimizing ecosystem services offered. It could be done by developing urban green spaces, planting trees, road side planting, underground tunnels and vegetated overhead bridges.

**Site level management plans should be developed for each wetland area.** Site level management plans should be developed which identify the strategic interventions needed at each site in order to ensure that these sites continue to provide the present level of ecosystem services.

**Alien invasive species management plans should be developed as part of wetland site management plans.** It is important to manage and control alien invasive plants in a sustainable manner. Outright removal may always not be an option, instead selective replacement of the exotic and alien invasive species with native and preferably endemic and threatened species should be tried out at pilot level. Furthermore, some of the faunal species, especially birds have become adapted to use these invasive plants as roosting, breeding and feeding grounds and therefore removal of these alien invasive plant species will have to be followed with replacement of some of these services using suitable native plant species.

**Species action plans should be developed for different alien invasive plants.** Separate management plans should be developed for each of the identified invasive plant species as management prescriptions are not common for all the species concerned. Of particular importance are *Annona glabra*, *Salvinia molesta* and *Eichornia crassipes*.

**Developing innovative ways to manage alien invasive plants.** The removal of alien invasive plants represents a long-term process. Opportunities should be developed which transform the removed plant material into a valuable resource. For instance, developing a biogass production for electricity generation to benefit the local wetland communities, or the development of composting programmes to supply organic material to the horticultural industry could be pursued as both sustainable solutions and novel financing approaches.

**Soft engineering approaches should be implemented along the canal banks.** Some of the canals are lined by gabion (rock basket) walls, especially around Heen Ela Marsh and the canals in the Nawala-Nugegoda area. This management prescription changes the bank characters as it introduces a hard boundary that suppresses plant growth and provides limit niche opportunities for fauna. More innovative green-engineered solutions should be developed and implemented across the canal network.

## BEIRA LAKE

**Beria Lake is still showing a bad water quality.** A permanent bloom seems to be maintained by: on the one hand, new input of nitrogen and phosphorus from the catchment area, on the other hand by the nutrients stock in sediment water.

**Sediment water represents a main stock of nutrients** for the whole lake system. A management plan needs to embed sediment dredging activities or/and reduction nutrient level in sediment.

**The sediment does not show major micro-pollutant contamination.** However, the sediment contains medium to bad heavy metal contamination (in particular lead and zinc). Dredging activities need to be clearly regulated and fishing strictly prohibited during such works.

Various studies have already shown that the Beira lake hydrosystem is heavily polluted and has a hypertrophic status. This study fills some specific gaps (sediment quality) but **considerable elements are missing in order to have a complete and comprehensive overview**. The main elements include the fauna (fish, worms in sediment, zooplankton) and flora (algae). In the same way, it is absolutely necessary to lead such study during at least one year, and ideally during three years.

Water, sediment water and sediment quality also would not be solved by:

- a. Algae filtration: it has no significant value as a result of heavy nutrient rate which maintains primary production system.
- b. Dilution (supplying water from another source like Kelani River): such management will have no real and sustainable impact to reduce algae bloom due to huge nutrient stock in water sediment and sediment.
- c. Phytophage fish: they will have no impact apart from the end of restoration plan, in case of bloom decrease. Actual chemical indicators do not allow fish population to be

sustained (basic pH, high TSS, low oxygen, etc.) and it does not fix the problem of nutrient amount in the lake. It is another link in the foodweb, but not a key-factor.

- d. Biofan (aerators): in the same way as phytophage fish, it could be interesting as soon as nutrient rate is lower and/or deoxygenation cause disturbing effects (metal and H<sub>2</sub>S discharge) in bottom layer. A biofan enables oxygenation and mixes water column. On one hand, it can allow fauna and flora development in lake. On the other hand, if it is a shallow depth lake, it can mix sediment water and maintain nutrient discharge therefore, increase primary productivity (algae bloom) and water pollution.

**The first activity before beginning other actions is to decrease the discharges from all the inlets in Beira Lake.** It is the only way to stop nutrients and heavy metal inlet in the lake.

Only if the first activity is complete, restoration procedure can be delivered. Even though the nutrient inlets can be stopped, we have seen that the sediment water and sediment behave like a bank, so that algae bloom can persist for several years or decades. That is why **the second activity would be the dredging of all the lakes sediments**. It means that during this period (one or two years) the bloom would be even more intense probably causing more turbidity, more deoxygenation leading to hydrogen sulfide (H<sub>2</sub>S) gas discharge. The whole dredging sediment must be placed in an appropriate landfill (high lead, mercury and zinc rates) or ideally they should be decontaminated before being placed over land.

This two first steps completed, and only after, third step can be a more **smooth restoration plan** including shoreline beautification, development of recreational facilities, floating wetlands, fish restocking (with indigenous species), etc.

According to these three steps, we can develop the first and main action: route multiple discharge points in an “adapted wetland”. More than the major discharge points, we could consider to pump the water from Beira lake in a transitional wetland functioning as a waste water treatment plant.

## EXECUTIVE SUMMARY

- i. **Colombo is a unique and dynamic city.** The economic prosperity of Sri Lanka and the future wellbeing of the population are dependent on the city as a gateway for commercial, industrial and financial success.
- ii. **Colombo is also a city whose history is inextricably linked with wetlands.** The city developed around wetlands and still depends on the same wetlands today. However, over time the wetlands have been degraded and lost. Despite the presence of a variety of regulations and government institutions, wetland loss and degradation persists today.
- iii. **The loss and degradation of wetlands** within the Colombo Metropolitan Region (CMR) not only impacts on wildlife and species of conservation concern, but it **degrades the natural capital upon which the socio-economic welfare of the city depends.**
- iv. In some parts of the city, **up to 60% of wetland extent has been lost since the 1980s.** Estimates suggest that wetland loss is continuing at an annual rate of in excess of 1% per year.
- v. However, it is not simply a matter of loss. Whilst loss and infilling may be absolute, the **chronic and acute degradation** of wetlands brought about as a result of a range of pressures and threats, including pollution from dumping of solid waste and unregulated wastewater, encroachment from unplanned settlements and permitted developments, changes in hydrological regimes, intrusion of sea water, the proliferation of alien invasive species and habitat changes, **is undermining the functioning of wetlands and impacting upon the benefits they provide human society.** All of these threats and pressures are being exacerbated by climate change.
- vi. Even though they were once far more extensive, **today wetlands cover almost 19 km<sup>2</sup> of the CMR surface area.** Several different wetland types are present including **open water** lakes, tanks and canals, native, mixed and alien species dominated wet **woodland, herb-dominated** habitats including active and abandoned paddy lands and reedbeds and **complex marshes** systems comprised of mosaics of these different habitats.
- vii. **The functioning of the wetlands is driven by hydrological controls.** Physical tidal influence penetrates as far as Parliament Lake, regulating the daily water levels within extensive areas of wetlands. Brackish water also penetrates through the wetland network and has implications for the species assemblages and the ecological functioning of the wetlands. However, **approximately 85% of all the wetlands are freshwater systems** which depend on surface water supplied through the wider catchment network and rainfall to maintain them.
- viii. **All the wetlands of Colombo, even the most degraded areas, are providing benefits and maintaining elements of human wellbeing.** Over 90% of all the benefits provided by the wetlands are delivered within the CMR.
- ix. **Different types of wetland provide different benefits.** The importance for wetlands in storing runoff and mitigating flood risk is well catalogued. However, **the wetlands provide a far greater range of benefits than simply the regulation of flood waters.** Benefits include the provision of food from paddy lands and other forms of agriculture, the supply of freshwater for irrigation or for domestic wells, the provision of ornamental and medicinal plants, the regulation of local air temperatures, the suppression of pest species, pollination of home gardens, the storage and sequestration of carbon which contributes to global climate regulation, the provision of recreational and education opportunities, spiritual and cultural benefits linked to traditional belief systems and actual and potential tourism values. **As wetlands become degraded through various human activities, the range and quality of these benefits is undermined and progressively lost.**
- x. These benefits, or **ecosystem services**, are **underpinned and maintained by vital supporting services** such as soil formation, nutrient cycling, water recycling, photosynthesis, primary production and the provision of habitat. These supporting services maintain the provisioning, regulating and cultural services and are essential for delivering human wellbeing.

xi. Consequently, decisions regarding the **future management of wetlands should consider the linkages with human wellbeing**, taking account of the perspectives of the diverse range of beneficiaries rather than simply expert views, and ensure that they are reinforced rather than compromised

xii. The **wetlands of Colombo also support** a high diversity of species and a range of plant and **animal species of significant nature conservation importance**. Among these are two globally endangered animal species, the Sri Lanka paddy field frog and the fishing cat.

xiii. The **wetlands form a comprehensive and interlinked network** which facilitates the flow of benefits. This connectivity of wetlands with each other as well as with other urban green spaces, such as parks, golf courses and wastelands, is vitally important for the overall functioning of the natural capital within Colombo.

xiv. The **Wetland Management Strategy** (WMS) is based upon global best practice and a series of underlying principles. **Key amongst these is the concept of the wise use of wetlands**. The wise use approach places the wellbeing of people at the centre of decision-making processes, whilst recognizing its dependence on **maintaining the natural ecological character of wetlands** and managing them within the limits of acceptable change. Wise use is one of the central tenets of the Ramsar Convention.

xv. Other the underlying principles embrace **the Ecosystem Approach**, which promotes the conservation and sustainable use of land, water and living resources in an equitable way, the need for **interdisciplinary working across sectors and disciplines**, and the adherence to **best practice for the planning and management of urban and peri-urban wetlands**.

xvi. The Goal of the WMS represents the high level ambition for wetlands within the CMR. **Five interlinked and mutually dependent Strategic Objectives are described in order to deliver the Goal.**

**The Goal of the Colombo Wetland Management Strategy is:**  
**The wise use and sustainable management of all wetlands within the**  
**Colombo Metropolitan Region.**

xvii. The **Strategic Objectives** possess cross-cutting synergies and **are addressed through the following five themes: recognise, prevent, restore, engage and govern**. The five Strategic Objectives are defined as follows:

**Strategic Objective 1: Recognise** – The benefits and values derived from the wetlands provide the basis for wise use, sustainable development and human well-being. All of these values must be recognised and integrated into decision-making.

**Strategic Objective 2: Prevent** – The Further loss and degradation of wetlands must be prevented and all wetlands should be conserved.

**Strategic Objective 3: Restore** – Efforts must be made to restore degraded wetlands in order to improve ecological functioning and to enhance socio-economic values.

**Strategic Objective 4: Engage** – Participatory approaches must be implemented to engage with diverse stakeholders in order to recognise values and to promote wise use.

**Strategic Objective 5: Govern** - Legal instruments and management institutions must be fit for purpose and fully engaged in the integrated delivery of the WMS.

xix. Each of the **Strategic Objectives is underpinned by a range of Initiatives** which will support their delivery. Activities and future outcomes have been identified for each of the initiatives.

xx. The **implementation of the WMS will require developing the appropriate institutional capacities and harmonising across existing legal instruments**. It is **proposed that the Colombo Wetland Management Strategy (CWMS) subcommittee is constituted** under the National Wetland Steering Committee.

xxi. The proposed CWMS subcommittee would be multidisciplinary and would aim **to enhance horizontal integration and cooperation across government institutions** whilst also being participatory with regard to local communities, wider stakeholders, the private sector and other relevant institutions.

xxii. Existing legislation already offers wetlands a degree of protection and can be used to uphold wise use and the pursuit of the Goal of the WMS. Therefore, **a priority of the CWMS subcommittee is to ensure the existing legislation and regulation is implemented and enforced robustly**. However, **the need for harmonisation across the various legal instruments and policies**, and the removal of ambiguities, especially regarding wetland definition and demarcation, will also be an important role of for the subcommittee.

xxiii. The WMS should not be considered as an open ended commitment. **It is essential that the WMS is time bound so that progress can be reported upon** and modifications, adaptations and improvements can be included in subsequent iterations. Therefore the WNS should be **reviewed comprehensively in 2026**.

xxiv. Ultimately the **success, or otherwise, of the WMS will come down to the political will supporting it and the ability of institutional cooperation** to ensure successful implementation across all of its integrated Strategic Objectives.

## NOTE ON THE STRUCTURE OF THE DOCUMENT

xxv. The Colombo Wetland Management Strategy (WMS) has been produced by an interdisciplinary team comprising Sri Lankan and international experts. The content, structure, goal and objectives of the WMS have been developed through the completion of reviews of historic published information, on recently conducted empirical studies across the wetlands of Colombo, on participatory workshops involving a wide breadth of stakeholders and through consideration of best practice in wetland management and conservation.

xxvi. The WMS is supported by a range of detailed Technical Reports. These describe in detail the studies conducted and provide the robust scientific evidence-base underpinning the assumptions and conclusions integrated within the WMS. These are presented as supplements to the WMS.

# 1 THE STATE OF WETLANDS IN COLOMBO

## 1.1 COLOMBO – A DYNAMIC CITY

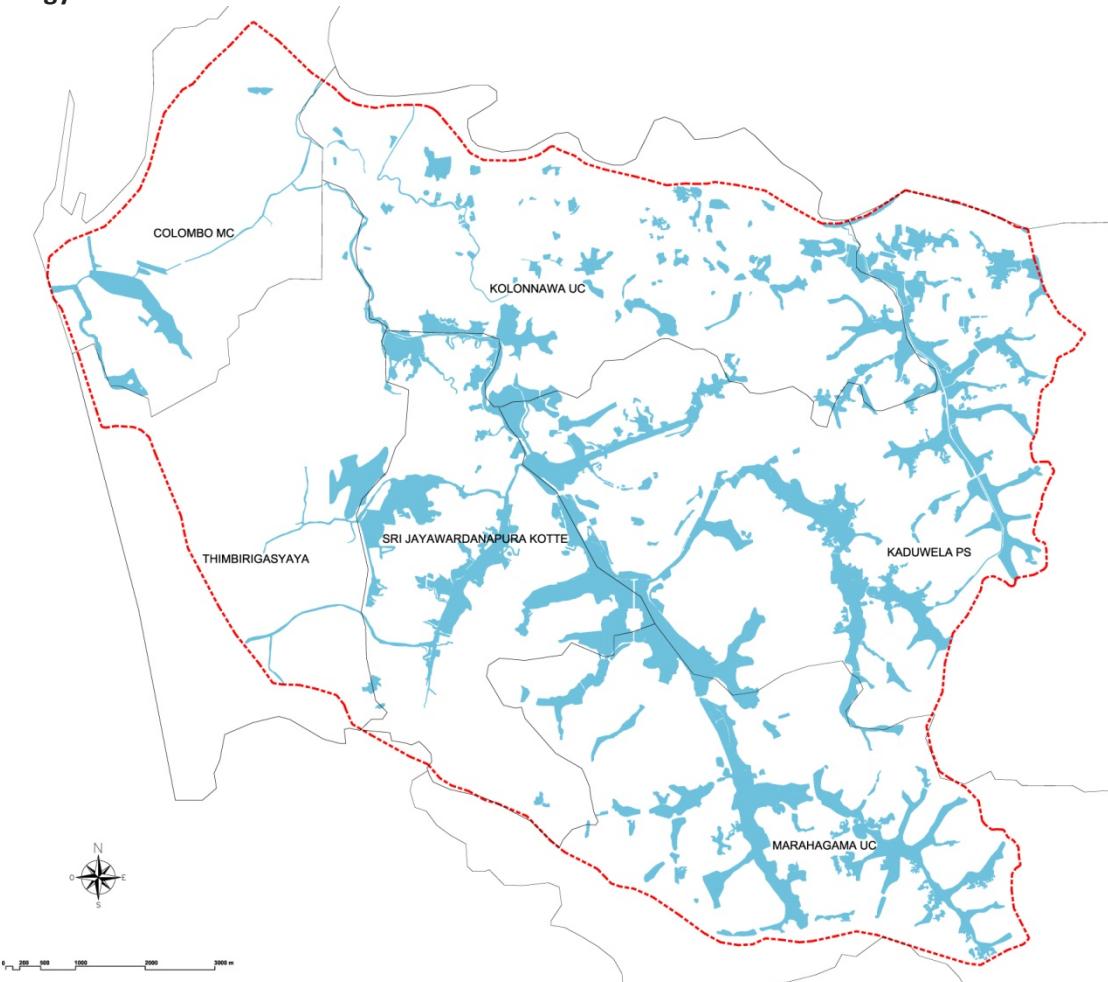
1. Colombo is a dynamic and evolving city which is pursuing a vision to be a global hub and an exemplar of sustainable urban development. As the principal gateway to the country, the Colombo Metropolitan Region (CMR) is the national centre for manufacturing, commerce and finance and is the driving force behind Sri Lanka's economic development
2. Despite covering less than 6 percent of the country's total land area, the CMR houses over a quarter of the nation's population and accounts for almost 50 percent of national Gross Domestic Product (GDP). However, the CMR is vulnerable to a range of threats which unless addressed will compromise the ability of the nation to achieve its full economic potential and thereby securing the well-being of the population.
3. The CMR faces a range of challenges which need to be addressed in a holistic and integrated manner to ensure that a sustainable future is secured for all. Not least of these is Goal 11 of the United Nation's Sustainable Development Goals which aims to make cities and human settlements inclusive, safe, resilient and sustainable by 2030 (<http://www.un.org/sustainabledevelopment/cities/>). The drivers of economic development, population growth and climate change are exerting pressures on the social and environmental systems within and beyond the CMR. The city is expanding through both formal and informal settlements in order to house the growing population. The growth in the population places pressures on local resources, food production, water demand and the quest for sustainable household incomes. Domestic and industrial developments, along with a proliferation in road traffic generate air and water pollution and increase risks to human health. Uncontrolled disposal of solid waste further pollutes the soil and water and increases the risk of pests and disease. Invasive species clog up waterways and threaten native biodiversity. At the same time, climate change is amplifying these pressures, including increasing urban air temperatures, causing implications for both human health and energy usage through increased demand on air conditioning. As the sea level rises, the risks from storm surges and saline intrusion increase directly threatening communities, their water resources and livelihoods.
4. Flooding is acknowledged to pose a particular threat within the CMR. The people of the CMR are highly vulnerable to flood risks and the city has experienced considerable flood damage in recent years. The triple drivers of climate change, population growth and economic development are all either directly or indirectly exacerbating flood risk to communities and infrastructure. Climate change is altering rainfall and temperature regimes potentially increasing storm peak run-off rates across the region. Economic development and population growth are altering land use, through intensification of agriculture, encroachment on low-lying areas, increases in impermeable surfaces and degradation of natural ecosystems and their watersheds. All of these land use changes have implications for water and flood risk management, for the governance and institutional structures (Technical Report 01) and the sustainable development of the CMR. At the heart of these issues are the wetlands of the CMR.

## 1.2 COLOMBO'S DISAPPEARING WETLANDS

### Wetland types

5. Colombo can be considered as a city built on and around wetlands. Over 500 years ago the ancient Kingdom of Kotte flourished in Sri Jayawardenepura Kotte and centred on a fortress surrounded by lakes and marshes known as DiyawannaOya and KolonnawaOya. Whilst much has changed in the intervening years, today the home of the Sri Lankan parliament and administrative centre for the country can still be found situated on a reclaimed island on a lake in the suburb of Sri Jayawardenepura Kotte at the centre of the CMR.
6. Today, a diverse variety of natural and heavily modified wetlands still remain within the CMR (Figure 1) (Technical Report 02). The study area investigated some 121.5km<sup>2</sup> comprising densely urban, peri-urban and rural environments. It is estimated that wetlands currently cover approximately 19km<sup>2</sup>, or 15.4% of the study area, however their former extent was much greater (Technical Report 03). Freshwater wetlands dominate, accounting for almost 85% of all the wetlands. Almost two fifths of the wetlands are dominated by herb species, including the extensive active and abandoned paddy lands. Complexes of wetland mosaics comprising woodlands, tall and short herbs and open water habitats cover approximately a third of all the wetland areas. Open water wetlands, such as tanks, lakes and canals cover represent just over 20% of all the wetlands.

**Figure1.The wetlands of the Colombo Metropolitan Region covered by the Wetland Management Strategy.**



7. These wetlands can be classified according to a range of criteria. The wetland types observed reflect the contribution of natural dynamics and anthropogenic influences. Physical tidal influences penetrate inland through the drainage system as far as Diyata Uyana Marsh and the northern margins of Parliament Lake. Therefore both freshwater and brackish (or seasonally brackish) wetlands are observed. Hydrological modelling has demonstrated that even at a considerable distance from the coast the physical hydrology of the wetlands can be influenced by the daily tidal cycles causing cyclical fluctuations in water levels within the wetlands (Technical Report 03). In some places, water chemistry in the wetlands remains fresh despite the physical influence of tides. However, in other places, particularly towards the Kelani River in the north of the CMR and to the west along Wellawatta Canal, the water chemistry can be distinctly brackish or seasonally brackish (Technical Report 04). The influence of tidal water ingress is also reflected in soil chemistry through the amount of salts present as indicated by the electrical conductivity of wetland soils (Technical Report 05).
8. The habitats observed within the wetlands reflect primarily natural successional processes, direct human management and the spread of alien invasive species (Technical Report 02). Three main habitat types are present across the CMR – open water, herb-dominated and woodland (Figure 2). Each of these three main habitats is represented by a range of wetland types depending on the prevailing management regime, hydrodynamic and water source (Table 1a, 1b). For instance, in the south and south-east of the CMR active paddy lands are common, such as in the area below Thalangama Tank. However, some formerly active paddy lands have been abandoned and low herb communities have been through a process of succession to tall herbs and in some places to Annona woodland. This demonstrates that the wetland types are not fixed in time and space. Anthropogenic interventions and natural processes will influence the distribution and quality of the wetland types. Furthermore, larger wetland bodies, such as Kolonnawa Marsh, comprise mosaics of different, co-existing wetland habitats.

**Figure 2.Illustration of the main types of wetland observed in the CMR.**

Habitat type	Upland	Woodland	Herb dominated	Open water	Woodland	Herb dominated		Open water
Habitat feature		Mixed woodland	Tall herb	Flowing water	Annona woodland	Low herb		Tall herb
Wetland type		Mixed woodland	Marginal vegetation	Floating vegetation	Annona woodland	Active paddy		Abandoned paddy
Illustration								

**Table 1a. Classification of freshwater wetland types observed within the CMR.**

Dominant water source	Hydrodynamic	Habitat type	Habitat feature	Wetland type	Wetland description
Freshwater	Non-tidal	Open water	Flowing water	Floating vegetation	Freshwater, non-tidal, flowing water with floating vegetation
				Open water	Freshwater, non-tidal, open flowing water body
			Standing water	Floating vegetation	Freshwater, non-tidal, standing water with floating vegetation
				Open water	Freshwater, non-tidal, open standing water body
		Herb-dominated	Low herb	Active paddy	Active paddy land
				Abandoned paddy	Abandoned paddy land dominated by low herbs
			Tall herb	Marginal vegetation	Low herb communities on margins of non-tidal freshwater bodies
				Abandoned paddy	Abandoned paddy land dominated by tall herbs
				Marginal vegetation	Tall herb communities on margins of non-tidal freshwater bodies
		Woodland	Annona woodland		Freshwater, non-tidal Annona dominated woodland
			Mixed woodland		Freshwater, non-tidal mixed woodland
	Weak-moderately tidal	Open water	Flowing water	Floating vegetation	Freshwater, weak/moderately tidal, flowing water with floating vegetation
				Open water	Freshwater, non-tidal, open flowing water body
			Standing water	Floating vegetation	Freshwater, non-tidal, standing water with floating vegetation
				Open water	Freshwater, non-tidal, open standing water body
		Herb-dominated	Low herb	Marginal vegetation	Low herb communities on margins of weak/moderately -tidal freshwater bodies
			Tall herb	Marginal vegetation	Tall herb communities on margins of weak/moderately -tidal freshwater bodies
		Woodland	Annona woodland		Freshwater, weak/moderately tidal Annona dominated woodland
			Mixed woodland		Freshwater, weak/moderately tidal mixed woodland

9. The wetlands of the CMR represent a broad cross-section of the classification system for wetland types adopted by the Ramsar Convention on Wetlands (Ramsar Convention Secretariat, 2010). The National Wetland Directory of Sri Lanka produced in 2006 classified the wetlands within the Colombo Flood Detention Areas into just four Ramsar categories: permanent rivers/streams/creeks, permanent freshwater marshes/pools, ponds and irrigated land (IUCN & CEA, 2006). The wetland classification that has been developed in studies supporting this Wetland Management Strategy builds on this earlier work, adding rigour on the basis of improvements in the understanding of the complexities of the hydrological, hydro-chemical and ecological functioning of the wetlands.
10. The classification of wetlands is not simply an academic exercise. By understanding how different wetlands function it is possible to interpret and predict the responses of different wetland types to particular pressures or stresses. For instance hydrological modelling has demonstrated that many of the marshes experience flooding to a depth of 0.1m every year and potentially up to 0.5m every other year (Technical Report 03). However, to ensure free conveyance of flood waters the canals are regularly dredged, with the spoil being deposited

along the marsh margins. Locally this material may prevent or restrict the ingress of floodwaters on an annual or biannual basis. This can result in a functional change to the wetland. Where this regular flood pulse is essential to the functioning of the wetland the alteration in its hydrological functioning may compromise the delivery of certain services, such as storing carbon and thus regulating global climate or allowing nutrients and other pollutants to be filtered.

11. Therefore it is possible to interpret the functional properties of different wetland types and to relate these to benefits that they provide to human society (Technical Report 06). Therefore changes in wetland type resulting from human-induced and other pressures can be described in terms of resultant changes in their contribution to human well-being.

**Table 1b. Classification of non-freshwater wetland types observed within the CMR.**

Dominant water source	Hydrodynamic	Habitat type	Habitat feature	Wetland type	Wetland description
Seasonally brackish / Brackish	Weak-moderately tidal	Open water	Flowing water	Floating vegetation	Brackish, weak-moderately tidal, flowing water with floating vegetation
				Open water	Brackish, weak-moderately tidal, open flowing water body
		Standing water	Floating vegetation	Brackish, weak-moderately tidal, standing water with floating vegetation	
				Open water	Brackish, weak-moderately tidal, open standing water body
	Herb-dominated	Low herb	Marginal vegetation	Low herb communities on margins of weak/moderately -tidal brackish bodies	
		Tall herb	Marginal vegetation	Tall herb communities on margins of weak/moderately -tidal brackish bodies	
	Woodland	Annona woodland		Brackish, weak/moderately tidal Annona dominated woodland	
		Mixed woodland		Brackish, weak/moderately tidal mixed woodland	
	Strongly tidal	Open water	Flowing water	Floating vegetation	Brackish, strongly tidal, flowing water with floating vegetation
				Open water	Brackish, strongly tidal, open flowing water body
		Standing water	Floating vegetation	Brackish, strongly tidal, standing water with floating vegetation	
				Open water	Brackish, strongly tidal, open standing water body
	Herb-dominated	Low herb	Marginal vegetation	Low herb communities on margins of strongly -tidal brackish bodies	
		Tall herb	Marginal vegetation	Tall herb communities on margins of strongly -tidal brackish bodies	
	Woodland	Annona woodland		Brackish, strongly tidal Annona dominated woodland	
		Mixed woodland		Brackish, strongly tidal mixed woodland	

## Wetland loss and degradation

12. Today wetlands cover approximately 20 km<sup>2</sup> across the CMR (Figure 1). However, the extent of the wetlands only tells part of the story. Since the days of the Kingdom of Kotte wetlands within the CMR have been progressively degraded, infilled and lost. Much of this damage is considered irreversible. The rates and extent of wetland loss across the CMR vary. Some estimates suggest that wetlands comprising the Kolonnawa Marsh have been reduced in area by as much as 65% since the 1980s. Similarly, as much as 60% of paddy lands across the wetlands of CMR may have been converted to non-wetland use over a similar time period. Other estimates place the figure at closer to 22% across the city, yet this still represents a significant loss. What is clear is that wetlands, irrespective of their type, continue to be lost and degraded across the CMR.
13. Human activities are progressively degrading the wetlands within the CMR. Air, water and soil are being polluted from a range of point and diffuse sources including domestic waste water, industrial activities and transport infrastructure. Indiscriminate dumping of dredge spoil associated with the maintenance of the canal network is remobilising contaminants in sediments and polluting watercourses and marshes alike. The failure to manage solid waste

- disposal across the CMR has resulted in widespread dumping within the wetlands and commensurate increases in pollution and pest species (Technical Report 06).
14. Unplanned and poorly regulated development is encroaching into wetland areas. Informal settlements account for some of this development, but other permitted development is also occurring. There is a lack of rigour in undertaking environmental impact assessments and upholding existing legislation and policies; this compounds the impact upon wetlands and, critically, can compromise their capacity to regulate flooding and other human benefits often remotely from the wetland location. Developmental pressures are resulting in changes to habitat types and structure, and in some places they are resulting in the complete loss of all wetland-related properties. Even where wetland loss is not complete, development pressures are resulting in degradation of wetland habitats and fragmentation of the network of natural ecosystems, including both wetlands and non-wetlands, across the CMR.
15. Pollution is extensive within of the surface water bodies of the CMR (Technical Report 04). When considered against the standards within the European Union's Water Framework Directive ([http://ec.europa.eu/environment/water/water-framework/index\\_en.html](http://ec.europa.eu/environment/water/water-framework/index_en.html)), approximately 50% of the drainage network is represented by water of very bad quality and less than a fifth of the surface drainage system can be considered to be in good ecological status. Ammonia, phosphorous and total dissolved solids are particularly problematic especially towards the western part of the CMR. While there are some signs of localised improvement in water quality since 2014, overall the trend is a steady deterioration over time with an increase in rates of deterioration since 2010. Some water bodies, such as Beira Lake, are very heavily polluted with the consequent stimulation of observed toxic algal blooms. The degradation of water quality, through pollution from domestic waste water, industrial pollutants, untreated stormwater drainage and agricultural inputs of nutrients, across the CMR undermines the ecological functioning of the wetlands, reducing their overall value to human society and introducing potential negative human health implications.
16. The spread of exotic alien invasive species proliferates across the CMR and represents a significant threat to native biodiversity across the region (Technical Report 02). Many of these plants and animals result from introductions through the ornamental plant and fish industry. Additionally, as the character of some wetlands has changed, Kolonnawa Marsh for instance, some native species such as *Hibiscus tiliaceus* have become invasive forming dense monospecific stands. Eleven species of alien invasive plants have been recorded across the various wetland types. Of these *Annona glabra*, *Eichhorniacrassipes* and *Salviniamolesta* are widespread and common even in areas considered important as examples of nature conservation, such as the Thalawathugoda Wetland Park which supports all eleven invasive plant species. In some wetlands, for instance Talangama Tank Marshes, exotic flora can comprise a third of the plant species observed. Whilst not all the exotic flora may be considered invasive, in some locations, such as Thalawathugoda Marshes, invasive plants can make up over 10% of all the floral species. Furthermore, slow flowing canals can become completely choked by floating invasive plant species, such as *Eichhorniacrassipes*, resulting in loss of hydrological conveyance and an on-going maintenance cost. A range of alien animal species are also common within the wetlands including fish, snails, amphibians and reptiles. Several of these species are considered invasive (tending to spread prolifically and undesirably or harmfully), such as the Sucker mouth catfish *Pterygoplichthys multiradiatus*, the Clown knife fish *Chitala ornata*, the Giant African snail *Lissachatina fulica* and the Golden apple snail *Pomacea diffusa*. Often the alien invasive and exotic flora and fauna occur in sites that support rich species assemblages but there is evidence that the richness of native species can decline as the exotic species become more dominant (Technical Report 02).
17. The hydrological network across the CMR has been progressively and significantly altered by human activities since the Portuguese Era, and other interventions can be traced even further back in time. Changes made to the hydrological network of canals, rivers and tanks impact on

the functioning of the wetlands. The dredging, widening and construction of canals alter the hydrological dynamics within the wetlands of the CMR. The reliance on locks to control outflows to the Kelani River has significantly altered the hydrological regimes in the wetlands, especially in the Madiwala area resulting in the reverse flow of water during times of high water in the Kelani River. The deepening and dredging of canals allow seawater to ingress into the drainage network. The conversion of marshes to open water tanks alters the evapotranspiration rates and the nature of run-off responses to rainfall. When taken on an individual wetland basis the impact might appear relatively small. However, the cumulative effect of these progressive and on-going changes are irrevocably altering the hydrodynamics of the wetlands their hydrological functioning, with potentially substantial aggregated impacts downstream.

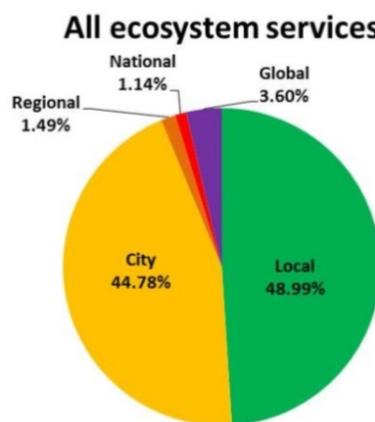
18. Recent assessments have suggested that sea levels along the Colombo coastline are expected to rise by approximately 0.59 m by 2100 (DMC & UNDP, 2012). This will potentially accelerate the rate of salt water intrusion within groundwaters underneath the CMR and will also influence the extent to which tidal influence is manifest across the canal and wider wetland network. Potentially this will have implications for the ecological functioning of the wetlands as the effects of sea level rise progress towards the south and east of the CMR. In addition to sea level rise, climate change will exacerbate a range of other pressures on both the wetlands and people of the CMR. Temperatures within the city will increase and resilience to disasters will be undermined unless an appropriate climate change mitigation and adaptation strategy is implemented.
19. All of these pressures are causing chronic and acute impacts on the quality of the wetlands and their ability to function as natural systems. The implications of this are not only felt by the fauna and flora living in, and dependent upon, the wetlands, but this progressive degradation and loss of wetlands brings with it commensurate impacts on the overall well-being of citizens within Colombo. Therefore not only are Colombo's wetlands disappearing in terms of their areal extent but their loss or degradation also compromises many of the important benefits they provide to the citizens of Colombo and beyond.

## 2 WHY ARE WETLANDS IMPORTANT?

### 2.1 WETLANDS AND HUMAN WELL-BEING

20. Wetlands and the benefits they provide are fundamental to maintaining human well-being within urban environments (McInnes, 2013). All of the wetlands in the CMR, even the most heavily degraded sites, remain valuable and are delivering a range of benefits (Technical Report 06). These benefits are being received by a diversity of beneficiaries including government institutions, private businesses, individual households and visitors to Colombo, some also affecting people at a global scale. Over 90% of the benefits derived from the wetlands are delivered within the CMR (Figure 3). However, some benefits, such as the role of the wetlands in global climate regulation and the protection of rare and threatened species of conservation concern extend to a national and international scale.

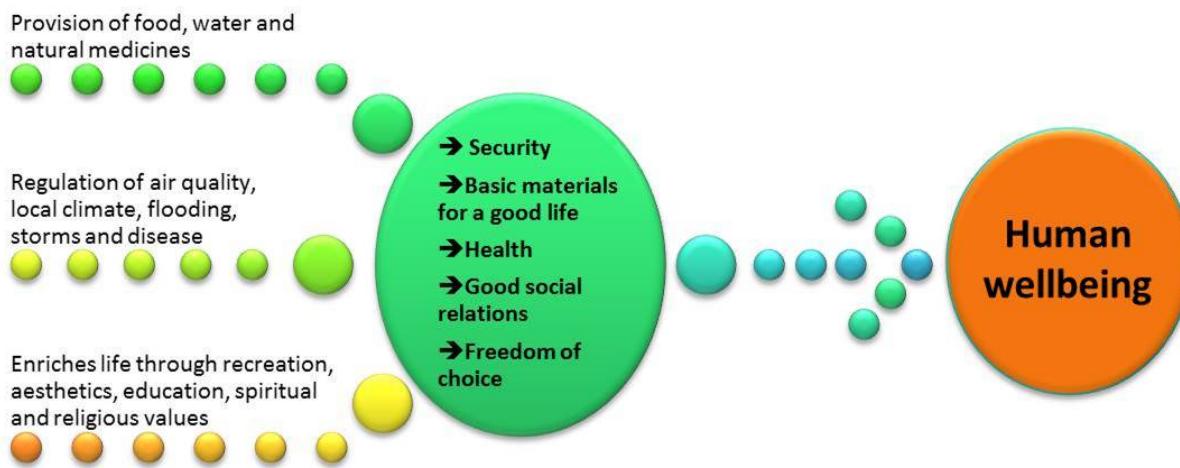
**Figure 3. Scale of distribution of the benefits derived from Colombo's wetlands.**



21. Human wellbeing comprises different elements including security, basic materials for a good life, health, good social relations and freedom of choice. The wetlands within the CMR contribute to these various elements of human wellbeing in different ways. The provision of food through rice production, the growing of vegetables, the grazing of livestock for milk production and the harvesting of other foodstuffs all fundamentally contribute to the health, security and basic requirements for a good life of the citizens of Colombo. For some wetlands, such as active paddy lands or leafy vegetable cultivation areas, the production of food generates a direct economic income. However, for many households food production is just one activity conducted in the wetlands in order to supplement family diets and to support livelihoods.
22. The availability of freshwater and access to natural medicines from the wetlands also contribute human health and provide basics for a good life. The regulation of water and the control of flooding, the suppression of pest species and the moderation of extreme local air temperatures all provide the security necessary to deliver appropriate levels of human wellbeing. Good social relations are maintained across Colombo through strong links with the cultural wetland ecosystem services, namely those that enrich the human experience. For instance, recreational, aesthetic, educational and inspirational services provided by the wetlands help to bond communities and foster strong relationships among the citizens of the CMR. There is also a strong cultural link between rituals in the Buddhist faith and the

wetlands, through the provision of flowers as temple offerings. Such activities can further provide livelihood opportunities for local residents who supply the flowers.

**Figure 4. Links between wetland ecosystem services and human wellbeing.**

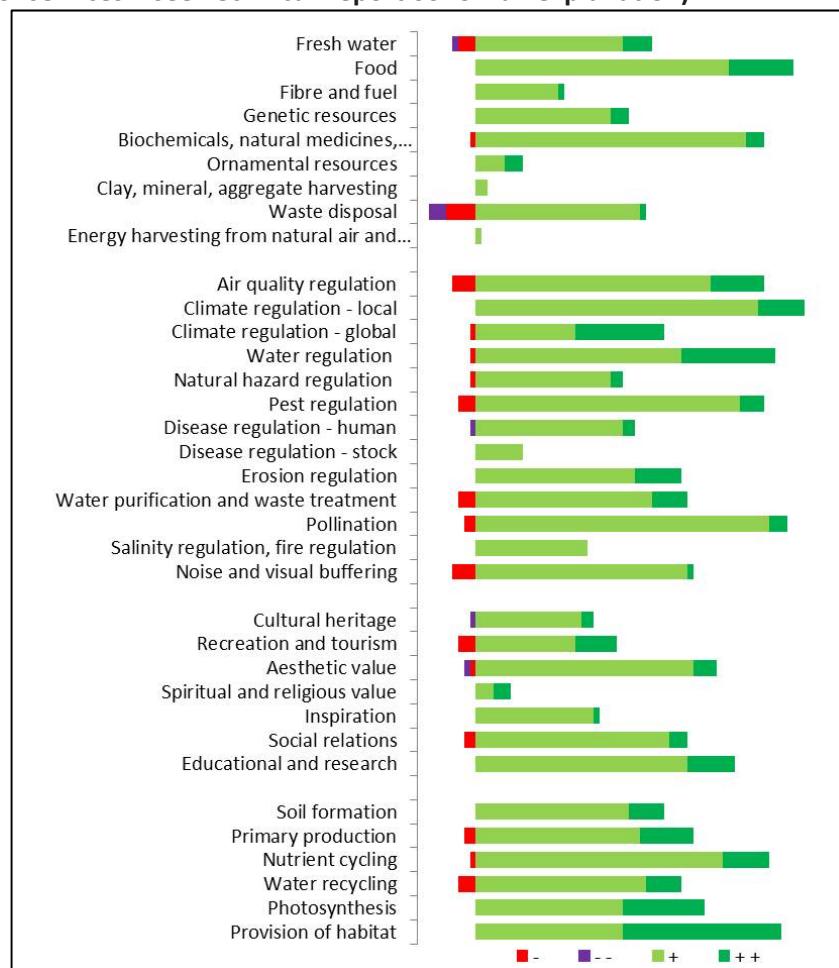


23. Consequently, decisions regarding the future management of wetlands should consider the linkages with human wellbeing, taking account of the perspectives of the diverse range of beneficiaries rather than simply expert views, and ensure that they are reinforced rather than compromised.
24. Different wetlands in Colombo provide different benefits (Technical Report 06). As wetlands become degraded through various human activities, the range and quality of these benefits is undermined and progressively lost. The substantially degraded wetlands in the west and north-west of the CMR, such Kimbula Ela, potentially provide a glimpse into the future if inappropriate wetland management is allowed to persist. The wetland areas in the heavily urbanised part of the CMR provide a relatively small range of services and at a lower quality. These wetlands are often poorly connected to the wider network of wetlands and are suffering from human-induced impacts. Without implementing effective strategic management, it is possible that the progressive loss of these wetlands and their many associated benefits for the wellbeing of the city's increasingly dense human population will become the norm if Colombo continues to urbanise and degrade the natural capital on which it was founded and, ultimately, still depends.
25. Towards the east and south-east of the CMR a variety of active and abandoned paddy lands and open waterareas, such as those around Thalangama, deliver a significant range of supporting services as well as providing various provisioning, regulating and cultural services. The majority of these wetlands are not 'natural' systems but are managed, either actively or through a process of abandonment. Nevertheless, they consistently deliver a significant range of ecosystem services the benefits of which accrue both locally, and in the case of water vectored services such as reduction in flooding, to the many people who live or work downstream.
26. The regulation of flooding is particularly significant for the CMR as, like many metropolitan regions across the world, a substantial proportion of urbanisation is occurring on low-lying land. Hydrological modelling has demonstrated that the wetlands interact and function as an inherently linked network across drainage basins, so even seemingly small changes in apparently remote wetlands can contribute to significant cumulative effects, particularly downstream (Technical Report 03). For instance, the northern outlets to the Kelani River are unable to cope during high flow events resulting in water back-flowing through the wetlands and being stored in a network of channels, marshes and paddy lands. Furthermore, if development and urbanisation were left unchecked resulting in the wholesale loss of

wetlands across the CMR, on a two year return event, locally flood water levels could rise by approximately 0.5m in some parts of the city causing major economic and social costs.

27. Wetland conservation, modification and management have therefore to be undertaken in an informed and integrated manner, cognisant of their broader spatial and temporal effects. Historic loss of natural flood regulation across the wetland network of the CMR already contributes to significant localised flood risk in the city, particularly where permitted or informal development encroaches on low-lying land. Halting or, ideally, reversing loss of flood regulating processes across the wider wetland network is therefore a priority for the sustainable development of the CMR.
28. The graphic below (Figure 5), based on the field assessment of ecosystem services demonstrates the breadth of benefits provided by the wetlands of the CMR. In relative terms of value, the most important provisioning services are the supply of food and natural medicines, with freshwater, waste disposal and genetic resources also important. The regulating services clearly provide a broad range of positive contributions. Significant amongst these regulating services is the regulation of flooding, as described above, strongly identified by the field assessments as of high importance. Climate regulation, on both local and global scales, pollination, air quality regulation, pest regulation and noise buffering were also found to be important regulating services. The positive contribution of the cultural services to the wellbeing of people within the CMR is more variable with educational, social relational and aesthetic values recorded as the most significant.

**Figure 5. Relative importance of different ecosystem services provided by Colombo's wetlands.**  
**(The green bars demonstrate positive contributions and the red and purple bars express negative contributions of services – see Technical Report 06 for full explanation).**



29. The importance of supporting services emerged from the field assessments, especially in provision of a diversity habitats and cycling nutrients. Recognition of supporting services, which by their nature are not directly exploited by people so are hard to capture and integrate within decision-making frameworks, is nevertheless of high importance as it is this range of services that underwrite ecosystem integrity, functioning and resilience.
30. However, the challenge remains in determining how to manage these multiple values and ecosystem services, provision of which is dispersed across diverse interconnected wetlands throughout the urban landscape. Part of the challenge is to understand different perspectives from different stakeholders. The conversion of a marsh to an open water tank could make sense with regard to optimising one or two benefits, such as a perceived improvement in the retention of floodwater and an enhancement of recreation. However, such a change could also reduce the welfare of some sectors of society by degrading air quality, increasing air temperatures, compromising aesthetics, reducing access to fuelwood and natural medicines, damaging ecological connectivity of habitat provision and even undermining global climate regulation. Therefore, the diversity of values, and indeed types of value (monetary, aesthetic, spiritual, etc.) assigned by different stakeholders to wetlands need to be captured and integrated into decision-making.

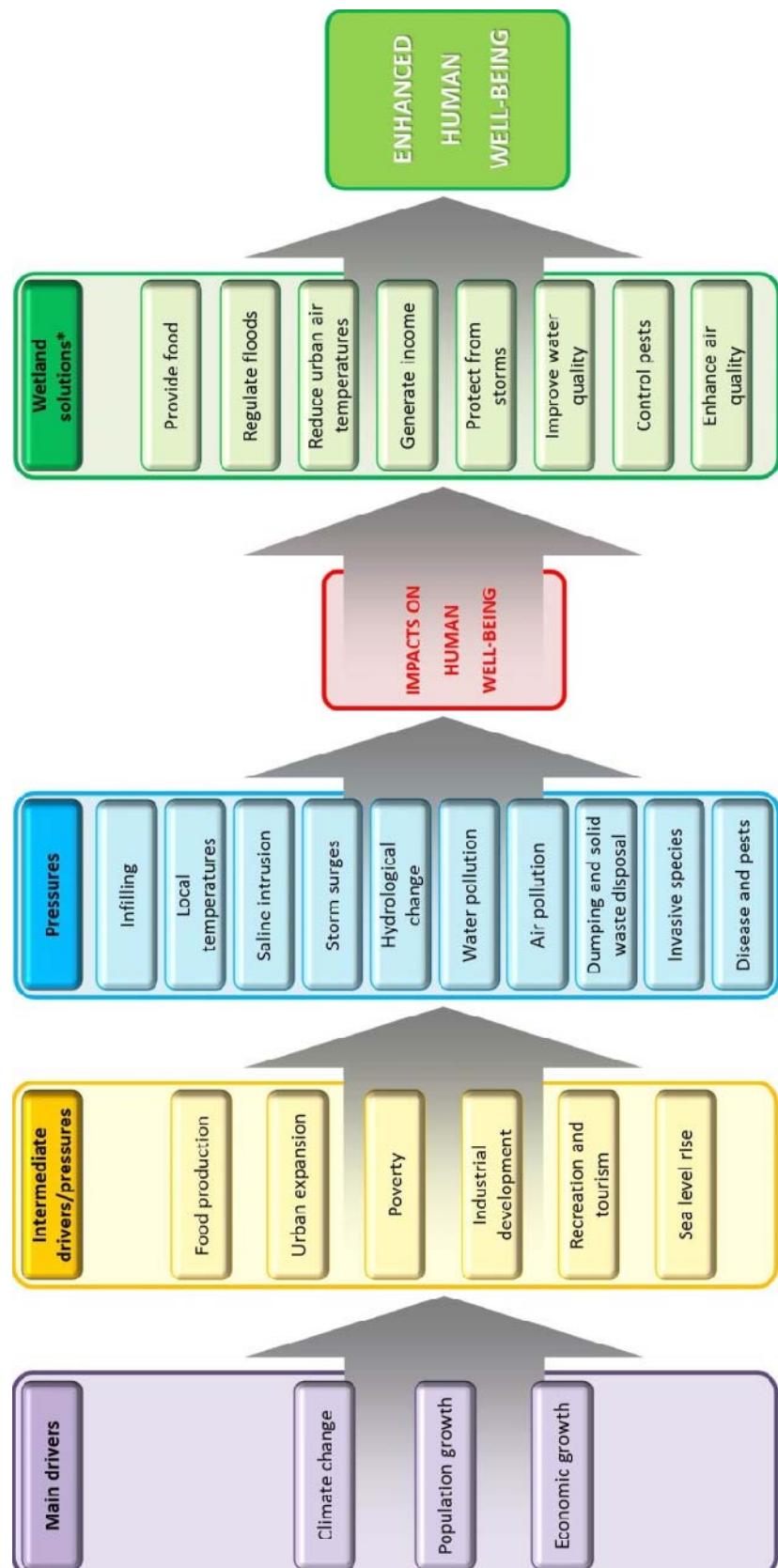
## 2.2 WETLANDS AND NATURE CONSERVATION

31. Despite the progressive impacts and threats from urbanisation, the wetlands within the CMR continue to support a rich biodiversity including species of global conservation importance. A number of wetland areas have been designated based on their nature conservation importance. The Sri Jayawardenapura Kotte area and Thalangama Tank have been designated and are offered a degree of protection under the Fauna and Flora Protection Ordinance and National Environmental Act respectively.
32. In addition, there are several wetland areas, such as the Beddagana Biodiversity Park, Thalawathugoda Wetland Park, Malabe Marsh, Weli Park Marsh, Mulleriyawa Marsh and Kolonnawa Marsh, that are not designated as protected areas but that nonetheless support high species diversity and richness including endemic and threatened plant species (Technical Report 02). For example, the Beddagana Biodiversity Park and Kolonnawa Marsh support *Aganopeheptaphylla*, a critically endangered woody climbing plant species native to Sri Lanka. These sites represent two out of the three known sites where this species is recorded in Sri Lanka at present. In addition a variety of endangered, near threatened and vulnerable plant species are present across the wetlands of the CMR.
33. Based on the national and global conservation status, at least 20 critical species of animal are known to exist in the wetlands of the CMR (Technical Report 02). These include four species of dragonflies, two species of butterflies, four species of land snails, two species of freshwater fish, two species of amphibians, two species of reptiles and four species of mammals. Two species are globally endangered, the Sri Lanka paddy field frog *Zakeranagreenii* and the fishing cat *Prionailurusviverrinus*. One land snail *Scabrinabrounae* is critically endangered at a national scale.
34. The fishing cat is recorded at a range of wetland sites across the CMR, whereas the Sri Lanka paddy field frog has only recently been recorded at Thalawathugoda Wetland Park. The other critical animal species occupy several wetland sites or connected complexes of wetland areas. The interconnectivity of these sites may be crucial in supporting and maintaining viable populations and acting as vital refugia in the urban environment. Similarly, the interconnectivity of both wetland and non-wetland habitats and other urban green spaces, such as golf courses or parks, may be crucial in allowing a range of faunal species of conservation concern to survive in urban Colombo.

## 2.3 INTEGRATING WETLAND VALUES

35. Whilst the focus remains on flood risk management, with an occasional sympathetic nod to the conservation of a few threatened species and habitats, then the quality and extent of the wetlands in Colombo will be degraded resulting in chronic and acute impacts on human well-being.
36. Historically in Colombo, as in other parts of the globe, wetlands have been considered as wastelands with little or limited value. However, all of the wetlands within the CMR possess a range of values and provide a breadth of benefits to a wider range of beneficiaries. Therefore, a paradigm shift is required in order to consider wetlands as solution providers which can assist the CMR deliver on Goal 11 (to make cities and human settlements inclusive, safe, resilient and sustainable) of the Sustainable Development Goals and the obligations of ‘wise use’ as a national commitment under the Ramsar Convention.
37. The focus for wetlands needs to be significantly broadened to encompass their multiple values, not merely as flood detention areas or for traditional ‘conservation’ reasons but for safeguarding the many, often formerly overlooked, benefits that they confer on society. Wetlands should therefore be considered as fundamentally important natural infrastructure (or green/blue infrastructure) and therefore as providers of solutions for a range of urban challenges and for delivering enhanced human wellbeing for all (Figure 6). For instance, urban and peri-urban agriculture and forestry within wetland areas should be considered in terms of impacts on a wide range of linked ecosystem-derived benefits within decision-making and city planning in order to reduce vulnerability to climate change while at the same time enhancing food security, urban liveability and livelihoods. Similarly, wetland objectives should be integrated within wider climate change mitigation and adaptation strategies, for instance through planning and implementing measures that increase carbon sequestration rates, moderate localised extreme city air temperatures or increase resilience against disasters. Furthermore, wetlands have a day-to-day role to play in managing water and air quality, buffering residents from noise, enhancing the aesthetics of the city and providing opportunities for tourism, education, training and employment. Often the management of wetlands as essential green infrastructure in order to tackle a range of urban management issues can be achieved at significantly lower capital and maintenance costs than conventional electro-mechanical or engineered solutions.
38. One of the most significant challenges for integrating the Wetland Management Strategy (WMS) into the mainstream of the CMR-wide planning and management is the recognition and subsequent integration of the multiple values of wetlands across the layers of governance and range of institutions responsible for managing the urban and peri-urban environment. Drivers and pressures which are currently degrading wetlands need to be understood both in terms of physical or ecological changes to the wetlands but also, perhaps more significantly, through their multiple impacts on human wellbeing. Through adopting this benefit-focussed approach, the roles that wetlands play as solution providers for mitigating pressures and enhancing human wellbeing can elevate them into mainstream deliberations and policy-making.

**Figure 6.Wetland solutions as part of a driver, pressure-response framework.**



## 3 PRINCIPLES, GOAL AND STRUCTURE OF THE WETLAND MANAGEMENT STRATEGY

### 3.1 UNDERLYING PRINCIPLES

39. The WMS is predicated on a range of principles not least among these is the recognition by the Ministry of Environment in 2006 that *wetlands, both man-made and natural, have been central to Sri Lanka's cultural, economic and social development for more than 2,000 years*. The future economic prosperity of Colombo, and consequently Sri Lanka, depends on the city becoming resilient to flood risk and developing into a world-class capital and an exemplar of urban environmental management. In order to achieve this, appropriate environmental safeguards need to be put in place to ensure that the multiple values provided by the network of wetlands across the CMR are integrated into future urban planning and decision-making. In order to achieve this, the following principles have been considered in developing the WMS.

#### An interdisciplinary approach

40. Managing the interconnected socio-economic and environmental complexities within a rapidly developing urban area is a significant challenge. Integrated and holistic approaches are required that bring together different disciplines and perspectives. Different stakeholders have different perspectives and assign different values to wetland-related benefits and issues. For example, more than two-thirds of the householders living alongside the wetlands did not recognise the nature conservation value of their local wetlands or the potential recreational value that they provide. Therefore efforts to protect wetlands solely on nature conservation grounds, or to enhance recreational opportunities, may be misunderstood by the local communities that depend on the wetlands for a range of other benefits. To address potential conflicts, resolve trade-offs, develop inclusive and integrated solutions, and to improve implementation, efforts must be made to increase awareness, participation and cooperation among stakeholders and sectors (such as the public, local and national governments, private business and local communities).

#### Wise use

41. Sri Lanka became a signatory to the Ramsar Convention on Wetlands on the 22<sup>nd</sup> June 1990. By acceding to the Convention, Sri Lanka has an obligation to uphold and implement the mission of the Convention which states:

*"The conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world."*

42. The concept of wise use should be considered in the context of delivering against a spectrum of objectives including maintaining human well-being, increasing resilience to disasters, mitigating and adapting to climate change, alleviating poverty and delivering environmental justice.

43. Within the CMR wetland wise use should be regarded as a fundamental concept which will assist the city to deliver on sustainable development. Such an aspiration can only be achieved, as the mission states, through local and national actions and the conservation and wise use of all wetlands within the CMR.

#### Principles for the planning and management of urban wetlands

44. At the 11th Meeting of the Conference of the Parties to the Convention on Wetlands (Ramsar) in Bucharest, Romania, in July 2012, Resolution XI.11 on the 'Principles for the planning and management of urban and peri-urban wetlands' was adopted. Resolution XI.11 set out a clear set of policy principles which governments, from national to local need to consider and

implement when developing policies that jointly address urban planning and management and the wise use of wetlands. These policy principles are apposite for the development of the WMS. The policy principles state:

- Wetlands and the range of services they provide are essential elements of the supporting infrastructure of urban and peri-urban settlements.
  - The wise use of wetlands contributes to socially and environmentally sustainable urban and peri-urban areas.
  - Any further degradation or loss of wetlands as a result of urban development or management should be avoided, and where not possible, any impacts should be mitigated, and any residual effects appropriately compensated for by off sets such as wetland restoration.
  - The full participation of indigenous and local communities, municipalities and government sectors involved in urban and peri-urban spatial planning and wetland management decision-making is vital to creating sustainable urban and peri-urban settlements.
  - The threat of natural calamities and human-made disasters and their impacts on urban populations and wetlands requires government priority and convergent actions to enhance resilience to disasters.
45. In addition to the five policy principles, Resolution XI.11 also set out practical principles which should be considered when seeking to deliver sustainable urban development in combination with better maintenance and enhancement of wetlands. The practical principles recommend:
- Wetland conservation – urban development should seek to avoid destroying wetlands.
  - Wetland restoration and creation – especially as elements of urban water management infrastructure.
  - Understanding the values of wetlands – urban planners need to use wetland values in their decision making.
  - Stakeholder engagement – inclusivity, empowerment and participation of local communities should be pursued with decision making decentralised to the lowest appropriate level.
  - Integrated planning – thematic and spatial planning should be used to protect and integrate wetlands and their values into the management of urban environments.

## **Ecosystem Approach**

46. The Ecosystem Approach is defined by the Convention on Biological Diversity (CBD) as a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Adopted at the Fifth Meeting of Parties to the Convention on Biological Diversity (CBD) through COP5 Decision V/6 in 2000 in Nairobi, the ecosystem approach is the primary framework for action under the Convention to which Sri Lanka is a signatory.
47. The Ecosystem Approach is underpinned by 12 complementary and interlinked principles, all relevant to the development and implementation of the WMS. Adherence to the 12 principles of the Ecosystem Approach should be sought in implementing the WMS. In particular adherence to the following principles should be pursued:
- Principle 1: The objectives of management of land, water and living resources are a matter of societal choices.
  - Principle 2: Management should be decentralised to the lowest appropriate level.
  - Principle 3: Manager should consider the effects (actual and potential) of their activities on adjacent and other ecosystems.
  - Principle 5: The conservation of ecosystem function and structure, in order to maintain ecosystem services, should be a priority
  - Principle 6: Ecosystems must be managed within the limits of their functioning.
  - Principle 9: Management must recognise that change is inevitable.

- Principle 12: All forms all relevant information, including scientific and indigenous and local knowledge, innovations and practices should be used.

48. In applying the Ecosystem Approach within the context of the WMS, it is essential that the relationships and processes within wetland ecosystems are understood, benefit sharing is enhanced, adaptive management practices are adopted and that sectorial cooperation is guaranteed.

49.

## 3.2 GOAL

50. The specific Goal of the WMS has been developed through an iterative process that has involved the following activities:

- A literature and historical data and information review.
- Extensive empirical studies on the wetlands of the CMR.
- Participatory workshops and consultation sessions which have engaged with a broad sector of stakeholders representing national and local government, academics, non-governmental organisations, the private sector, local communities and international experts; and
- An evaluation of existing principles, guidance and international exemplars germane to developing an urban wetland management strategy.

51. At a stakeholder workshop, participants drawn from a range of local and national institutions with an existing involvement with the wetlands of the CMR were asked to draft their version of the goal for the WMS. These draft statements have been collated to produce the following word cloud (Figure 7).

52. The word cloud clearly demonstrates the desire to develop a sustainable approach that can conserve, manage and utilise wetlands and practice wise use within the CMR and the wider catchment. Consequently the Goal of the WMS is defined as:

**Figure 7. Word cloud formed from terms used by stakeholders for defining the goal of the WMS.**



## **GOAL      The wise use and sustainable management of all wetlands within the Colombo Metropolitan Region**

53. The Goal of the WMS sets the high level ambition for wetlands within the CMR. The intention of the WMS is to unite different policies, plans, laws, institutions and organisations in order to commit thevarious actors and stakeholders within the CMR to deliver on the Goal for mutual benefit. It is anticipated that taking this inclusive and holistic approach will lead to broader appreciation of the issues, including the often formerly unrealised benefits, surrounding wetlands, and this will strengthen overall ownership and implementation of the WMS both horizontally across sectors and institutions and vertically through tiers of governance.
54. For any strategic approach, performance needs to be measured and targets need to be set to ensure that the objectives are being met and actions implemented as appropriate. Therefore a monitoring and evaluation programme is required to ensure that objectives stemming from the overall strategic Goal are being delivered, the strategic approach is being uniformly applied and that success or lessons learnt are recorded to improve the realisation of benefits.

### **3.3 STRATEGIC OBJECTIVES**

55. The Goal represents the desired state that, when achieved, demonstrates that the WMS has been successfully implemented. In order to achieve the Goal, the WMS sets out Strategic Objectives necessary for implementation.
56. The Strategic Objectives have been derived through an inclusive and participatory process that has included the collective intelligence of the multiple stakeholders who have engaged in workshops and wider consultations, the synthesised outcomes of a variety of detailed technical studies (see Technical Appendices), a review of historical literature and global best-practice experiences in the development of urban wetland management strategies.
57. The Strategic Objectives address five key themes: recognise, prevent, restore, engage and govern.These are described below:

<b>Strategic Objective1</b>	<b>Recognise</b> The benefits and values derived from the wetlands provide the basis for wise use, sustainable development and human well-being. All of these values must be recognised and integrated into decision-making.
<b>Strategic Objective2</b>	<b>Prevent</b> Further loss and degradation of wetlands must be prevented and all wetlands should be conserved.
<b>Strategic Objective3</b>	<b>Restore</b> Efforts must be made to restore degraded wetlands in order to improve ecological functioning and to enhance socio-economic values.
<b>Strategic Objective4</b>	<b>Engage</b> Participatory approaches must be implemented to engage with diverse stakeholders in order to recognise values and to promote wise use.
<b>Strategic Objective5</b>	<b>Govern</b> Legal instruments and management institutions must be fit for purpose and fully engaged in the integrated delivery of the WMS.

58. All of the Strategic Objectives directly underpin the delivery of the Goal as well as possessing synergies with each other. Therefore there is no mutual exclusivity and the implementation of the WMS should be seen as dependent on effective implementation of all its parts. The Strategic Objectives provide an integrated framework based around the five themes. Under each of the Strategic Objectives, a range of initiatives need to be pursued to ensure that the strategic Goal is achieved.

**Figure 8.Synergies among the five Strategic Objectives and the WMS Goal.**



## 4 THE WETLAND MANAGEMENT STRATEGY

### 4.1 GOAL

**GOAL** **The wise use and sustainable management of all wetlands within the Colombo Metropolitan Region**

59. A critical first step towards securing the future of the wetlands of the CMR and ensuring that their role in maintaining human wellbeing is protected, and wherever possible enhanced, is to understand the meaning of the Goal. The Goal embraces the concept of 'wise use' as defined under the Ramsar Convention. Wise use is the longest established approach for the conservation and sustainable use of natural resources. The wise use approach places the wellbeing of people at the centre of the decision-making process, whilst recognising its dependence on retaining and balancing the natural character of the ecosystems that support it. By doing this, the wise use approach identifies critical linkages and connections that exist between human societies and the sustainable development of natural resources. A fundamental tenet of the wise use approach is to encourage community engagement in shaping and determining equitable outcomes for conservation.
60. The wetlands of the CMR are highly diverse, ranging from man-made canals and tanks to complex mosaics of natural marshes and wetlands modified for direct human uses such as paddy lands. Some of these wetlands are controlled by the dynamics of the tides, others are freshwater systems that respond to rainfall and run off from adjacent uplands. Many of the wetlands in the CMR are agricultural systems or paddy lands that may be intensively managed. Therefore, in order to deliver wise use and sustainable management of wetlands, it is necessary to define 'wetland'.
61. Through the publication of the National Wetland Policy and Strategy in 2006, the Sri Lankan National Wetland Steering Committee (NWSC) has adopted the Ramsar Convention on Wetlands' definition for wetlands. This definition states that:
 

*"Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres."*
62. In the text of the Ramsar Convention it further considers that wetlands may include a wide range of freshwater, brackish and saline wetland ecosystems and:
 

*"...may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands."*
63. Within the Guidelines for Western Province Wetlands Zoning & Relevant Regulations for Application in Urban Development Plan Preparation published in 2006 seven categories of wetland are identified including:

*“...deep freshwater marshes and swamps, shallow freshwater marsh, abandoned and active paddy fields, other agricultural wetlands, water bodies and mangrove areas.”*

64. All of these wetland types are embraced by the Ramsar Convention’s definition of wetlands and can be assigned to types within the Ramsar Classification of Wetlands.
65. Similarly, the definition used in the Sri Lanka Land Reclamation and Development Corporation Act, No. 15 of 1968 and its subsequent amendments of land gazetted and requiring written approval for filling or developing specifies:  
*“areas of low lands, marshes, barren or muddy lands.”*
66. Again, these terms can all be interpreted within the context of the Ramsar Convention’s definition of a ‘wetland’. Therefore, the WMS adopts the Ramsar Convention’s wetland definition throughout. However, the use of local terms and names, some of which will have a long-standing history of usage should be encouraged in dialogue with stakeholders, along with a harmonization of terms and the implementation of the bespoke classification described in Section 1.
67. Therefore, the Goal refers to *all wetland types satisfying the Ramsar definition* within the CMR, both protected and managed, as well as those that may be gazetted through existing legal processes and those that are currently outside or poorly considered though any legal or regulatory framework.

## 4.2 STRATEGIC OBJECTIVES

### Strategic Objective

1

#### Recognise

The benefits and values derived from the wetlands provide the basis for wise use, sustainable development and human well-being. All of these values must be recognised and integrated into decision-making.

68. All wetlands within the CMR have value, making a contribution to human wellbeing. However, not all the benefits that are provided by wetlands are routinely recognised and integrated into decision-making and the scale of value formerly provided by degraded or lost wetlands may not be realised. Wetland benefits or ‘ecosystem services’ *provide* society with food, water, medicines and fuel, they *regulate* air and water quality, flows of water, the local and global climate and the impacts of storms, they *enrich culture* across education, recreation, spiritual, aesthetic and religious dimensions, and they *support* the health and functioning of well-balanced ecosystems.

69. The National Wetland Policy & Strategy 2006 acknowledges that wetlands provide important ecosystem services. However, barriers still exist which prevent the full range of values being recognised and integrated into wetland management and planning. This Strategic Objective seeks to ensure that the unique importance of the wetlands of the CMR is integrated fully into future decision-making through embedded knowledge horizontally across government institutions and assimilating benefits into spatial zonation, planning and management.

## INITIATIVE 1.1

### ***INTEGRATING WETLAND VALUES INTO URBAN PLANNING INSTITUTIONS***

70. **PREAMBLE:** Within the CMR there are a variety of government and non-governmental institutions involved either directly or indirectly in the planning and management of the Region. These include, but are not restricted to, the Ministry of Megapolis& Western Development, the Urban Development Authority (UDA), The Sri Lanka Land Reclamation and Development Corporation(SLLRDC), Metro Colombo Urban Development Project (MCUDP), the Central Environmental Authority (and its constituent agencies) and the National Physical Planning Department. Also included are Ministries responsible for a variety of portfolios such as Health, Transport, Disaster Management and many departments with responsibility for a range of functions such as housing, agriculture, irrigation, etc., as well as local authorities, districts and municipalities. Numerous non-governmental and civil society organisations are also involved both formally and informally in the urban planning and management process.

71. It is apparent that the institutional landscape is complex and the boundaries of individual mandates are not always transparent, especially with regard to wetlands and their benefits. However, what is also clear is that wetlands, through the benefits they provide human society, impinge across all these various institutions and sectors. As essential natural infrastructure within the urban context, wetlands can provide solutions to a multitude of urban issues and should be considered as green infrastructure solution providers. The following highlight some of multiple benefits and how wetlands have a role to play in delivering on the obligations of different governmental mandates:

- Wetlands can improve physical health by trapping airborne particulates and reducing respiratory illness.
- Wetlands can improve mental health by providing spaces where people can relax, exercise or co-relate.
- Wetlands can act as route-ways within an integrated transport network.
- Wetlands can provide food to local communities.
- Wetlands can reduce risks associated with disasters and also increase resilience in post disaster scenarios.
- Wetlands can treat polluted wastewater from domestic and industrial sources.
- Wetlands can cool urban air temperatures and reduce the energy usage associated with air conditioning.
- Wetlands can provide attractive and interesting destinations as part of city-wide tourism package.

72. However, often the largest barrier to fulfilling this potential and implementing wetland-based solutions is a simple lack of understanding and awareness within both institutional structures and the individuals residing within those institutions. Worldwide, governmental institutions often work in ‘silos’ with limited consideration of potential synergies with other institutions and scant appreciation of negative outcomes, perverse incentives or missed opportunities. Therefore Initiative 1.1 seeks to embed knowledge on the roles that wetlands can play across

the complexity of institutions in order to facilitate the horizontal integration of wetland values into future decision-making.

<b>Activities</b>	Ensure that all institutions involved in urban planning and management activities within the CMR:
	<ul style="list-style-type: none"> <li>• are aware of the WMS;</li> <li>• have an understanding of the benefits that wetlands can provide;</li> <li>• have trained and competent staff that understand wetland values; and</li> <li>• understand how wetlands can assist in the delivery of individual institutional objectives.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Raised awareness across all sectors of government of the benefits that wetlands provide.</li> <li>• Wetlands as solutions (or green/blue infrastructure) providers integrated into the psyche of institutions.</li> <li>• Values of wetlands routinely considered by urban planning and management institutions.</li> <li>• Wetlands protected, enhanced or restored in order to deliver on institutional mandates.</li> </ul>

## INITIATIVE 1.2

### ***INTEGRATING WETLAND VALUES INTO URBAN SPATIAL PLANNING***

73. **PREAMBLE:** The wetlands of Colombo are integrated geographically and socially across the region. The origins and future prosperity of the city are inextricably linked with wetlands. To achieve the Goal of the WMS requires wetlands, and specifically their values, to be integrated spatially within the future planning and management of Colombo. This will require the implementation of best practices of mixed land use planning and the co-existence of rural, peri-urban and urban land-uses. The future planning across the CMR must fully consider ecosystem health, focusing on allowing sufficient space for natural systems, including wetlands, to continue to provide the diversity of benefits which form the foundation for social and economic activity.
74. Future planning cannot separate the relationship between the built and natural environments. The future planning and management of infrastructural systems, such as roads and housing, should be conceived differently so that citizens not only help to protect wetlands but that they continue to enjoy the benefits provided by natural systems. Investments in infrastructure projects should include environmental safeguards and the consideration of the benefits ecosystems provide as a catalyst for urban sustainability.
75. All cities are human constructs and by definition humans can control their developmental trajectories and associated impacts. Decisions regarding the future planning of the CMR, and for instance the integration within the Western Region Megapolis Project, must consider how the environmental impacts associated with the growth of the city can be appropriately

mitigated and where necessary compensated. The plight of wetlands is intimately linked across different spheres of decision-making and urban planning. For instance, managing the proliferation of informal settlements and decisions regarding rehousing their communities should consider issues such as the benefits of densification of housing and the futuremobility of citizens to help to slow urban expansion into ecologically sensitive land. While such decisions are intuitively in the realm of urban planners and managers, they should also fully consider and integrate wetland values within such decision-making.

76. The role of zoning is already well established in urban planning within the Urban Local Authorities in the Western Province. The existing Guidelines for Western Province Wetland Zoning produced in 2006 define five basic wetland zones. These Guidelines are predicated on a range of assumptions, including:

- That the precautionary principle should be applied in identifying zones.
- Maintaining essential flood storage capacity and other environmental benefits.
- Development is permitted in all zones(except the Special Paddy Cultivation Zone) as long as there is adherence to the conditions of development.
- Some infilling of wetlands is necessary for development purposes.

77. However, while there is implicit recognition of the benefits that wetlands provide, the five zones group wetlands based on permitted uses and not on how they function or explicitly on the benefits that they provide. There is an overriding sense that the focus is on future 'developmental use' rather than current 'benefit'. In keeping with the obligations under wise use and the application of the precautionary principle, the focus of the Guidelines should change to maintaining, or enhancing, current values rather than facilitating future developmental use. Such harmonisation is required across various legal instruments (see Initiative 5.2).

78. It has been clearly demonstrated that all the wetlands within the CMR provide benefits and possess value. Therefore the zonation should be based on assisting decision-makers and managers in the understanding of how the wetlands function and how functioning drives the flow and distribution of benefits. Decisions regarding individual locations, sites or development projects should be based on understanding how a particular wetland functions (with regard to hydrology, soils, water chemistry and ecology, etc.) and how the functioning contributes to the delivery of benefits. The complexity of the environmental and social interactions observed in the technical work underpinning the development of the WMS renders the broad scale mapping of different wetland zones based on permitted development and the thresholds for different activities in individual zones redundant.

79. Similarly, individual wetlands, whether they are abandoned paddy lands or open water tanks, do not function in isolation. All of the wetlands of the CMR function as components within a wider, interconnected network. Localised changes or impacts on a wetland can have wider implications across the drainage network. Equally, individual developmental changes may generate limited changes within one wetland area but the cumulative impacts resulting from multiple impacted sites might have serious repercussions across the CMR.

80. Wetlands and the species they support also depend on the distribution and quality of non-wetland areas. Avoiding fragmentation of wetlands and other urban green spaces and maintaining and improving connectivity should be key elements in the spatial planning within the CMR. Therefore, Initiative 1.2 should ensure that wetlands and their values, as essential urban green infrastructure, are strongly embedded in urban spatial planning based on a presumption in favour of maintaining and enhancing their benefits rather than an assumption that their value resides in future conversion through infrastructural development.

<b>Activities</b>	Redraft and issue an amendment to the Guidelines for Western Province Wetlands Zoning & Relevant Regulations for Application in Urban Development Preparation 2006 that are predicated on maintaining and enhancing wetland values and underpin the delivery of the WMS. This should include: <ul style="list-style-type: none"> <li>• Defining principles underpinning the maintenance and enhancement of wetland values.</li> <li>• Advising on how to apply these principles within environmental impact assessments.</li> <li>• Ensuring harmonization and synergies with other legal instruments.</li> <li>• Producing appropriate legislation and guidance to facilitate the implementation of the guidelines.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Implementation</li> <li>• Integration of values in decision-making</li> </ul>

## Strategic Objective 2

### Prevent

Further loss and degradation of wetlands must be prevented and all wetlands should be conserved.

81. An objective of the Ramsar Convention is the desire to stem the progressive encroachment on and loss of wetlands now and in the future. Similarly, the principles adopted under Resolution XI.11 on the 'Principles for the planning and management of urban and peri-urban wetlands' emphasise the fact that any further degradation or loss of wetlands as a result of urban development or management should be avoided, and where not possible, any impacts should be mitigated, and any residual effects appropriately compensated for by off sets such as wetland restoration. The ambition to protect and conserve wetland ecosystems is also an objective of the Sri Lankan National Wetland Policy and Strategy.
82. However, wetlands across the CMR are currently being lost at an alarming rate and it is clear that these commitments are not being met. The progressive loss and degradation of wetlands undermines human wellbeing and degrades the vital natural capital upon which the economic prosperity of Colombo is built.
83. Prevention of wetland loss and degradation must not simply focus on the aerial extent of wetlands. Loss and degradation also applies impacts on the functioning of a wetland which may not directly alter a wetland's size or boundaries. In order to assess degradation it is essential to understand the current baseline and functioning of the wetlands. Once a baseline has been established, the prevention of wetland loss and degradation can subsequently

involve proactive measures to avert adverse change in a wetland's functioning through appropriate regulation, planning or activity design decisions. Examples would include choosing a non-damaging location for a development project, or choosing a 'no-project' option where the risks to a wetland are assessed as being too high. Similarly, establishing appropriate programmes of measures which control the spread of alien invasive species or which seek to proactively manage polluted water from industrial and domestic discharges, road run off or construction sites can all be key elements in reducing and preventing wetland degradation.

84. Changes to the hydrological network which seek to increase flood storage capacity and reduce flood risk should also seek to avoid further loss and degradation of wetlands. The physical conversion of wetlands, for instance from complexes of marsh habitats to open water tanks, can generate a commensurate loss of functioning and a reduction in the overall benefits a wetland provides. Such a scenario would represent an example of wetland loss and would need to be mitigated appropriately. Therefore, the desire to maximize one element of a wetlands functioning, in this scenario flood storage capacity, needs to carefully consider the overall impact on wetland ecosystem services and should seek to prevent any deterioration or loss of that functioning.
85. However, in some instances prevention or avoidance of wetland loss and degradation may be difficult or impossible to achieve unless a decision is taken to abandon a particular project or proposal. Consequently, under such circumstances appropriate responses must consider mitigating or compensating for impacts. To successfully achieve the Strategic Objective, such responses need to understand how the wetland is functioning and particularly the range of ecosystem services wetlands are providing.

## INITIATIVE 2.1

### ***IMPLEMENT THE OBLIGATIONS UNDER THE RAMSAR CONVENTION***

86. **PREAMBLE:** Sri Lanka, as a signatory to the Ramsar Convention, has adopted guidance on how to avoid, mitigate and compensate for wetland loss and degradation (Ramsar Convention Resolution XI.9, 2012). This guidance stresses that the imperative is to avoid wetland losses (or degradation) in the first instance. This imperative to avoid wetland loss applies to all wetlands and as such addresses all the wetland types present in the CMR.
87. In order to avoid wetland loss and degradation, the following decision criteria should be considered *inter alia* in order to evaluate whether avoidance is a realistic response to a likely negative change to the wetland:
  - Is the site unique and/or does it provide valuable or irreplaceable ecosystem services?
  - Have other localities been examined for the proposed activity or is the proposed activity Wetlands dependent?
  - However design modifications been considered to avoid wetland losses?
  - Have the values of lost or altered ecosystem services being considered in the project cost benefit analysis?
  - What are the costs and efficacy of mitigation or compensation measures if the proposed activity is implemented?
  - Have both direct and indirect impacts on the wetland been considered?
  - However cumulative or in combination impacts and the wetland been considered?
  - Has an assessment been made of all the risks and benefits associated with the project?

88. Where an activity or project proceeds, but a change in the functioning of the wetland is likely, then appropriate proactive mitigation should be undertaken. In adopting mitigation measures, the following decision criteria should be considered:

- Are the costs and risks associated with effective mitigation measures considered to be too high?
- Is it possible to mitigate the impacts of the activity in a practical and effective manner?
- Are the mitigation activities going to fully minimize the impacts?

89. Sometimes there will be residual post mitigation impacts. In this scenario, it is necessary to compensate for the resultant loss or degradation in wetland functioning or area. Any such compensation action should be ex situ and appropriate to offset the residual impacts. During the development and implementation of compensation measures, the following decision criteria Require consideration:

- Is the compensation wetland type-for-wetland type?
- Is the compensation function-for-function, component-for-component, or area-for-area?
- Where should compensation be located?
- How can compensation be achieved?
- How can long-term compensation be implemented?
- Are the costs and risks associated with effective compensation considered to be too high?

90. In some situations it may be feasible to create wetlands on land that has never been wetland, or that has historically been wetland but has since been changed into an alternative land use, in order to provide compensation or even to assist in mitigating changes in ecological character. Therefore, wetland restoration should be considered as a key component of mitigating or compensating for potential wetland loss and degradation.

91. A further Ramsar-related consideration extends to the implementation of wise use, one of the cornerstones of the Convention. Wise use essentially balances human wellbeing with the functioning of the wetland. The ecosystem services that a wetland provides, such as the provision of food, the improvement of water quality, the recreational opportunities or the cycling of nutrients are all part of the character of the wetland and can be compatible with wise use. Therefore, wise use does not necessarily equate with no-use. The key is to understand the ecological character of the wetland, essentially how it works and the ecosystem services that it provides. Decisions on the management of the wetland, or assessments regarding potential loss or degradation, must be cognisant of any limits to the functioning of the wetland and ensure that these are not exceeded resulting in negative consequences for the ecological character of the wetland.

<b>Activities</b>	<p>Implementation of the existing obligations adopted under the Ramsar Convention will include the following activities:</p> <ul style="list-style-type: none"> <li>• Cross sectorial awareness-raising of the existing obligations under the Ramsar Convention and the meaning of wise use.</li> <li>• Embedding of the obligations within the wetland management planning and urban spatial planning and management practices.</li> <li>• Integration of the avoid-mitigate-compensate decision-making framework within the project scoping, screening, development and environmental impact assessment processes.</li> <li>• Develop and utilise readily available computer models to interrogate the hydro-</li> </ul>
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	ecological functioning of the different wetland areas.
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>The prevention of further loss and degradation of wetlands.</li> <li>Implementation of what is essentially a no net loss policy for the wetlands of the CM.</li> <li>Compliance with the obligations under the Ramsar Convention within the scope of the wetlands of the CMR.</li> </ul>

## INITIATIVE 2.2

### ***UPHOLD EXISTING LEGISLATION AND POLICIES***

92. **PREAMBLE:** A range of existing legislation and policy currently considers wetlands from a variety of perspectives. For instance, the National Wetland Policy and Strategy sets clear principles, objectives, policy directions and a framework for delivery in order to conserve Sri Lanka's wetlands. The existing Guidelines for Western Province Wetland Zoning set out criteria and conditions for development. In addition, and among others, the National Environmental Act, the Forest Act, the Fauna and Flora Protection Ordinance; the Flood Protection Ordinance, the Sri Lanka Land Reclamation and Development Corporation Act, the National Physical Planning Process as per the Town & Country Planning Act all address wetlands in one form or another.
93. Whilst there are some positive synergies among these various pieces of legislation and policy, there are also overlapping mandates and jurisdictions. Similarly, there are multiple definitions of wetlands depending on the statute under consideration. However, despite the potential lack of harmonization across these various policies, plans, acts, etc. there are still considerable powers which can be applied to prevent loss and degradation of wetlands. (NB Harmonization issues are considered further under Initiative 5.1).
94. Given the prevailing rates of wetland loss and degradation in the CMR, it is clear that implementation of existing legislation and policies is not robust or consistent. It is also clear that if applied appropriately, that the existing legislation could help to prevent further wetland loss and degradation. Therefore, in the absence of any new legislation, or the harmonization of existing legislation, efforts must be increased to uphold the existing statutes. However such efforts need to include a recognition and understanding not only of wetland extent and type but also the capturing of wetland values and the upholding of the links between wetland functioning and the contribution made to human wellbeing.

<b>Activities</b>	Adherence to existing wetland-related legislation and policies in order to prevent further wetland loss and degradation will require the following activities: <ul style="list-style-type: none"> <li>• A more rigorous understanding of wetland values and their links with human wellbeing.</li> <li>• Appropriately interpretation, application, compliance and regulation of existing wetland-related legislation.</li> <li>• Cross jurisdictional integration across government departments and authorities to ensure consistency in consideration of wetlands within legal processes.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• The prevention of further loss and degradation of wetlands.</li> <li>• Compliance with existing legislation and policies.</li> <li>• Consistency in the consideration of wetlands within existing legislation and policies.</li> </ul>

**Strategic Objective 3** **Restore**  
**Efforts must be made to restore degraded wetlands in order to improve ecological functioning and to enhance socio-economic values.**

95. A significant proportion of the wetlands in the CMR have already been drained, infilled and lost. This loss has had commensurate impacts on both human wellbeing and the diversity of biota using the wetlands. Therefore efforts should be made to reverse this loss through wetland restoration measures.
96. However, restoration should not be seen as a substitute for protecting and ensuring the wise use of wetlands, i.e., the potential to restore a wetland is not a justification or suitable trade-off for the continued wetland degradation. Furthermore, while restoration can play an important role in enhancing wetland benefits, experience shows that a ‘restored’ wetland rarely provides the full range and magnitude of services delivered by a wetland that has not been degraded.
97. Where wetland restoration is to be implemented, the focus should be on optimising benefits, rather than pursuing single or narrow objectives. Elsewhere in the world, it has been shown that the inability to recognize or appreciate the potential for achieving multiple benefits across sectors has, in some cases, precluded cost-effective, participatory approaches to wetland restoration. By considering multiple values and beneficiaries, wetland restoration may be more successful in recovering benefits and delivering more sustainable outcomes for people and the environment. Therefore, decision-makers and practitioners are urged to take appropriate measures to recognise the full suite of environmental, cultural and socio-economic benefits potentially possible from any wetland restoration scheme.

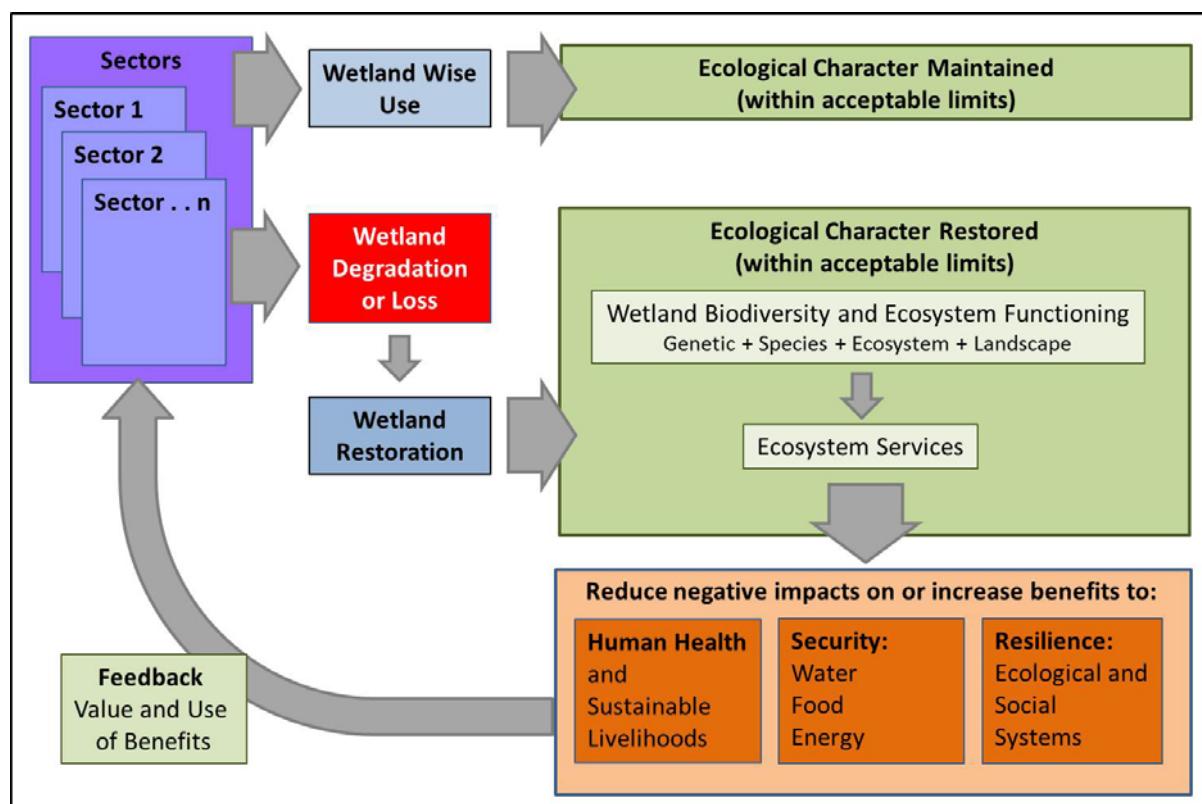
98. Wetland restoration can be considered to be the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed. The Society for Ecological Restoration have defined the attributes of successful wetland restoration activities as:

- the utilization of native wetland species in characteristic assemblages and functional groups,
- self-sustaining and resilient wetland ecosystems integrated within the larger landscape, and
- the reduction or elimination of the drivers of wetland degradation.

99. Restoring lost or degraded wetlands represents a valuable and cost-effective opportunity for society to recover and enhance benefits for human health and well-being, including reduced risk from storms and other extreme events, improved food and water security, and the capacity to mitigate and adapt to climate change. Similarly, wetlands have the potential to provide long-term benefits to multiple sectors concurrently, such as agriculture, fisheries, water, forestry, health, energy, extractive industries, recreation, transport, education, tourism, development, and local communities.

100. In addition to understanding ecological processes within the context of the larger catchment across the CMR, restoration projects and programmes must be designed and implemented with the aim of fostering multi-sectoral cooperation and stakeholder participation to allow for the pooling or leveraging of knowledge and resources. The objectives of wetland restoration should be the resolution of long-term governance issues and equitable socio-economic development and benefit sharing. Under these circumstances, wetland restoration can be a ‘win-win’ proposition that, with limited resources, enhances the quality of life for both people and nature across the various sectoral interests in the CMR (Figure 9).

**Figure 9.Relationship between sectoral use of wetlands and the delivery of multiple benefits (from Alexander & McInnes, 2012).**



## INITIATIVE 3.1

### ***ENHANCING WETLAND ECOSYSTEM SERVICES FOR CROSS-SECTORAL BENEFITS***

101. **PREAMBLE:**To achieve a sustainable future and to become an exemplar of urban management will require the CMR to demonstrate comprehensive integration and cooperation across a diversity of sectoral interests. The management of existing wetlands and the restoration of lost wetlands have a significant role to play as green infrastructure providing multiple cross-sectoral benefits.
102. Sectors can be thought of as discrete subdivisions within the wider socio-economic system of the CMR and include private landowners and corporations, local, regional or national governmental bodies and authorities, and components of civil society, including NGOs and local communities.All of these sectors can benefit from wetland restoration activities. The key challenge is to develop and utilise a comprehensive evidence-base to demonstrate and communicate the full suite of benefits and their relevance across different sectors.
103. Starting at the community and grass-roots level, participation in wetland restoration activities can contribute significantly to long-term success by educating local communities and focusing attention on the causes of degradation, as well as by creating employment and a more equitable distribution of benefits. A simple example of this could be the restoration of a wetland to store flood waters, to improve the quality of road run-off and also to grow endemic ornamental plants as a saleable commodity thus increasing employment opportunities, enhancing local livelihoods but also dealing with transport infrastructural concerns.
104. Private sector involvement should also be encouraged. Waterfront locations can be an attractive proposition for private development. Enhancement and restoration of the wetlands can make some locations more attractive to private corporations, but in combination with the aesthetic values of restoration, private finance could be leverage to assist in the multi-functional restoration of wetlands in order to provide a broader suite of benefits.Such approaches could be developed in association with private corporate social responsibility (CSR)agendas which can demonstrate a continuing commitment by businesses to behave ethically and contribute to sustainable economic development while improving the wellbeing of their workforce, the local community, society at large and the environment. Potential funding opportunities may arise through public-private initiatives where a business pays for the restoration and ongoing management of wetland in return for benefiting from the values the wetland provides. Such 'payment for ecosystem services' schemes could be developed where wetlands are restored for their ability to provide a direct benefit to a private company, such as supplying food, cooling temperatures, improving water quality or sequestering carbon, but are managed through a financial contribution to the local community or an NGO to ensure the long-term delivery of the benefits.
105. However, a key component to delivering on Initiative 3.1 is the horizontal integration of government institutions and the need for them to first recognise the role wetlands play in supporting the delivery of their mandates (Initaitive 1.1) and then to consider the restoration of wetlands as an essential and cost-effective approach to pursue. For instance, micro-drainage subprojects implemented under the Metro Colombo Urban Development Project that reduce risk of flooding in localized areas should investigate the feasibility of restoring or

creating wetlands as components within a sustainable urban drainage measures. Integrated within such sustainable micro-drainage projects should be the multiple objectives to reduce flood risk, to improve water quality and to enhance and optimise the delivery of other benefits through the use of wetlands. Through consultation and collaboration with other agencies, a drainage-led project, which restores wetlands, could also deliver benefits for recreation, tourism, biodiversity, education and health.

106. Similarly, the development and planning of major infrastructural projects, such as transport infrastructure or housing and office developments as proposed through the Western Region Megapolis Project, need to carefully consider the potential benefits that the restoration of wetlands can provide across different sectoral interests. Only through collaborative working and horizontal integration can such opportunities be realised and the multi-functional benefits that they can bring to overall wellbeing of the population of the CMR be delivered.

<b>Activities</b>	<p>In order to enhance the cross-sectoral benefits provided by wetland restoration, the following activities should be conducted:</p> <ul style="list-style-type: none"> <li>• Implement fully and successfully Initiative 1.1.</li> <li>• Develop champions in different government institutions who can assist in identifying opportunities and catalyse cross-sector integration and delivery.</li> <li>• Seek champions within civil society and NGOs who can assist with identifying local opportunities and catalyse integration and delivery within communities and with government and private institutions.</li> <li>• Engage with the private sector to transform their design and planning processes in order to embed multiple benefit wetland restoration options in their business practices.</li> <li>• Seek to develop novel funding initiatives, such as through payment for ecosystem services, which catalyse and support wetland restoration actions.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Wetlands within the CMR are restored.</li> <li>• Cross-sector working through restoring wetlands for multiple benefits becomes standard practice.</li> </ul>

## INITIATIVE 3.2

### ***DEVELOP A SYSTEMATIC BENEFITS-BASED WETLAND RESTORATION PLAN***

**107. PREAMBLE:**

108. The catalysts for initiating wetland restoration activities are present at a number of levels, from obligations under international treaties, such as delivering on the obligations under the Ramsar Convention or achieving the Aichi Biodiversity Targets for 2011-2020, to community-based initiatives which will enhance local livelihoods, to the implementation of cross-sectoral infrastructure programmes. The variety of policy sectors where wetland restoration can play a role has already been identified in the WMS, including, among others, economic investment,

development planning, housing, sanitation and water resources, food production, tourism and recreation, transport and education. The various government institutions need to be encouraged to demonstrate dialogue and leadership across sectors to ensure that social, economic and environmental benefits are delivered in a strategic as well as reactive manner.

109. A strategic approach which combines individual sites and wetland areas at a landscape scale across the CMR should be developed. Such an approach should highlight the circumstances under which wetland restoration can be considered and provide recommendations on how wetland restoration can be prioritized by decision-makers and different sectors. The development of a systematic benefits-based wetland restoration plan should also be integrated with wider spatial planning processes (as considered in Initiative 1.2) to ensure that opportunities are future-proofed and their benefits optimised. The benefits-based approach should extend across sectors and disciplines to ensure that other strategic sustainable development objectives, such as disaster risk reduction, poverty alleviation and water, sanitation and health issues, are fully integrated. Furthermore, the feasibility of implementing a strategic programme of wetland restoration is often dictated by the availability of funds and resources. By considering the cross-sectoral benefits and identifying priorities it can be possible to pool limited resources in order to optimise the scope of wetland restoration and the diversity of benefits delivered.

<b>Activities</b>	In order to develop a systematic benefits-based wetland restoration plan the following activities are required: <ul style="list-style-type: none"> <li>• Identify locations of former wetlands and assess their potential for restoration.</li> <li>• Identify possible beneficiaries and the range of benefits that wetland restoration opportunities could provide.</li> <li>• Prioritise sites and locations for restoration.</li> <li>• Integrate strategic objectives within wider spatial planning initiatives.</li> <li>• Investigate potential cross-sectoral funding and resourcing opportunities.</li> <li>• Develop and implement the systematic restoration plan.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Area of wetlands in the CMR is increased with a commensurate increase in the benefits provided by the wetlands.</li> <li>• Cross-sectoral benefits realised.</li> <li>• Obligations met under intergovernmental treaties and conventions.</li> </ul>

## INITIATIVE 3.3

### ***RESTORE WETLANDS AS ESSENTIAL ELEMENTS IN CLIMATE CHANGE MITIGATION AND ADAPTATION PROGRAMMES***

110. **PREAMBLE:** The International Panel on Climate Change(IPCC) has defined mitigation as an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases. Actions that decrease emissions reduce the projected magnitude and rate of climate change and therefore diminish the risks of impacts on natural and human systems. Similarly, the IPCC has defined adaptation in human systems as the process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities. In natural systems, adaptation has been defined as the process of adjustment to actual climate and its effects. Human intervention may facilitate adjustment to expected climate. While human and natural systems possess the capacity to adapt to a changing climate, ultimately the management of climate change will depend on the effectiveness of mitigation actions which are expected to delay or reduce damage caused by climate change. It is also expected that better management of wetlands will not provide the complete solution to climate change, but undoubtedly wetland wise use can assist in the short-term while efforts are taken to decrease emissions from burning fossil fuels and reducing other sources of greenhouse gases.
111. There is increasing interest in the use of ecosystem-based adaptation in responding to climate change. Ecosystem-based adaptation can be defined as the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change. This approach is usually consistent with the management of ecosystems to assist their adaptation to future climates, but it also embraces supporting people's lives and livelihoods. For example, the protection of wetlands as aquifer recharge areas is consistent with increasing ecosystem resilience and human adaptation through increased groundwater supply.
112. A key component of climate mitigation is to ensure that carbon remains stored in wetland soils and the standing biomass. It is widely acknowledged that wetlands, in particular peat-based and forested forms, can lock up more carbon on a pro rata basis than any other terrestrial ecosystem through inactive exchange with the atmosphere. Extensive organic rich soils and wooded wetland systems exist across the CMR and as a priority these, and the catchment hydrology that maintains their functioning, should be protected. The protection of wetlands as elements in climate change mitigation measures can also deliver co-benefits and opportunities to directly enhance livelihoods and human wellbeing.
113. However, wetland restoration offers opportunities to mitigate climate change and deliver multiple benefits. The total value of the benefits that flow from a restored wetland, including their role in climate change mitigation and moderating hydrological regimes, can often be several times higher than the cost of restoration when added to the value of the benefits lost due to degradation (Alexander and McInnes 2012). The restoration of forested wetland ecosystems across the CMR can lead to reduced emissions and increased carbon sequestration and although the opportunities to restore these ecosystems may be limited, when taken as part of wider, systematic restoration programme they can be highly productive in terms of carbon storage and delivery of co-benefits.
114. Carbon offsetting may also be attractive to the private sector as a means to deliver on their corporate social responsibility ambitions. Proactive engagement with the corporate sector

may open avenues for funding opportunities for wetland restoration and protection targeted at climate change mitigation measures.

115. Temperatures in the CMR are expected to rise under future climate scenarios (DMC & UNDP, 2012). Urban wetlands are acknowledged in the scientific literature and recognised at the community level within Colombo (Technical Report 06) to reduce air temperatures. As natural 'air conditioners' wetland have an important role in facilitating adaptation to warming temperatures. When wetland restoration for adaptation to increasing temperatures is considered in conjunction with other potential benefits and as an integral component of city-scale green infrastructure the case for action is strong.

116. Whilst the reduction of emissions of greenhouse gases should remain a priority in the future development of Colombo, the development of a proactive climate change mitigation and adaptation wetland restoration programme would be a substantial innovative step forward for the city.

<b>Activities</b>	<p>The development and implementation of a wetland restoration-based climate change mitigation and adaptation programme will require the following activities:</p> <ul style="list-style-type: none"> <li>• Collating and defining a robust evidence base on the rates of carbon storage and sequestration, and the emission of greenhouse gases, in the different wetland types across the CMR.</li> <li>• Identifying mutually compatible co-benefits which will enhance livelihoods and human wellbeing.</li> <li>• Integrating climate change mitigation and adaptation opportunities with wider wetland restoration ambitions across the CMR.</li> <li>• Seeking innovative funding opportunities through engaging with NGOs, civil society and the private sector.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Successful mitigation of climate change through, for instance, increased storage and sequestration of carbon in restored wetlands.</li> <li>• Successful adaptation to climate change through, for instance, reduced temperatures associated with restored wetlands.</li> </ul>

## Strategic Objective 4 Engage

Participatory approaches must be implemented to engage with diverse stakeholders in order to recognise values and to promote wise use.

117. Involvement of local people in wetland management is embraced by the general resource management approach known as 'participatory management'. Terms such as collaborative, joint, community-based or co-management are more or less synonymous with participatory management. Wetland stakeholders can be considered as the bearers of separate interests and/or contributions for the management of a wetland, with a particular focus on interest groups within local communities. These may be individuals, formal or constituted local groups, such as farming cooperatives, larger civil society organisations or established non-governmental organisations. Likewise, the various government institutions and agencies responsible for wetland management and local authorities should also be considered as stakeholders. In addition, the private sector actors should also be thought of as stakeholders.
118. The term community, as considered within the WMS, can be understood at two levels. On the one level it represents a more or less homogenous group that is most often defined by geographical location (e.g., a village adjacent to a particular wetland), but possibly by ethnicity. At this level, the community may have very distinct interests compared with other major stakeholders such as government agencies, private businesses and NGOs. On another level, it can represent an ostensibly disparate collection of different interest groups such as women and men, young and old, livestock grazers and rice farmers, wealthy and poor people, and different religious groups. Even in some of the relatively unified communities around the wetlands of Colombo, it has been shown that these sub-groups can possess different interests and perspectives on the wetlands that need to be taken into account in the participatory management process (Technical Report 06).
119. Participatory approaches to wetland management are completely compatible with the programme adopted by the Ramsar Convention which aims to have people taking action for the wise use of wetlands. The Ramsar Convention 'communication, education, participation and awareness (CEPA) programme formally embraces participatory approaches as way to deliver wise use and to promote the value of wetlands. Therefore the implementation of participatory approaches which genuinely engage with local stakeholders will also assist Sri Lanka deliver on strategic objectives under the Ramsar Convention.

## INITIATIVE 4.1

### ***ENGAGING WITH LOCAL COMMUNITIES AND STAKEHOLDERS***

120. **PREAMBLE:**Currently, different stakeholders hold different perspectives on the values and importance of the wetlands in the CMR (Technical Report 06). There is also evidence that community participation and consultation has traditionally been poor with regard to decision-

making on wetlands within the CMR (Technical Report 01). In order to facilitate wise use and to ensure that the benefits that are provided by the wetlands are maintained, and wherever possible enhanced, and that the rights of citizens to receive these benefits are protected, it is necessary to engage fully with local communities and stakeholders.

121. Engagement should be with all forms of the community, as described above, including governmental and non-governmental institutions, private sector interests, and the communities and households living around the wetlands. Engagement should also extend to wider stakeholders including to the higher reaches of the national government to ensure that ministers understand fully the implications of continued wetland loss and degradation on the future sustainability of Colombo as a hub of economic prosperity.
122. A range of best practice approaches can be applied for engagement, depending on the circumstance and the stakeholder. The actual technique for engagement or the audience to be engaged, are subordinate to the concept that engagement is a prerequisite for the implementation of the WMS to be successful.

<b>Activities</b>	In order to engage with local communities and stakeholders the following activities will be required: <ul style="list-style-type: none"> <li>• Identification of local stakeholders as appropriate.</li> <li>• A commitment to engage through genuinely inclusive and participatory approaches.</li> <li>• The creation of appropriate governance structures which facilitate and encourage stakeholder engagement.</li> <li>• Active programmes of engagement and the development of a proactive and reactive network of engaged stakeholders.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Empowered local communities that assist decision makers in taking action for the wise use of wetlands.</li> <li>• Benefits enjoyed by local stakeholders are secured and wherever possible enhanced through inclusive decision-making.</li> </ul>

## INITIATIVE 4.2

### **IMPLEMENTING A COMMUNICATIONS PLAN**

123. **PREAMBLE:** The development of the WMS is only one step in a larger process. The overall WMS and the Goal and Strategic Objectives need to be communicated to a diverse set of audiences and feedback is required from those audiences as part of an on-going implementation and impact assessment programme. Initial elements of a communication plan are elaborated here, however, a final plan needs to have the ownership of the institutions, stakeholders and individuals responsible for the implementation of the WMS.
124. Any communications plan needs to identify the key messages, the target audiences, the appropriate media through which communication is to be achieved and how the success of the communication can be monitored. Through the development of the WMS, the following non-exhaustive potential target audiences within Colombo have been identified:

- Politicians.
- Academic bodies.
- Governmental institutions.
- Non-governmental institutions and civil society groups.
- Urban planners.
- Farmers.
- Residents.

125. Within each of these broad groups there are many specific audiences. For instance, academic institutions embrace kindergartens, primary and secondary schools as well as further education establishments such as colleges and universities. Within these academic institutions there will be specific audiences such as research academics, teachers and students. Even within these specific audiences, such as undergraduate or post-graduate students in different faculties such as social sciences or natural sciences. The audience will therefore depend on the objective of the communication and the desired outcome.
126. The specific messages need to be targeted at the particular audience and also on the desired outcome. Outcomes may be nested insofar that a key outcome of the communications plan should be to increase overall awareness of the presence of the WMS. But whilst raising awareness is of value, there may be particular nuances that are required such as raising awareness of how a local community or an individual stakeholder can get involved in the implementation of the WMS through monitoring programmes, management activities or collaboration in more strategic decision-making.
127. Potential key high-level messages to be communicated could include, but not be limited to, the following:
- There is a wetland management strategy for the wetlands of the Colombo Metropolitan Region.
  - How to get involved in the wetland management strategy.
  - The importance of the wetland management strategy for human wellbeing.
  - The importance of the wetland management strategy for wildlife.
  - Why you should get involved in the implementation of the wetland management strategy.
128. Additional, more nuanced messages would need to be developed for specific audiences. For instances, for secondary school children and their teachers, the following messages might be used:
- How to integrate wetlands into elements of the school curriculum.
  - Schools, wetlands and the role of citizen science in monitoring and managing wetlands.
  - How can wetlands improve your school environment.
  - Why wetlands in the Colombo Metropolitan Region are important.
129. Once audiences and messages have been defined, it is necessary to consider the range of media to be used to communicate. For certain audiences, such as government institutions, conventional reports or presentations might be adequate. However, for some audiences, for instance where levels of literacy may be relatively poor more innovative methods of communication will be required. These could include radio broadcasts, television programmes, street theatre presentations or cartoon murals on public walls near the wetlands. Following are examples of tools or media that could be considered within the communications plan:
- Promotional leaflets, either on the entire WMS or on key aspects or elements.
  - Website as a way of telling stories but also a way to upload and capture information.
  - Newspaper, magazine or journal articles on specific wetland stories.

- Social media to allow communication of real-time activities such as pollution incidents or celebratory events.
- Specialist conferences on aspects of the strategy, for instance on sustainable rice cultivation practices or on natural history aspects.
- Public meetings to discuss wetland benefits and threats.
- Wetland trails through specific sites, such as the Biodiversity Park, which explain both local wetland and the context of the WMS.
- Specific events, such as World Wetlands Day which is celebrated on the 2<sup>nd</sup> February every year to commemorate the original signing of the Ramsar Convention in 1971.
- Television and radio programmes, either as one-off events or as part of a regular communication activity.
- Street theatre events highlighting a specific issue such as the negative implications of dumping of solid waste in the wetlands.
- Positive branding opportunities for wetland products, such as organic rice varieties, ornamental flowers or natural medicines.

130. It is essential that the success of the communication plan is monitored and evaluated. Steps must be put in place to understand how different audiences have received information and whether the desired outcomes have been achieved. Monitoring and evaluation data need to be interpreted in order to modify either the audiences, messages all media being used to ensure the long-term effectiveness of the communications plan.

<b>Activities</b>	<p>The generic information provided above needs to be shaped into a specific communications plan in order to be implemented.</p> <ul style="list-style-type: none"> <li>• Produce a high level policy brief that highlights the key values of the wetlands.</li> <li>• Define the specific audiences.</li> <li>• Match the specific message from the policy brief to these audiences.</li> <li>• Identify the most effective media through which audiences can be reached.</li> <li>• Synthesise the above into a coordinated and robust communications plan.</li> <li>• Implement the communications plan.</li> <li>• Monitor and evaluate the success of the plan and, where necessary, modify elements of it to ensure ongoing success is achieved.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Awareness of the WMS is raised significantly and widely across the CMR.</li> <li>• Specific actions or activities within the overall scope of the WMS are clearly and successfully communicated.</li> </ul>

## INITIATIVE 4.3

### PROMOTING COLOMBO'S WETLANDS

- 131. PREAMBLE:** Colombo is a unique wetland city. The development and implementation of a fully integrated wetland management strategy is a significant achievement, especially for a city in Asia. There is the opportunity to promote the wetlands of Colombo and the WMS as a global exemplar of best practice in the wise use of wetlands. This promotion should seek to influence audiences beyond Colombo and Sri Lanka.
132. One of the key tenets of the Ramsar Convention is international cooperation. The successful development and implementation of the WMS should be promoted widely across Asia with a view to not just celebrating success but also to provide a learning and knowledge exchange platform so that other towns and cities across the region can benefit from the lessons learnt in Colombo. This would establish Colombo as a global leader in the wise use of urban and peri-urban wetlands and the development of an inclusive and sustainable wetland management strategy.
133. Opportunities also exist to promote the success of the WMS not just to other wetland practitioners and managers but also as an element in the development of Colombo as an important wetland tourism destination. The network of wetlands integrated within, and dispersed across, an exciting and vibrant city provides fundamental blue and green infrastructure which can be sustainably exploited for tourism. Positive marketing and branding opportunities should be pursued with a view to promoting Colombo as Asia's wetland city. A potential range of tourism activities could be established and integrated into a tourism masterplan which not only assisted in the wise use of the wetlands but also created opportunities to enhance livelihoods and wellbeing amongst local communities. The following represent some examples of activities and elements which could be incorporated into a wetland tourism masterplan:
- The development of low-carbon water-based transport which provides tourists with an immersive experience within the wetlands.
  - The creation of guided day trips into Colombo to wetland jungles.
  - Night time safaris to view exotic wetland wildlife such as fishing cats.
  - Cultural tours of the ancient wetlands of pre-Portuguese era Colombo.
  - Religious tours which promote the link between Buddhism and wetlands.
  - Wetlands specific cultural events.
  - The development of Colombo wetland branded products.
134. The tourism potential could be developed to raise the overall awareness of Colombo's wetlands both within and beyond the city but also to generate training and employment opportunities for the local communities and a sustainable source of income and economic prosperity for the city. There are also opportunities to link with the private sector under their corporate social responsibility agendas and especially with regard to hotels and other private interests already active within the tourism sector. There are also opportunities to link the tourism potential of the city and its wetlands with the Sri Lanka Business and Biodiversity Platform to demonstrate further the potential of Colombo as sustainable wetland city.
135. Resolution XII.10 on Wetland City Accreditation of the Ramsar Convention was adopted at the twelfth meeting of the Conference of the Parties (COP12) in June 2012. This resolution responded to a desire for the Ramsar convention to pursue positive branding opportunities within the urban environment. Resolution XII.10 offers the opportunity for cities to become accredited as a Wetland City if they successfully meet the specified criteria. The potential therefore exists in time for Colombo to consider pursuing this accreditation. If ultimately successful in achieving accreditation this would bring positive branding opportunities for the wetlands of Colombo.

<b>Activities</b>	<p>In order to promote Colombo's wetlands widely, the following activities will need to be undertaken</p> <ul style="list-style-type: none"> <li>• The development and coordination of a learning and knowledge exchange network which extends across the region in order to share best practice in the planning and management of the urban and peri-urban wetlands.</li> <li>• Hosting the specific urban wetland management training courses, workshops, conferences, etc.</li> <li>• Developing an integrated wetland-related tourism masterplan.</li> <li>• Implementing elements of the wetland-related tourism the masterplan.</li> <li>• Development of the necessary information and eight are required for pursuing Wetland City accreditation</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Enhanced international cooperation with regard to wetlands.</li> <li>• Increased tourism numbers and economic impact for Colombo.</li> <li>• Colombo recognized globally as a leader in the planning and management of urban and peri-urban wetlands.</li> </ul>

## Govern Strategic Legal instruments and management Objective institutions must be fit for purpose and 5 fully engaged in the integrated delivery of the WMS.

136. Ultimately the success, or otherwise, of the WMS will come down to the political will supporting it and the ability of institutional cooperation to ensure successful implementation across all of its integrated Strategic Objectives. The WMS should be considered as the sum of its parts and not as isolated projects or elements which can be implemented through a piecemeal approach. For the WMS to genuinely deliver the wise use of wetlands across the CMR, and sustainably support and enhance social and economic prosperity, will require the comprehensive implementation of all of its components.

137. Historically, integration across horizontal levels of government, between governmental departments and across governmental, non governmental and private sectors has been poor within the CMR (Technical Report 01). While isolated examples of good practice do exist in Colombo, the current institutional framework, backed up by complex jurisdictional mandates and overlapping and potentially contradictory legal statutes, undermine the delivery of the wise use of wetlands. Additionally, ambiguities currently exist with regard to different types of wetlands, the legal status and the degree of protection they are afforded. The primary

roles of the WMS are to develop a governance structure which addresses historical failings, a legal mandate which harmonises existing legislation and regulation and a definition of wetlands that is compatible with national standards and implementable within the context of the CMR.

138. The successful delivery of the WMS will also depend on putting in place the appropriate individual skills and institutional capacities. There resides within the diversity of government, non-governmental, academic and civil society organizations and individuals a considerable breadth of knowledge and experience in wetland management. This extensive knowledge base needs to be leveraged to ensure that all elements of the WNS can be successfully delivered. Where there are potential knowledge gaps or capacity issues these also need to be addressed. Within this it is essential that succession all planning and long-term objectives are considered rather than only addressing short term training needs.
139. For the WMS to be successfully implemented will require monitoring and evaluation. It is considered essential that the WMS is time bound and not conceived as an open-ended commitment. Key outcomes will need to be achieved and the success of meeting the Strategic Objectives and the overall Goal should be measured against these. The WMS should be reviewed on a regular and timely basis and future iterations should evolve in order to address changing demands and objectives within the sustainable development of Colombo.

## INITIATIVE 5.1

### ***DEVELOPING INSTITUTIONAL CAPACITIES***

140. **PREAMBLE:**A variety of institutions, including governmental and non-governmental, have a role and responsibilitywithin wetland management in Colombo. Given the on-going loss and degradation of wetlands, it is clear that the lack of clarity and synergies are not delivering wise use. Furthermore, the breadth of ambition and objectives presented within the WMS are currently far broader than any one institutional mandate and subsequently would be problematic for an existing body to take forward unilaterally. Therefore the establishment of a new multidisciplinarybody, which canimprove horizontal integration and cooperation across government institutions but which can be participatory with regard to local communities and wider stakeholders, is proposed. The key role of this new body would be the translation of knowledge into practiceand implementation.
141. It is also important to work within the existing institutional frameworks and to integrate these within any new body. Therefore, the responsibility for the implementation, monitoring, evaluation and future of the WMS should rest within a legally constituted subcommittee of the National Wetland Steering Committee (NWSC). The NWSC should act as the governing body overseeing the subcommittee. This subcommittee is referred to herein as the Colombo Wetland Management Strategy (CWMS) subcommittee.
142. The role of the CWMS subcommittee is one of ensuring implementation rather than the necessarily directly delivering on the ground through practical or regulatory approaches. Delivery on the ground should be the responsible of a range of institutions, organisations and individuals. The subcommittee should ensure that its constituent parties and institutions are operating in a manner compatible with the overall Goal and Strategic Objectives of the WMS. The role of the subcommittee in regulation is covered under Initiative 5.2.
143. The CWMS subcommittee should comprise appropriate representatives from at least all of the following governmental organisations:
  - Ministry of Megapolis& Western Development

- Urban Development Authority
- Sri Lanka Land Reclamation and Development Corporation
- Wetland Management Division
- Metro Colombo Urban Development Project
- National Physical Planning Department
- Ministry of City Planning & Water Supply
- Ministry of Mahaweli Development and Environment
- Central Environmental Authority
- Department of Wildlife Conservation
- Board of Investment
- Ministry of Agriculture
- Ministry of Lands
- Ministry of Provincial Councils & Local Government
- Ministry of Defence
- Ministry of Industrial Development
- North Western Provincial Environmental Authority
- Ceylon Tourist Board
- Ministry of Fisheries
- National Aquatic Resources Agency
- Road Development Authority
- Natural Resources Energy and Science Authority
- National Chamber of Commerce
- Coast Conservation Department
- Department of Forest.

144. In addition to governmental institutions, it is essential that the CWMS subcommittee engages as equal partners with a variety of nongovernmental, private sector, civil society and the local community organizations. For instance, representatives from the following organisations should also be on the subcommittee:

- IUCN
- International Water Management Institute
- Environmental Foundation Limited
- Centre for Environmental Justice
- Universities
- Local resident and community groups
- Wetland management committees
- Village management committees
- Cooperative farming groups
- Private sector representatives.

145. The NWSC should have a role coordinating the composition and functioning of the subcommittee and addressing issues relating to conflicting mandates. The outcomes of the successful delivery of the WMS should be considered to be of national importance and therefore highly germane to the objectives and mandate of the NWSC. The NWSC also needs to ensure that the subcommittee has a clear institutional home and identity.

146. To deliver the WMS requires a collective desire across the government institutions and dedicated champions within each institution who are charged with the responsibility to translate the strategy document into genuine action on the ground. Such champions need to comprehend fully the overall Goal of the WMS and the need to better integrate the delivery of benefits and the maintenance and improvement of human wellbeing through the wise use of wetlands.

147. The CWMS subcommittee also needs a strong chair who can co-ordinate, facilitate and, where necessary, coerce collective action in order to deliver on the Goal and Strategic Objectives of the WMS. Such a chair could be drawn from one of the constituent organisations with an existing strong remit for delivering wetland wise use, such as Central Environmental Authority or the Department of Wildlife Conservation, or could be an independent person appointed by the subcommittee. The chair shall be responsible for working with the other members of the subcommittee to ensure that necessary training and capacity building requirements are identified and addressed. This will assist individual members and champions within institutions to understand fully the objectives of the WNS.
148. The financing of the CWMS subcommittee should be met through the budgets of the governmental organisations serving on the subcommittee. However, innovative opportunities to secure further funding through grant-giving agencies or public-private initiatives should also be considered.

<b>Activities</b>	<p>In order to establish clear institutional responsibilities and capacity to implement the WMS will require constituting a new Colombo Wetland Management Strategy (CWMS) subcommittee of the National Wetland Steering Committee (NWSC). This will involve the following activities:</p> <ul style="list-style-type: none"> <li>• Establish a legally constituted CWMS subcommittee under the NWSC with appropriate and robust terms of reference for the committee as well as for individual members.</li> <li>• Ensure appropriate composition for the subcommittee.</li> <li>• Appoint a chair for the subcommittee.</li> <li>• Establish and implement a schedule of operation for the subcommittee.</li> <li>• Set up early engagement meetings with the ‘Megapolis’ project.</li> <li>• Ensure full integration with the ‘Megapolis’ project.</li> <li>• Implement the WMS.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• The establishment of a fully functioning and operational CWMS subcommittee.</li> <li>• Implementation of the WMS.</li> </ul>

## INITIATIVE 5.2

### ***RESOLVING IMPLICATIONS FOR EXISTING REGULATIONS***

149. **PREAMBLE:** Currently, there are a variety of existing legal instruments which consider wetlands. For the implementation of the WMS to be successful will require two clear actions regarding existing regulation and legislation. Firstly, existing legislation already offers wetlands a degree of protection and can be used to uphold wise use and the pursuit of the Goal of the WMS. Therefore the priority is to ensure the existing legislation and regulation is implemented and enforced robustly and in the spirit of delivering the wise use of wetlands. Secondly, there are potential conflicts among the different legal instruments which need to be resolved for the WMS to be successfully implemented (Technical Report 01). For instance, the definition of wetland needs to be consistent across all legal instruments so that ambiguity surrounding what is a low land, barren or muddy land can be clearly understood and aligned across all legislation. This will require a process of harmonisation which should seek to remove potential ambiguities or contradictions and should work towards achieving a universally compatible regulatory framework regarding wetlands.
150. An essential role of the CWMS subcommittee will be to ensure that this regulatory enforcement and harmonisation process is successful. It should be borne in mind however, that on completion of the harmonisation process there may still be the need for additional legal powers or regulatory requirements to ensure that the Goal of the WMS is adequately implemented. Therefore, the need to develop further legislation and regulation should be an ongoing consideration of the CWMS subcommittee.
151. In order to prevent further wetland loss and degradation within the CMR there is a strong case to be made for legally demarcating and delineating the boundaries of existing wetlands, irrespective of their degree of degradation or their nature conservation value. As has been highlighted elsewhere in the WMS, all wetlands possess value and currently, or through a programme of restoration, provide essential natural capital which needs to be managed wisely to secure the future prosperity of the city. Establishing the where these wetlands currently exist is an obvious precursor for the protection.

<b>Activities</b>	<p>In order to resolve the implications for existing regulations and other legal instruments will require the following activities:</p> <ul style="list-style-type: none"><li>• Improved enforcement and regulation of existing legal instruments which contribute to the delivery of the wise use of wetlands.</li><li>• A review of existing legal instruments, regulations and policies in order to define the implications for harmonisation across these various statutes.</li><li>• Harmonisation of existing legal instruments, which may potentially require amendments to Acts to be formally adopted by the government.</li><li>• Demarcation and delineation of existing wetlands within the CMR as a basis for gazetting and future legal protection.</li></ul>
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<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• The removal of ambiguities, contradictions or perverse incentives regarding wetland wise use within the existing legal instruments.</li> <li>• Harmonised legal instruments which can secure wetland wise use.</li> </ul>
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## INITIATIVE 5.3

### ***IMPLEMENTING A MONITORING AND EVALUATION PLAN***

152. **PREAMBLE:** It is essential that the CWMS subcommittee is able to assess the success of implementing the WMS. The details of the activities highlighted within each of the Strategic Objectives need to be synthesised into an implementation plan. This plan should be prepared to provide a schedule of actions, resourcing requirements, responsibilities, priorities and timing.
153. The success of the implementation of the WMS needs to be assessed through the establishment and reporting back on indicators for each of the outcomes identified under the Strategic Objectives. These indicators should be considered as measures of progress which can assess both the delivery of activities and the achievement of outcomes. Ultimately, the monitoring and evaluation plan needs to assess how robust the strategy actually has been but also on whether the loss and degradation of wetlands across the CMR has been achieved.
154. The development of a monitoring and evaluation plan need not be undertaken in isolation. Synergies should be sought with other initiatives and monitoring frameworks to reduce resource burdens and to optimise collaborative opportunities.

<b>Activities</b>	In order to develop and implement a monitoring and evaluation plan and the following activities will be required: <ul style="list-style-type: none"> <li>• Synthesise all the activities under the strategic objectives into a consistent format.</li> <li>• Identify relevant indicators for each of the activities and outcomes.</li> <li>• Identify appropriate resourcing and responsibilities for each of the indicators and outcomes.</li> <li>• Establish an overall timetable for monitoring and evaluation.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Clear indicators are established for all activities and outcomes.</li> <li>• Robust implementation of all elements of the WMS has been achieved.</li> </ul>

## INITIATIVE 5.4

### ***REVIEWING, ADAPTING AND RENEWING***

155. **PREAMBLE:** The WMS should not be considered as an open ended commitment. Similarly, the intelligence embedded within the WNS should not be considered as absolute and the needs to be recognised that it is important to review, adapt and renew elements of the knowledge on a regular basis.
156. It is essential that the WMS is time bound so that progress can be reported upon and modifications, adaptations and improvements can be included in subsequent iterations. Reviews with regard to implementation of activities and outcomes should initially be undertaken on a regular biennial basis. However the overall WMS should be subject to a comprehensive review in 2026 to allow for the consideration of new and updated

information. Following this initial 10 year review cycle, it is recommended that the biannual implementation review is increased to a five yearly review process in order to incorporate additional information and data as well as to address possible legislative and policy developments.

<b>Activities</b>	In order to ensure that the WMS is still relevant and inclusive of current knowledge and best practice the following activities will need to be undertaken: <ul style="list-style-type: none"> <li>• Initiate a bi annual review of the overall WMS .</li> <li>• Establish a robust review process in 2026 which seeks to learn from the experience encountered over the first 10 years and to renew and adapt the WMS based on current best practice as well as possible legislative and policy developments.</li> <li>• Implements and ongoing the five yearly review process commencing in 2031.</li> </ul>
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• The viability of the WMS in achieving its objectives is ensured.</li> <li>• Progress and developments in wetland science, knowledge, policy and legal developments are routinely embedded within the WM S in order to secure wetland wise use.</li> </ul>

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## **6 APPENDICES**

### **6.1 APPENDIX 1 \_ CHARACTERISATION OF THE WETLANDS OF THE CMR**

## **Appendix 1\_ Characterisation of the wetlands of the Colombo Metropolitan Region**

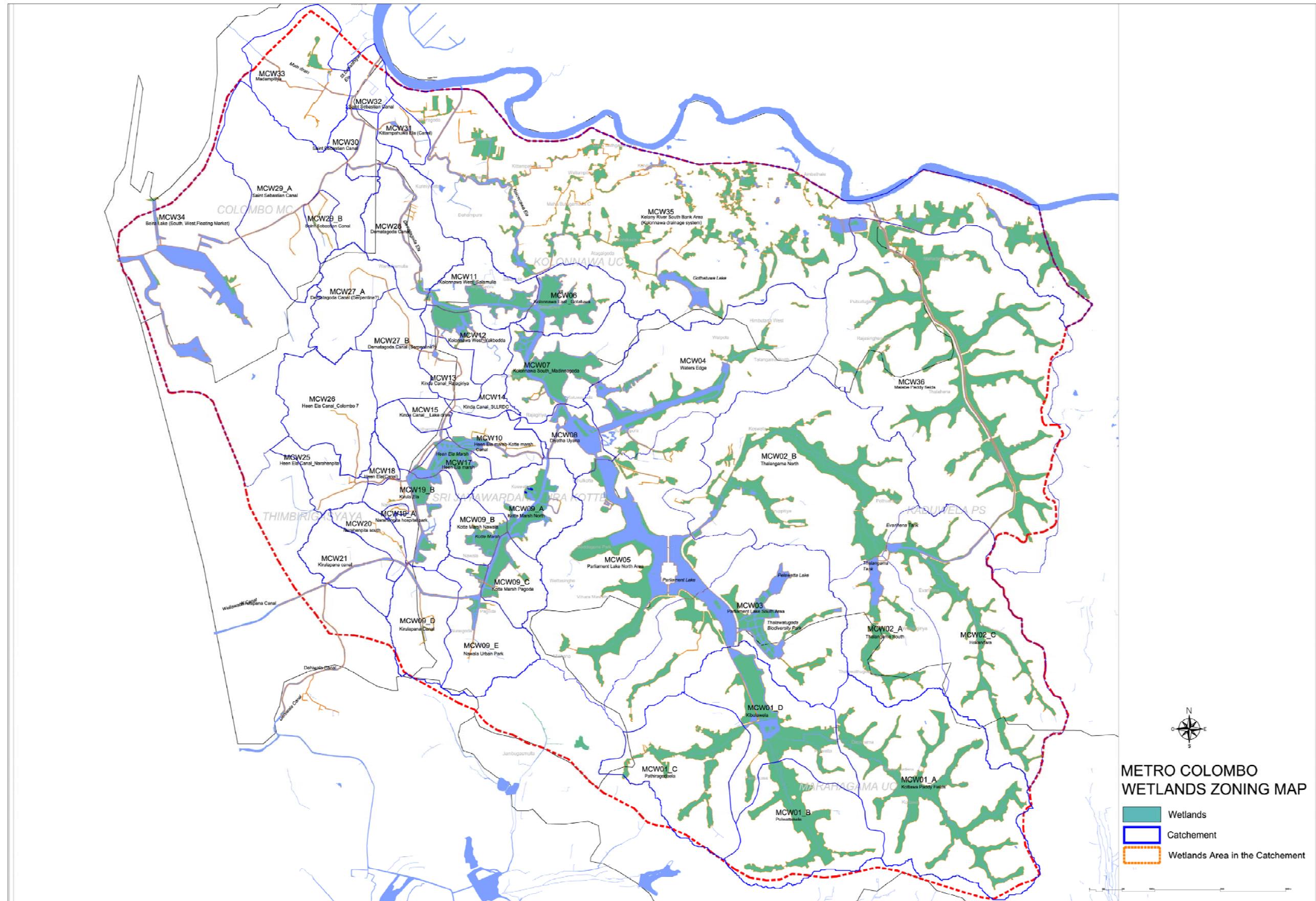
### **Introduction**

157. Many different wetland types and areas are present across the Colombo Metropolitan Region (CMR). The wetlands reflect differences in hydrology, land use and management, soils, topography and human influence. In order to better manage the wetlands it is important to identify the wetlands and to understand their various environmental and anthropogenic controls. The table presented in this Appendix summarises a range of information for all the wetlands within the CMR as an aid to supporting future decision-making. However, it should be noted that this information represents an overview of each wetland. Any future decision-making should use this information as a starting point for considering impacts or changes in the ecological character of the wetland and seek to also include new data derived from *inter alia* site investigations, modelling and consultation.

### **Characterisation categories**

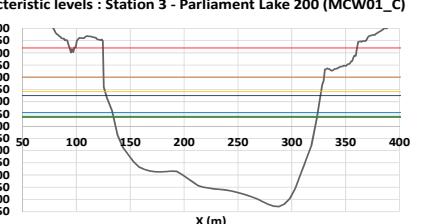
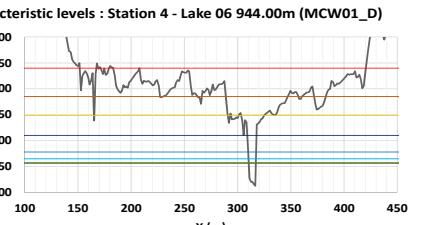
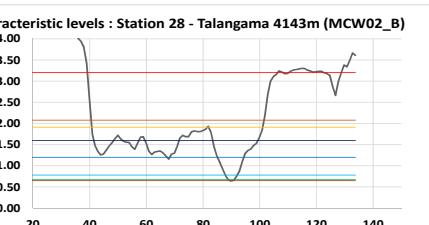
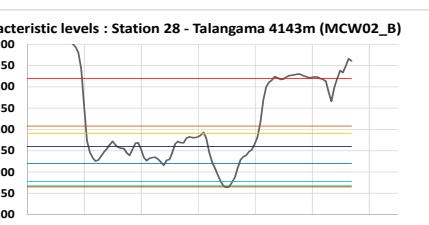
The following categories are used in the characterisation table:

<b>Category</b>	<b>Description</b>
Number	An identifying number for each separate wetland area based on the hydrological catchment number.
Area	Area of the wetland in hectares.
Name	Name of the wetland area.
Local Authority	Local authority, or authorities, in which the wetland is situated.
Hydrological characteristics	Description of the type of flow regime, the influence of the tide and, where data exists, the water level profile throughout a representative cross section of the wetland.
Ecological status	Water quality within wetland as expressed in terms of the ecological status (very good, good, medium, bad, very bad) based on categories used in the European Union's Water Framework Directive.
Bathing and recreation	Water quality within wetland as expressed in terms of the risk to human health from bathing or undertaking recreation in the wetland (from low risk - very good, good, medium, bad, very bad – to high risk).
Soil organic matter	Amount of soil carbon stored as organic material in the wetland soil.
Habitat type	Type of habitats present based on the classification presented in the Wetland Management Strategy.
Key features of interest	Key features of biodiversity or nature conservation interest.
Possible Development	Possible activities which could be considered for future development in the wetland which could have low levels of impact on the ecological character of the area. However, any development should be subject to a detailed assessment of the potential impacts upon the ecological character of the wetland.

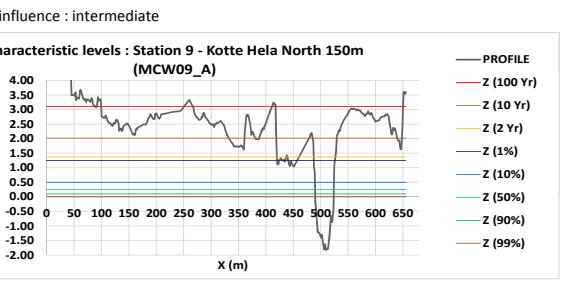
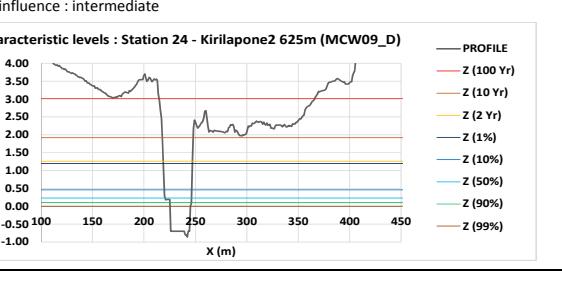
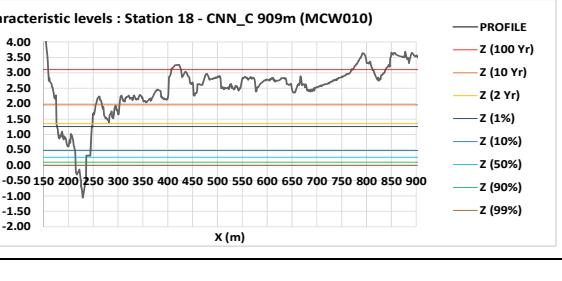
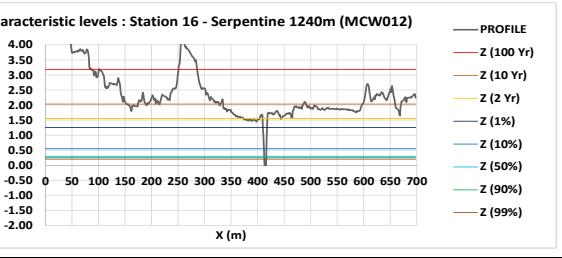


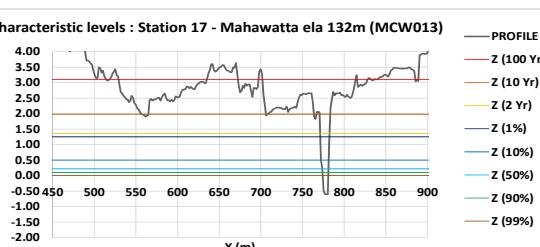
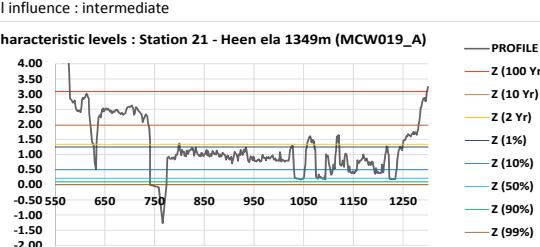
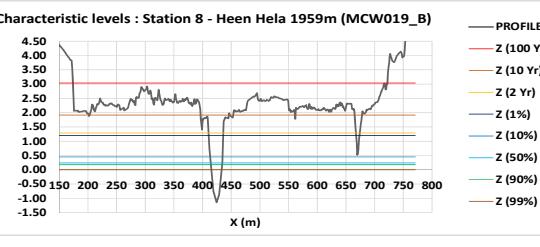
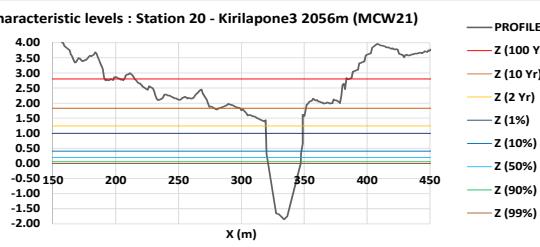
## FINAL REPORT\_COLOMBO WETLAND MANAGEMENT STRATEGY

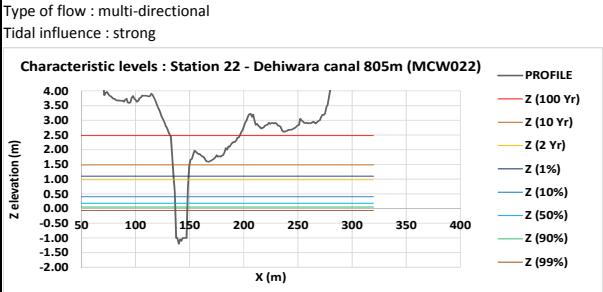
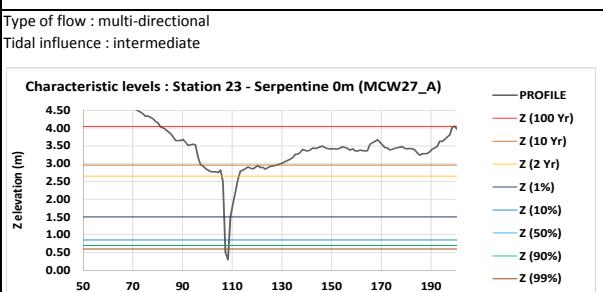
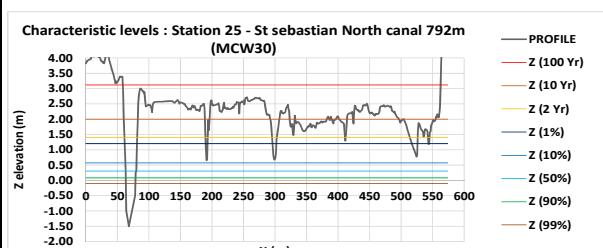
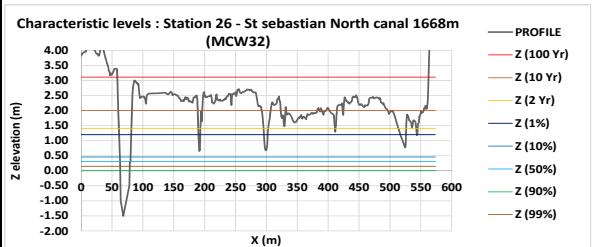
Metro Colombo Urban Development Project - Consultancy Services for the Preparation of Management Strategy for Wetlands and Carrying out an Assessment of Water Quality in the Inland Waterways and Lakes within Metro Colombo Area

Number	Area Ha	Name	Local Authority	Hydrological characteristics	Ecological status	Bathing and recreation	Aqua culture	Soils	Organic matter	Habitat type	Key features of interest_flora	Key features of interest_fauna	Possible Development
MCW01A	134,55	Kottawa Paddy fields (Depanawa)	Maharagama UC	Type of flow : mono-directional Tidal influence : no influence	1					Herb dominant low vegetation, Paddy fields			Eco tourisme, Urban Agriculture
MCW01B	69,90	Polwattekele (Polwatta Rd)	Maharagama UC	Type of flow : mono-directional Tidal influence : no influence	Data gaps	Data gaps				Herb dominant low vegetation, Open water, Paddy fields			Eco tourisme, Urban Agriculture
MCW01C	46,08	Pathiragodaela (Dambahena)	Maharagama UC	Type of flow : mono-directional Tidal influence : no influence  Characteristic levels : Station 3 - Parliament Lake 200 (MCW01_C) 	2					Herb dominant low vegetation, Open water, Paddy fields			Eco tourisme, Urban Agriculture
MCW01D	95,23	Kibulawela	Maharagama UC	Type of flow : mono-directional Tidal influence : no influence  Characteristic levels : Station 4 - Lake 06 944.00m (MCW01_D) 	3					Herb dominant low vegetation, Open water, Highland vegetation associated with wetlands, Paddy fields	Aponogeton crispus (Kekatiya)	Aplocheilus dayi Rasborides atukorali Gerarda prevostianus Semnopithecus vetulus	Recreational, Urban Agriculture
MCW02A	457,71	Talangama South (Talangama Lake)	Kaduwela PS	Type of flow : mono-directional Tidal influence : no influence  Characteristic levels : Station 28 - Talangama 4143m (MCW02_B) 	29					Open water, Annona Woodlands, Herb dominated Low Vegetation, Highland vegetation associated with wetlands, Paddy Fields	Areca concinna (Lenteri Puwak ) Aponogeton crispus (Kekatiya)	Libellago adami Aulopoma itieri Aplocheilus dayi Rasborides atukorali Duttaphrynus scaber Semnopithecus vetulus Prionailurus viverrinus Lutra lutra	Eco tourisme, Urban Agriculture
MCW02B	134,25	Talangama North_Akuregoda	Kaduwela PS	Type of flow : mono-directional Tidal influence : no influence  Characteristic levels : Station 28 - Talangama 4143m (MCW02_B) 	28					Open water, Highland vegetation associated with wetlands, Paddy fields	Aponogeton crispus (Kekatiya)		Eco tourisme, Urban Agriculture

MCW02C	96,05	Evarihena (Evarihena Tank; Madiwela East canal)	Kaduwela PS	Type of flow : mono-directional Tidal influence : no influence  	30				Paddy fields	Aganope heptaphylla Hypolytrum nemorum, Cinnamomum zeylanicum (Kurundu) and Areca concinna (Lenteri Puwak) Aponogeton crispus (Kekatiya)		Eco tourisme, Urban Agriculture
MCW03	103,91	Parliament Lake South (Diyawanna Oya; Thalawatugoda marsh)	Kaduwela PS Maharagama UC	Type of flow : mono-directional Tidal influence : no influence  	4-6-7				Annona woodlands, Mixed woodlands, Herb dominant low vegetation, Open water, Highland vegetation associated with wetlands	Cinnamomum zeylanicum (Kurundu) Aponogeton crispus (Kekatiya)	Aulopoma itieri Aplocheilus dayi Scabrina brounae Zakerana greenii Semnopithecus vetulus Prionailurus viverrinus Lutra lutra	Biodiversity observatory
MCW04	73,84	Waters Edge (Diyawanna Oya)	Kaduwela PS	Type of flow : multi-directional Tidal influence : intermediate	Data gaps	Data gaps			Mixed woodlands, Open water			Recreation
MCW05	167,49	Parliament Lake North (Diyawanna Oya; Beddagana marsh)	Kaduwela PS Sri Jayawardanapura Kotte Maharagama UC	Type of flow : mono-directional Tidal influence : no influence	5				Annona woodlands, Herb dominant low vegetation, Open water, Highland vegetation associated with wetlands, Annona woodlands,	Aponogeton crispus (Kekatiya) Aganope heptaphylla Hypolytrum nemorum, Cinnamomum zeylanicum (Kurundu) Garcinia terpnophylla Areca concinna (Lenteri Puwak) Quassia indica (Samadara) Nymphaea nouchali Mantel Aponogeton crispus (Kekatiya)	Onychargia atrocyana Deudorix epijarbas Ideopsis similis Aulopoma itieri Japonia vesca Scabrina brounae Glossula ceylanica Aplocheilus dayi Rasborides atukorali Semnopithecus vetulus Prionailurus viverrinus Prionailurus rubiginosus Lutra lutra	Biodiversity observatory
MCW06	45,84	Kolonnawa East _Gotatuwa	COLOMBO MC	  	10				Mixed woodlands, Herb dominant high vegetation, Open water, Highland vegetation associated with wetlands	Aganope heptaphylla Hypolytrum nemorum, Cinnamomum zeylanicum (Kurundu) and Areca concinna (Lenteri Puwak) Quassia indica (Samadara)	Onychargia atrocyana Ideopsis similis Semnopithecus vetulus Prionailurus viverrinus	Biodiversity observatory
MCW07	66,05	Kolonnawa South_Madinanagoda	Kolonnawa UC Kaduwela PS Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate  	11				Mixed Woodlands, Herb dominant high vegetation, Canals, Highland vegetation associated with wetlands	Aganope heptaphylla Hypolytrum nemorum, Cinnamomum zeylanicum (Kurundu) and Areca concinna (Lenteri Puwak) Quassia indica (Samadara)	Aulopoma itieri Glossula ceylanica Aplocheilus dayi Prionailurus viverrinus	Biodiversity observatory

MCW08	30,14	Diyatha Uyana	Kaduwela PS Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate	9				Annona woodlands, Herb dominant low vegetation, Open water, Highland vegetation associated with wetlands	Aponogeton crispus (Kekatiya)	Onychargia atrocyana Scabrina brounae Aplocheilus dayi Crocodylus porosus Semnopithecus vetulus Prionailurus viverrinus	Tourisme Recreation
MCW09A	36,06	Kotte Marsh North	Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate  Characteristic levels : Station 9 - Kotte Hela North 150m (MCW09_A) 	H3				Annona woodlands, Herb dominant low vegetation, Open water, Highland vegetation associated with wetlands	Cinnamomum zeylanicum (Kurundu)	Onychargia atrocyana Ideopsis similis Semnopithecus vetulus Prionailurus viverrinus	Biodiversity observatory
MCW09B	16,73	Kotte Marsh Nawala	Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate	Data gaps	Data gaps			Annona woodlands, Herb dominant low vegetation, Open water, Highland vegetation associated with wetlands		Onychargia atrocyana Ideopsis similis Semnopithecus vetulus Prionailurus viverrinus	Biodiversity observatory
MCW09C	21,83	Kotte Marsh Pagoda	Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate	Data gaps	Data gaps			Annona woodlands, Herb dominant low vegetation, Open water, Highland vegetation associated with wetlands		Onychargia atrocyana Ideopsis similis Semnopithecus vetulus Prionailurus viverrinus	Biodiversity observatory
MCW09D	4,53	Kirulapana Canal	Sri Jayawardanapura Kotte THIMBIRIGASAYA	Type of flow : multi-directional Tidal influence : intermediate  Characteristic levels : Station 24 - Kirilapone2 625m (MCW09_D) 	24				Open water, Highland vegetation associated with wetlands			Pedestrian city walkway
MCW09E	12,71	Kotte Marsh Urban Park (Nugegoda)	Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate	19				Mixed woodlands, Herb dominant high and low vegetation, Open water, Highland vegetation associated with wetlands		Onychargia atrocyana Ideopsis similis Semnopithecus vetulus Prionailurus viverrinus	improve water quality
MCW10	11,57	Welikada Canal (Heen Ela-Kotte marsh connexion)	Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate  Characteristic levels : Station 18 - CNN_C 909m (MCW010) 	18				Annona woodlands, Herb dominant low vegetation, Open water, Highland vegetation associated with wetlands			Urban Park
MCW11	34,21	Kolonnawa West_Salamulla	Kolonnawa UC	Type of flow : multi-directional Tidal influence : intermediate	Data gaps	Data gaps			Mixed woodlands, Herb dominant high vegetation, Open water, Highland vegetation associated with wetlands	Aganope heptaphylla Hypolytrum nemorum, Cinnamomum zeylanicum (Kurundu) and Areca concinna (Lenteri Puwak)	Aulopoma itieri Glessula ceylanica Aplocheilus dayi Prionailurus viverrinus	Biodiversity observatory
MCW12	20,89	Kolonnawa West_Yakbedda	Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate  Characteristic levels : Station 16 - Serpentine 1240m (MCW012) 	Data gaps	Data gaps			Mixed woodlands, Herb dominant high vegetation, Open water, Highland vegetation associated with wetlands	Aganope heptaphylla Hypolytrum nemorum, Cinnamomum zeylanicum (Kurundu) and Areca concinna (Lenteri Puwak) Quassia indica ( Samadara)	Aulopoma itieri Glessula ceylanica Aplocheilus dayi Prionailurus viverrinus	Biodiversity observatory

MCW13	2,58	Mahawatta	Sri Jayawardanapura Kotte THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : intermediate  Characteristic levels : Station 17 - Mahawatta ela 132m (MCW013)  Z elevation (m) X (m)	15			Canal			Development of walking paths
MCW14	1,70	Kinda Canal_SLLRDC	Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate	17			Canal			Development of walking paths
MCW15	6,67	Kinda Canal__Lake drive	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : intermediate	Data gaps	Data gaps		Canal			Development of walking paths
MCW17	31,36	Heen Ela marsh	Sri Jayawardanapura Kotte	Type of flow : multi-directional Tidal influence : intermediate	21			Wetland Complex	Areca concinna ( Lenteri Puwak ) Aponogeton crispus ( Kekatiya ) Cinnamomum zeylanicum ( Kurundu )	Onychargia atrocyana Prionailurus viverrinus Lutra lutra	Development of walking paths
MCW18	1,84	Heen Ela (Canal)	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : intermediate	Data gaps	Data gaps		Canal			Development of walking paths
MCW19A	27,37	Narahenpita hospital park (Heen elा)	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : intermediate  Characteristic levels : Station 21 - Heen elा 1349m (MCW019_A)  Z elevation (m) X (m)	8			Canal			Urban Park
MCW19B	2,38	Narahenpita _Heen Ela_Circular Rd	Sri Jayawardanapura Kotte THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : intermediate  Characteristic levels : Station 8 - Heen Hela 1959m (MCW019_B)  Z elevation (m) X (m)	Data gaps	Data gaps		Canal		Onychargia atrocyana Prionailurus viverrinus Lutra lutra	Urban Park
MCW20	1,16	Narahenpita south	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : strong	Data gaps	Data gaps		Canal			Urban Park
MCW21	2,63	Kirulapana canal (Kirilapone)	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : strong  Characteristic levels : Station 20 - Kirilapone3 2056m (MCW21)  Z elevation (m) X (m)	20			Canal			Development of walking paths

MCW22	5,06	Dehiwala Canal	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : strong  Characteristic levels : Station 22 - Dehiwala canal 805m (MCW022) 	22				Canal				Development of walking paths
MCW24	1,92	Kirulapana Canal	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : strong	H5		Data gaps		Canal				Development of walking paths
MCW25	9,37	Heen Ela Canal_Narahenpita	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : strong		Data gaps	Data gaps		Canal				Development of walking paths
MCW26	9,82	Heen Ela Canal_Colombo 7	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : intermediate		Data gaps	Data gaps		Canal				Development of walking paths
MCW27A	6,70	Serpentine	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : intermediate  Characteristic levels : Station 23 - Serpentine 0m (MCW27_A) 	23				Canal				Development of walking paths
MCW27B	7,33	Dematagoda Canal	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : intermediate	16				Canal				Development of walking paths
MCW28	8,07	Dematagoda Canal	THIMBIRIGASYAYA Kolonnawa UC	Type of flow : multi-directional Tidal influence : strong	H12		Data gaps		Canal				Development of walking paths
MCW29A	3,58	Saint Sebastian Canal	THIMBIRIGASYAYA	Type of flow : multi-directional Tidal influence : strong	H25		Data gaps		Canal				Development of walking paths
MCW29B	1,95	Saint Sebastian Canal	COLOMBO MC	Type of flow : multi-directional Tidal influence : strong		Data gaps			Canal				Development of walking paths
MCW30	3,84	Saint Sebastian North Canal	COLOMBO MC	Type of flow : multi-directional Tidal influence : strong  Characteristic levels : Station 25 - St sebastian North canal 792m (MCW30) 	25				Canal				Development of walking paths
MCW31	2,43	Kittampahuwa Ela (Canal)	Kolonnawa UC	Type of flow : multi-directional Tidal influence : strong		Data gaps	Data gaps		Canal				Development of walking paths
MCW32	1,90	Saint Sebastian North Canal	COLOMBO MC Kolonnawa UC	Type of flow : multi-directional Tidal influence : strong  Characteristic levels : Station 26 - St sebastian North canal 1668m (MCW32) 	26				Canal				Development of walking paths
MCW33	7,27	Main Canal Area(Madampitiya)	COLOMBO MC	Type of flow : multi-directional Tidal influence : strong	27				Canal				??

MCW34	72,72	Beira Lake (South, West,Floating Market)	COLOMBO MC	Type of flow : mono-directional (exceptionally bi-directional during very high floods) Tidal influence : no influence due to the +1.8 MSL level maintained artificially	35-36-37-38-39-40				Open Water				Recreational and coling area
MCW35	267,91	Kelani River South Bank Area: Kolonnawa drainage system, Wellampitya pond; Kotikawata marsh; Ambathale marsh, Mulleriyawa Tank	Kolonnawa UC	Type of flow : mono-directional Tidal influence : weak to intermediate (presence of gated structures connected to the Kelani Ganga)	12-13-14-33-34				Open Water, Herb dominated Low Vegetation,	Aganope heptaphylla Hypolytrum nemorum, Cinnamomum zeylanicum (Kurundu) and Areca concinna (Lenteri Puwak) Ficus heterophylla Wal Ehetu Quassia indica ( Samadara) Aponogeton crispus (Kekatiya)	Onychargia atrocyana Ideopsis similis	Biodiversidy observatory,Eco tourisme,	
MCW36	266,59	Malabe and Mulleriyawa marshes , Madiwella East Diversion Canal	Kolonnawa UC Kaduwela PS	Type of flow : mono-directional Tidal influence : intermediate to strong (except in the more upstream part where there is no influence)	31-32				Herb dominated Low Vegetation, Open water, Highland vegetation associated with wetlands,Annona woodlands,Mixed Woodland, Paddy fields	Aganope heptaphylla Hypolytrum nemorum, Cinnamomum zeylanicum (Kurundu) and Areca concinna (Lenteri Puwak) Aponogeton crispus (Kekatiya)	Libellago adami Ceriagrion cerinorubellum Onychargia atrocyana Macrogomphus lankensis Aplocheilus dayi Rasborides atukorali Semnopithecus vetulus Prionailurus viverrinus Lutra lutra Ideopsis similis	Biodiversidy observatory,Eco tourisme,	



## **6.2 APPENDIX 2 \_ PRE-FEASIBILITY STUDIES FOR DEMONSTRATION SITES**

## Pre-feasibility studies on two wetland demonstration sites in the Colombo Metropolitan Region

### Introduction

The wetlands of Colombo Metropolitan Region (CMR) are currently under threat from a range of anthropogenic activities. Efforts need to be made to stem wetland loss and degradation. This appendix provides a pre-feasibility assessment for two important wetland areas within the CMR. The intention of this pre-feasibility study is to use these two sites as demonstration areas from which lessons can be transferred to other wetland areas within the CMR. The two areas considered are **Talangama Tank** area and **Kolonnawa Marsh**.

The pre-feasibility assessment outlines the current values of the sites, provides information on how to maintain these values, identifies potential added values which could be developed at the sites, and provides an outline of potential financing mechanisms which could be applied at these areas and equally at other wetland sites and across the CMR.

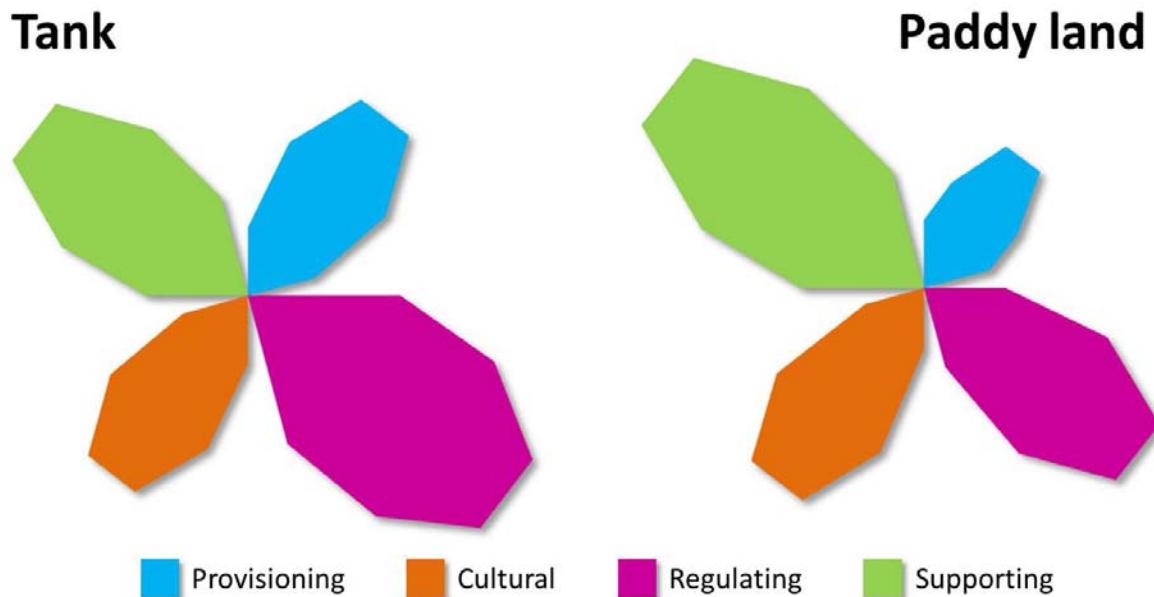
### Talangama Tank area

The Talangama Tank area represents a diverse complex of wetland habitats including areas of open water, with and without floating vegetation, mixed woodland and Annona woodland, tall herb communities and areas under paddy cultivation. Many of the open water areas have been subject to succession as sediment and vegetation has encroached into former open water habitats. The tanks are part of the traditional system of water management for irrigation that retain river runoff in order to support irrigation agriculture, and particularly the maintenance of rice production. Therefore the wetlands associated with this area of the CMR are part of an integrated system.

#### Current values

It is possible to divide the Talangama Tank area into the ‘upstream’ tank areas and the ‘downstream’ paddy lands. These distinct areas possess different values reflecting their different wetland habitats (Figure 1). For instance, the tank areas provide a greater range of supporting services, such as cleaning of polluted waters and the regulation of global climate through the accumulation of carbon-rich sediments. Similarly, the range of provisioning services are greater for the tanks, through the provision of water for agriculture, ornamental and genetic resources as well as providing food for the local community around the tank. Both parts of the wetland system deliver a similar range of cultural services. However, with the exception of soil formation, the paddy lands are more important for supporting services. This is interesting because the tank area is designated as a protected area under the Fauna and Flora Protection Ordinance and National Environment Act due to its high species diversity including 110 plant species and 174 faunal species (more than any other wetland site in CMR) of which 16 are endemic. However, of the 110 plant species 37 are exotics of which seven are invasive and degrading the value of the site. The area also forms part of wider complex of wetlands in the south east of Colombo. The Talangama-Malabe-Mulleriyawa complex is considered to support among the highest level of species diversity of any wetland in the CMR.

**Figure 1.** 'Petal diagram' demonstrating the relative value of different categories of ecosystem services provided by Talangama Tank and paddy lands.



### How to maintain the current values

The wetland complexes in the tank and paddy land areas are under threat from a range of activities including:

- Invasive species, including both floating aquatic plants such as and Annona woodland.
- Sedimentation and habitat change.
- Encroachment.
- Unregulated solid and liquid waste disposal.
- Change in agricultural land management.

In order to maintain the existing values provided by these wetlands a range of actions could be considered, including:

- Developing a detailed site management plan for the area.
- Increasing the level of protection through increased level of site designation.
- Establishing a wider protected network of wetland sites including the Talangama-Malabe-Mulleriyawa complex.
- Preventing further fragmentation of the existing wetland areas.
- Developing a site action plan for the management of invasive species. The removal of some invasive plant species, if undertaken in an uncontrolled manner, could potentially result in negative consequences to some species of conservation concern.
- Reducing impacts of herbicides, pesticides and nutrients associated with rice production.
- Reducing the amount of sediment entering the streams upstream of the tank in order to regulate sedimentation rates.
- Ensuring that all residents in the area have access to comprehensive solid waste disposal measures.

## Potential “added-value” activities

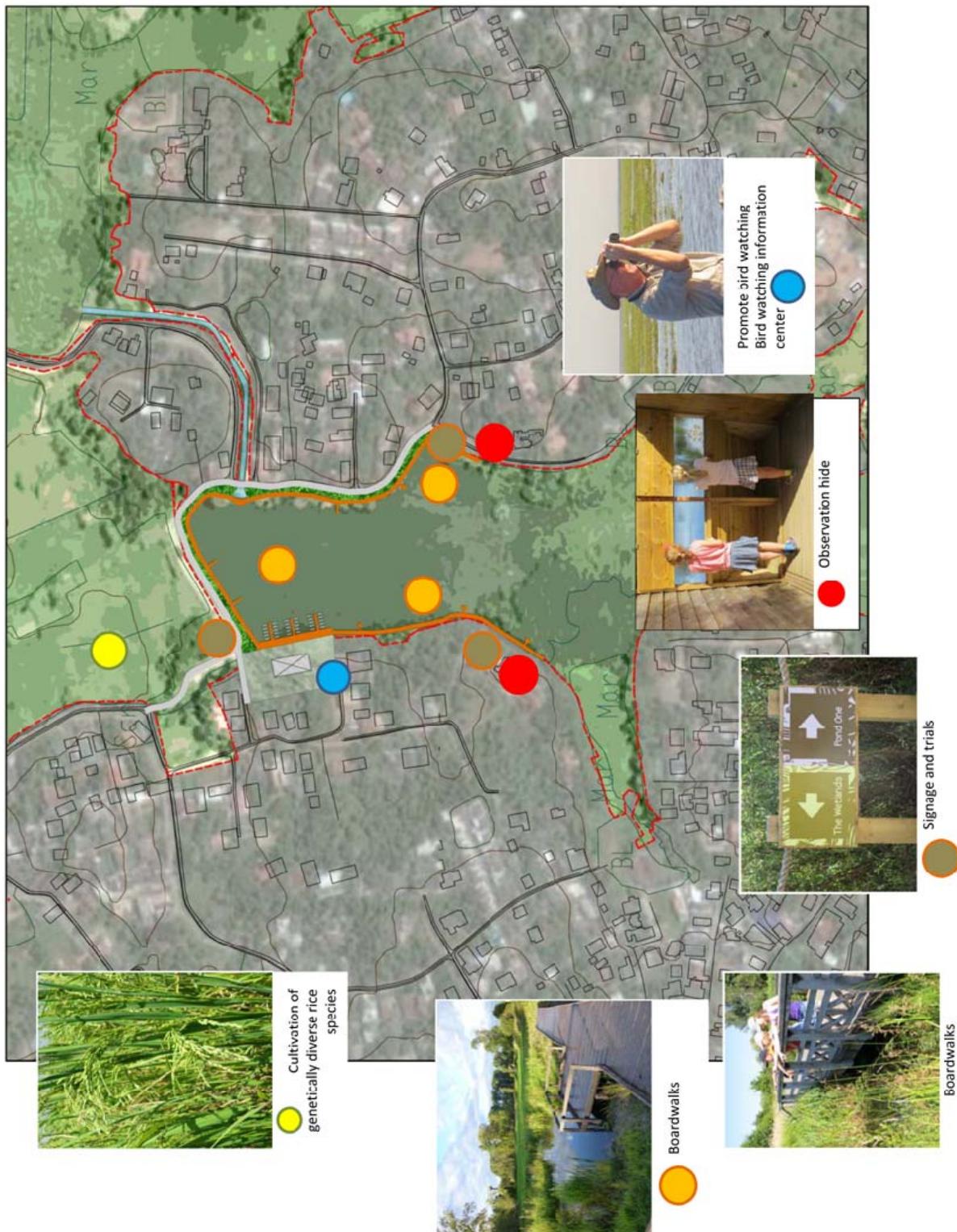
Whilst the priority should be to stop further wetland loss or degradation in the Talangama wetlands, there also exists the potential to deliver “added-value” through positive management actions. The following describe some general activities and actions which could be considered for the wetland areas in order to sustainably increase the range of benefits they provide:

- Promote the area more widely as a key destination within the CMR for experiencing the wonders of the wetlands and viewing a diversity of wetland species and habitats.
- Develop site wardens to act as both the guardians of the site but also to assist in promoting and raising awareness of the site within both the local community and also for visitors to the site.
- Develop a comprehensive programme of research (including all levels of education from primary to post-graduate and also ‘citizen science’) in order to expand the understanding of the site and to assist in monitoring long-term changes or impacts.
- Zone the area to allow different levels of physical and visual access and to minimise disturbance to wildlife.
- Introduce site information boards and leaflets which explain the multiple benefits of the area and describe some of the key species present.
- Develop a network of paths, trials and walks around the wetlands so that visitors can experience different elements of the area.
- Consider developing short boardwalks into the tank area to allow visitors to enjoy and more immersive experience.
- Develop a small area as an outdoor classroom with pond-dipping facilities, seating, shade and good access.
- Build hides from sustainably sourced materials to allow visitors to observe wetland wildlife with the minimum of impact.
- Developing more sustainable approaches to rice production, including reducing impacts of herbicides, pesticides and nutrients as well as cultivating local genetic varieties.
- Promoting local wetland food and other products.

## Talangama Tank landscape



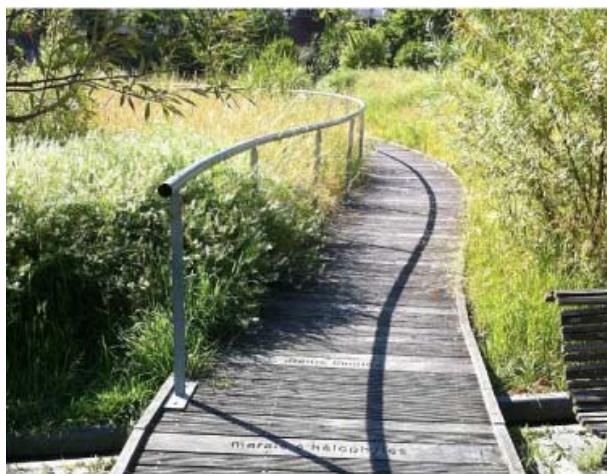
## Talangama Tank conceptual masterplan



## Boardwalks and decks



## Boardwalks and decks



## Observation hides and pergolas



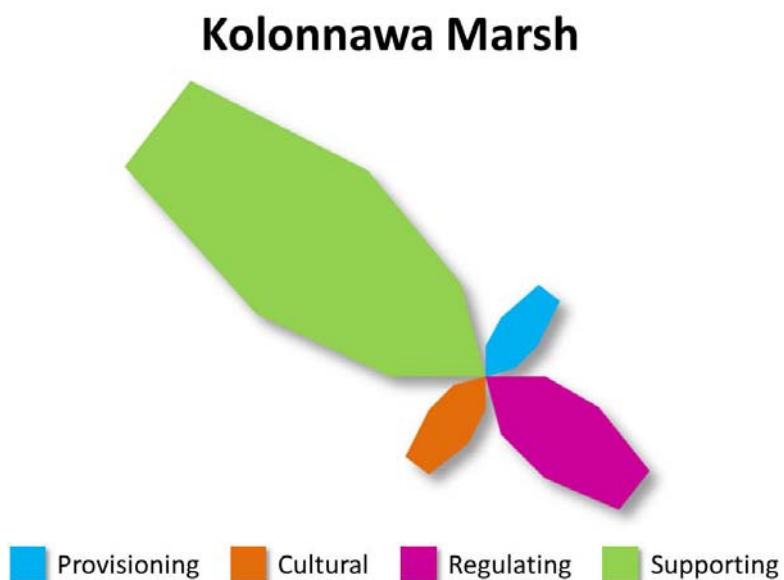
## Kolonnawa Marsh

Kolonnawa Marsh is a large complex of wetland habitats surrounded by relatively densely populated urban areas immediately to the east of the city centre. The Marsh comprises a diverse mosaic of open water channels some of which are completely open and others that are choked with vegetation, mixed woodlands and Annona woodland, and tall and short herb communities. Due to the urban nature of the environment, the Marsh has been subjected to considerable pressure from encroachment and infilling (both legal and illegal) and has reduced in area over the years. The areas of the Marsh that remain are also undergoing change resulting from invasive species, alterations in the hydrological regime and changes in water chemistry.

### Current values

Despite the pressures on Kolonnawa Marsh, it still provides several benefits to the citizens of Colombo (Figure 3). Provisioning services are limited to collection of plants for food, gathering of firewood for fuel and the use of plants for natural medicines. There is some use of the water but due to the locally highly polluted nature of the water this could be described as a dis-benefit. The regulating services comprise regulation of flooding, moderation of the local climate, especially peak temperatures, the cleaning of polluted floodwaters and the trapping sediment and control of erosion. Like the provisioning services, the cultural services are relatively limited. The area has been subject to several academic studies; hence it holds an educational importance. Additionally the area is considered of local importance for spiritual and religious values. However, despite the relatively low value of most of the provisioning, regulating and cultural services, the supporting services remain important. This suggests that the area is still functioning as a diverse wetland and cycling nutrients and water, forming soil, supporting biodiversity (including 85 plant and 139 animal species and several species of nature conservation concern, for instance Kolonnawa Marsh supports a Critically Endangered plant species that is native to Sri Lanka, *Aganope heptaphylla*, which only has only been recorded at three sites in Sri Lanka), etc. but that many of the potential benefits these services underpin are not currently being realised by society.

**Figure 3.** 'Petal diagram' demonstrating the relative value of different categories of ecosystem services provided by Kolonnawa Marsh (Note – Scale is different to Figure 1).



## How to maintain the current values

Despite a considerable body of research having been undertaken over the years, the Marsh remains under threat from a range of activities including:

- Invasive species, including both floating aquatic plants such as and Annona woodland and a shift from herb-rich habitats to shrubby and wooded habitats as a result of the spread of the invasive *Annona glabra*.
- Physical encroachment and infilling.
- Unregulated solid and liquid waste disposal.
- Physical infilling and encroachment.
- Change in soil types from organic rich soils to mineral dominated soils resulting in changes in soil hydrology and water-retention capacity of the soils.
- Changes in nutrient status within the wetlands due to flooding from polluted waters with high nutrient levels both from the canals and also directly from households.
- Fragmentation of different parts of the Marsh.
- Dumping of solid waste.
- Dredging of canals and alteration to the bank profiles resulting in hydrological changes within the wetlands.

In order to maintain the existing values provided by these wetlands a range of actions could be considered, including:

- Developing a detailed site management plan for the area.
- Increasing the level of protection through increased level of site designation.
- Establishing a wider protected network of wetland sites including the Kotte-Beddganaa-Kolonnawa-Weli Park complex.
- Preventing further fragmentation of the existing wetland areas.
- Developing a site action plan for the management of invasive species. The removal of some invasive plant species, if undertaken in an uncontrolled manner, could potentially result in negative consequences to some species of conservation concern, such as *Aganope heptaphylla*.
- Improving the water quality throughout the upstream catchment to prevent changes in the nutrient status of the wetland.
- Alter the canal dredging regime to ensure that dredge-spoil does not further impact on the hydrological functioning of the wetland areas.
- Ensuring that all residents in the area have access to comprehensive solid waste disposal measures.

## Potential “added-value” activities

As with Talangama Tank, the priority should be to stop further wetland loss or degradation in Kolonnawa Marsh. The pressures on Kolonnawa Marsh are greater than on Talangama due to the more heavily urbanised nature of the surrounding environment. However, despite this, there also exists the potential to deliver “added-value” through positive management actions. The following describe some general activities and actions which could be considered for the wetland areas in order to sustainably increase the range of benefits they provide:

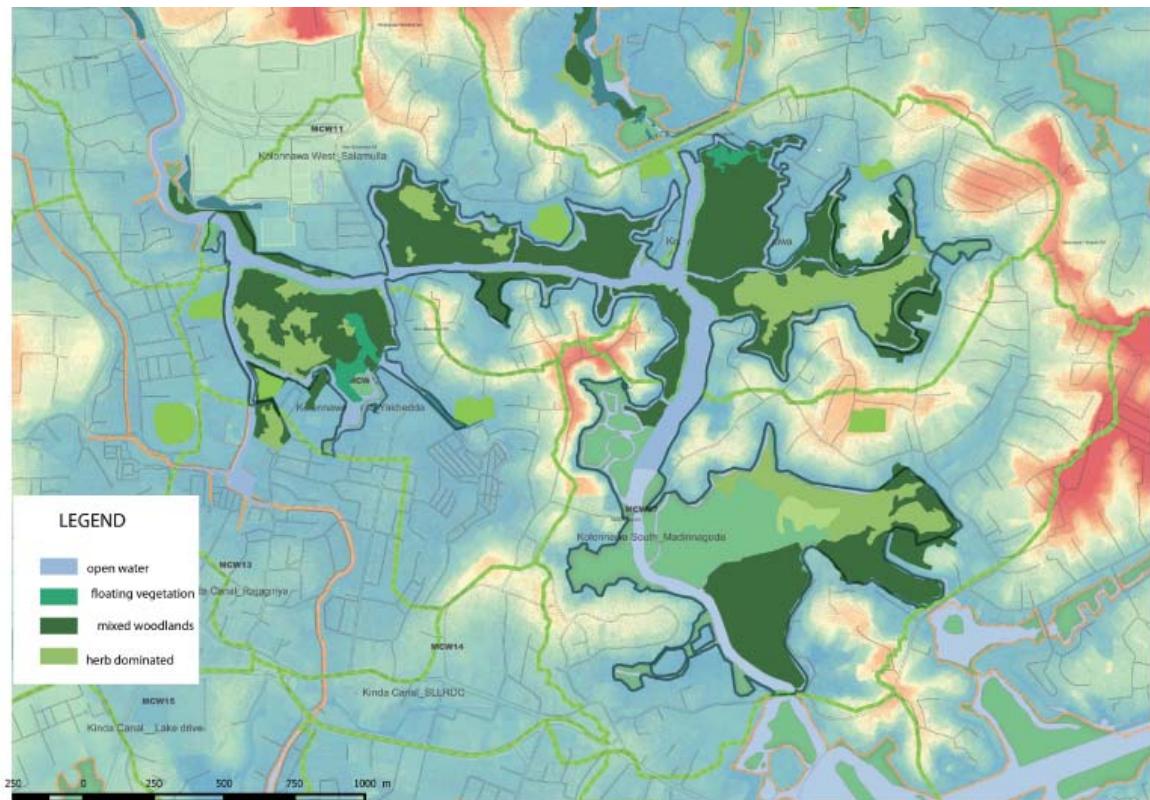
- Promote the area more widely as a key destination within the CMR for experiencing the wonders of the wetlands and viewing a diversity of wetland species and habitats.

- Develop site wardens to act as both the guardians of the site but also to assist in promoting and raising awareness of the site within both the local community and also for visitors to the site.
- Continue to develop a programme of research (including all levels of education from primary to post-graduate and also 'citizen science') in order to expand the understanding of the site and to assist in monitoring long-term changes or impacts.
- Work with the tourism sector to develop further the potential to deliver sustainable tourism benefits. Given the extent and variety of wetlands in Colombo the potential exists to integrate them into a more cohesive and expansive tourism experience.
- Zone the area to allow different levels of physical and visual access and to minimise disturbance to wildlife.
- Introduce site information boards and leaflets which explain the multiple benefits of the area and describe some of the key species present.
- Develop a network of paths, trials, walks and boat trips (including electric boats and canoes) around the wetlands so that visitors can experience different elements of the area.
- Consider developing boardwalks into the less accessible areas to allow visitors to enjoy and more immersive experience.
- Develop a small area as an outdoor classroom with pond-dipping facilities, seating, shade and good access.
- Build hides from sustainably sourced materials to allow visitors to observe wetland wildlife with the minimum of impact.
- Reduce the height of the existing dredge spoil on the canal margins to restore the hydrological connection between the marsh and the canals.
- Consider alternative uses for dredge spoil and investigate the potential to implement 'no dredge' areas at important hydrological connection points.
- Investigate creating or restoring parts of the wetland to act as dedicated water treatment areas, for instance the canal adjacent to Arunodiya Road.

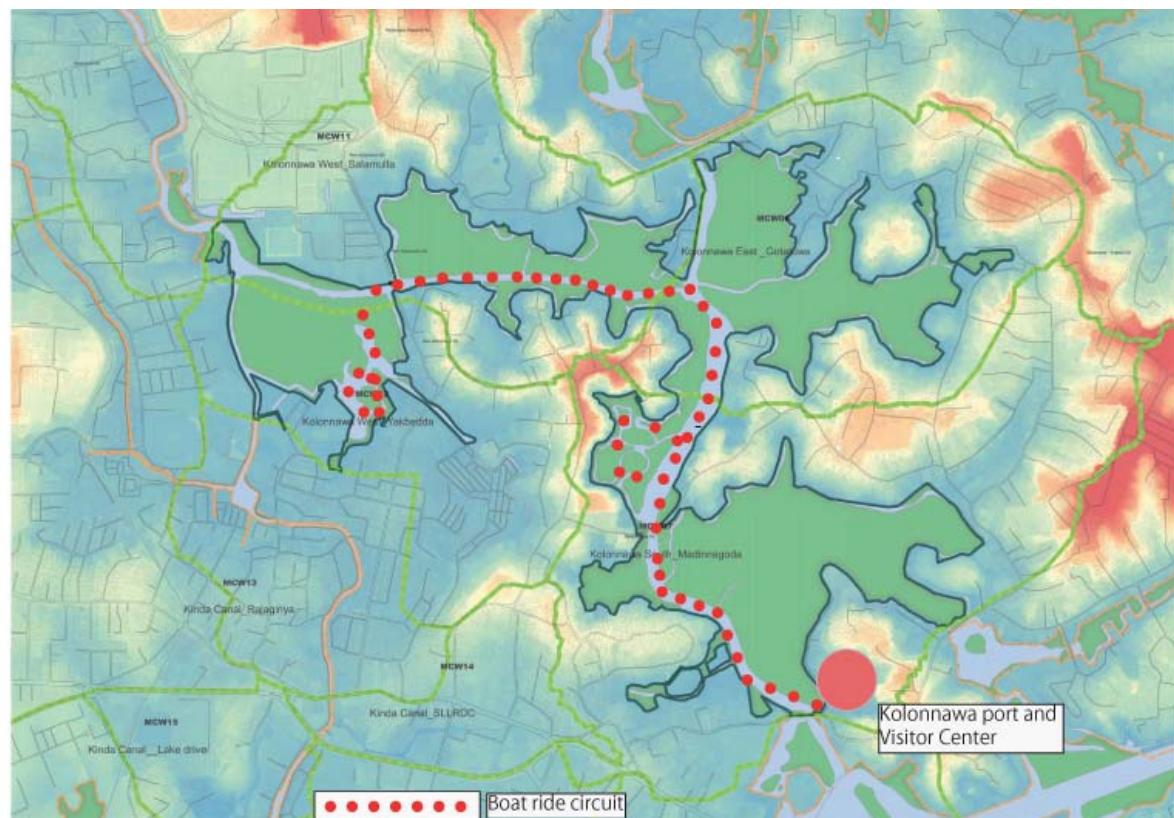
## Kolonnawa marsh landscape



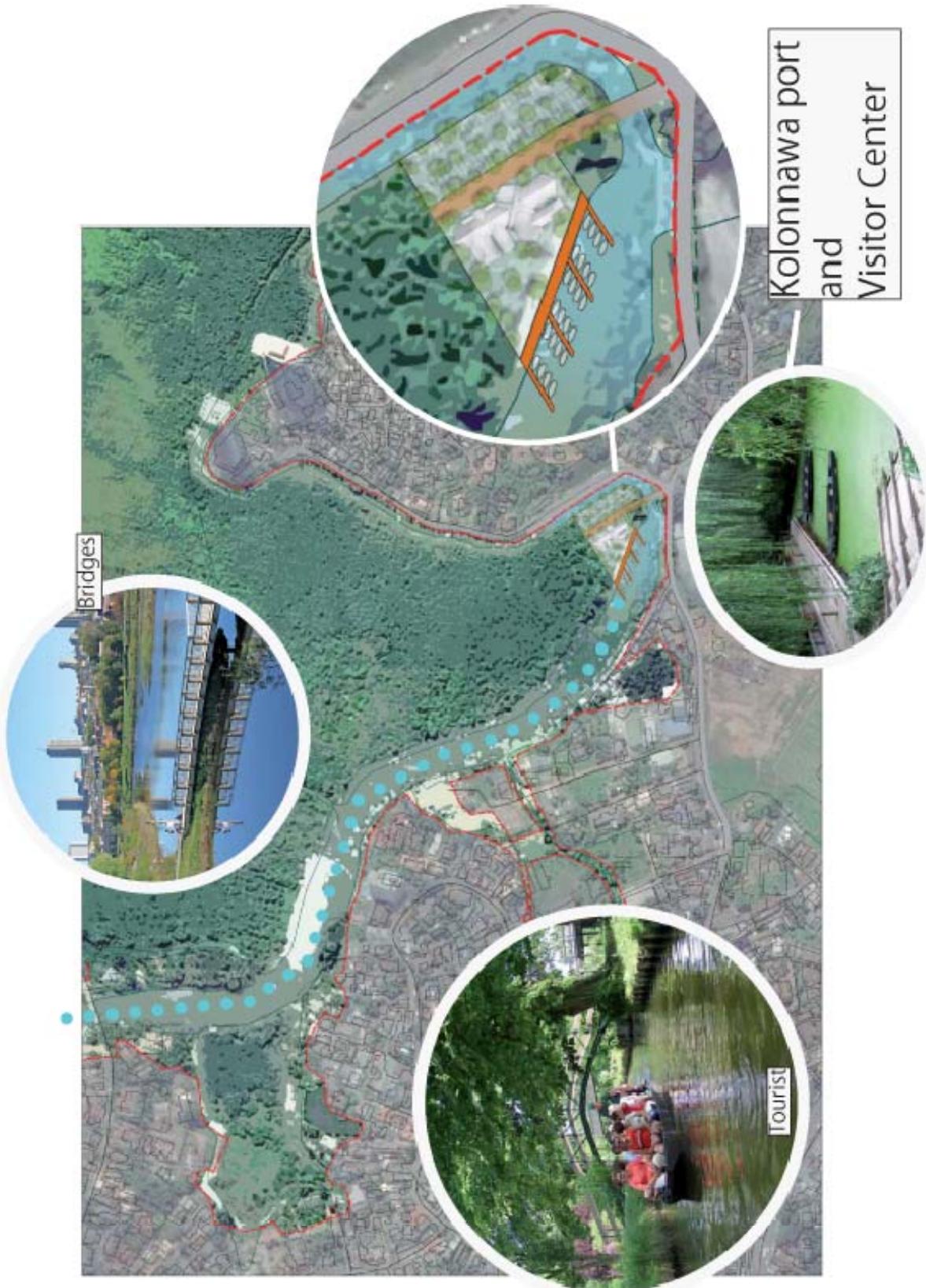
## Kolonnawa marsh vegetation distribution



## Kolonnawa marsh boat circuit



## Kolonnawa conceptual masterplan



**Kolonnawa and Thalangama Tank recommendation for the restaurant in the wetlands area**



## Potential financing mechanisms

A range of financing mechanisms could be developed to support the various activities proposed for Talangama Tank and paddy lands and Kolonnawa Marsh. Similarly, these financing approaches could be transferred to wetlands elsewhere in CMR. Following are some of the mechanisms that could be considered for development:

- Development of a system of payments for ecosystem services (PES) where a beneficiary pays a wetland manager for the benefit they receive. For instance, working with businesses which benefit from overlooking wetlands areas.
- Securing finances through endowments from development projects, where compensation for any wetland loss or degradation funds wetland restoration and enhancement activities.
- Implementing a more robust polluter pays principled approach where individuals or organisations are fined for contributing to wetland degradation.
- Developing a programme of sponsorship for hides, boats, signage etc.
- Charging for permits to enter certain wetland areas.
- Charging for activities, such as guided walks or night safaris or boat trips.
- Development of training courses relating to wetland activities, such as the benefits of wetland medicinal plants, sustainable rice production, wetland management, etc.
- If feasible without compromising the ecological character of the site, the development of more substantial visitor facilities at Kolonnawa Marsh.

FINAL REPORT\_COLOMBO WETLAND MANAGEMENT STRATEGY

**Metro Colombo Urban Development Project** - Consultancy Services for the Preparation of Management Strategy for Wetlands and Carrying out an Assessment of Water Quality in the Inland Waterways and Lakes within Metro Colombo Area

## **6.3 APPENDIX 3\_ MONITORING AND EVALUATION FRAMEWORK**

## Appendix 3

# Monitoring and evaluation framework for wetlands of the Colombo Metropolitan Region

## Introduction

The wetlands of Colombo Metropolitan Region (CMR) are currently under threat from a range of activities. In order to establish early warning systems or reactive assessments it is necessary to implement and undertake monitoring and evaluation of the wetlands. In some situations this will require comprehensive and bespoke investigations, such as in the case of an environmental impact assessment for a particular development activity. Some of the monitoring will be more routine, such as in the case of strategic water quality monitoring across the surface drainage network. In many cases however, the monitoring and evaluation will be used to ensure that baseline conditions are not altering and that the ecological character of the wetlands is not responding to negative changes.

In order to fully understand how the wetlands function will necessitate undertaking a range of detailed studies and investigations. However, the data and information gathered and collated in the Wetland Management Strategy provides a considerable body of knowledge on the functioning and ecological character of the wetlands. Therefore, the monitoring and evaluation plan seeks to build on this information and to provide a range of practical and, in some cases, simple approaches to monitoring the wetlands.

## Monitoring and evaluation activities

### Ecosystem services

The wetlands provide a range of ecosystem services. Routine of monitoring and observations undertaken in the wetland can provide an indication on the presence of these services. Many of these observations are simple and easy to undertake with limited training. Table 1 sets out a range of activities and observations which can be undertaken to provide wetland managers with a better initial understanding of how the wetlands are providing benefits to human society.

### Threats and impacts

Table 2 describes some of the indicators of possible threats or impacts to the wetlands. These are all based on simple field investigations and should act as prompts to highlight a particular issue which could then followed up on in more detail.

### Water quality monitoring

The water quality across the Metropolitan Colombo Region continues to contribute to widespread degradation of the wetlands. Recommendations have been provided elsewhere in the Wetland Management Strategy on the monitoring of water quality, however, the key elements are reproduced in Table 3.

### Ecological monitoring

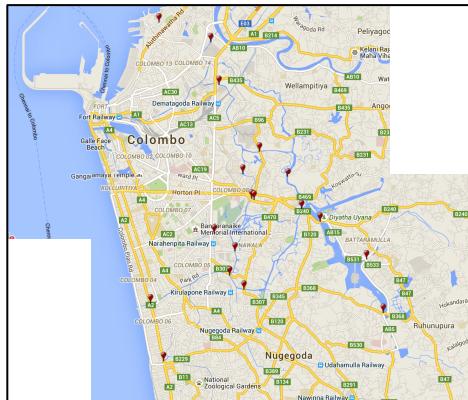
A range of ecological monitoring techniques could be employed to assess the nature conservation value of the wetlands. Details of the various techniques are not reproduced here, rather reference should be made to Technical Report 02. What is essential is that dedicated surveys are set up to

ensure that the critical species, both fauna and flora, of conservation concern are monitoring on a regular basis. Universities and government stakeholders should investigate funding opportunities, and especially collaborative working opportunities with academic establishments in Europe and North America where additional funding may be available to support these activities.

In addition, the monitoring of alien invasive species is critical in order to protect native biodiversity and to ensure the flow of benefits from the wetlands to citizens of Colombo. Reference once again should be made to Technical Report 02 regarding which species to monitor and the best approaches to their assessment.

### Hydrology monitoring

Concerning the key parameters to be monitored to understand the wetlands hydrological functioning, it is recommended that SSLRDC **maintains and develops** the existing monitoring network of water levels. The current network concerns 18 measuring points distributed within the hydrographic network. It is represented in the figure below (source: SSLRDC Internet site).



**Existing water level monitoring network**

(source :

[http://www.landreclamation.lk/web/index.php?option=com\\_content&view=article&id=317&Itemid=127&lang=en](http://www.landreclamation.lk/web/index.php?option=com_content&view=article&id=317&Itemid=127&lang=en)).

Two marshes could also be further equipped, in order to better understand the flow directions

- **The Kolonnawa marsh:** two measurement points could be added in the northern part: one in the MCW06 area and one in the MCW28 area at the junction with Dematagoda canal,
- **The Kotte marsh:** one measurement point could be inserted at the southern and northern extremities of the marsh.

At all measurement point the water level has to be expressed in an absolute levelling system (MSL) in order to be able to compare the different points and to assess the flow directions. The data should be transmitted in real-time to SSLRDC and available for consultation on the internet, which facilitates management, maintenance or prediction operations.

In a second step, in order to assess the hydrological balance and to offer new perspectives for the hydraulic wetland management, it would be interesting to assess continuously the flow going out from all the system. This involve to implement gauging stations at each outlet:

- **The 2 southern outlets:** Dehiwela and Wellawatta,

- **The northern outlets:** North Lock, Mutwal Tunnel and Beira Lake (and every new outlet that would be implemented in the area).

For Beira Lake, the calibration of the water level – discharge relationship can provide directly the discharge based on a water level measurement. For the other outlets, as this is not possible to obtain a simple relationship between water level and discharge due to the sea level variation, a measurement of **flow velocities** through ultrasonic equipment is required. At the north lock, the calculation of the discharge should take the pumpings into account.

Automatic water levels strategic locations are better than manual reading. For one location there could be more than one gauge at different levels to record high floods. One gauge established at a low level could inundate that gauge. SLLRDC is in possession of the past observed water levels and model generated water levels. These levels could be made used of to decide the different water level gauges representing several stages. It is also important to continually enter data, plot and look for inconsistencies. The feedback should be provided to the gauge reader.

Table 1. Simple monitoring and observations associated with different ecosystem services (not all services addressed).

Ecosystem service	Water levels	Monitoring activity													
		Presence of dumped waste or wastewater discharges	Presence of dredge spoil	Presence of farming activities	Presence of bees, butterflies,	People enjoying themselves	Presence of water pollution	Medicinal plants observed	Temperature	Augering for organic soils	Trash line of debris in wetland	Rats, mosquitoes, other pest species	Lotus ponds present	Archaeological features, ramparts, etc.	New sediment deposited
Fresh water			x				x								
Food	x 1			x											
Fibre and fuel															
Genetic resources								x							
Natural medicines															
Ornamental resources												x			
Waste disposal	x	x													
Air quality regulation									x						
Climate regulation - local				x						x					
Climate regulation - global			x								x				
Water regulation			x								x				
Natural hazard regulation															
Pest regulation	x	x										x			
Disease regulation - human						x									
Disease regulation - stock						x									
Erosion regulation															
Water purification	x	x			x		x								
Pollination															
Noise and visual buffering						x						x			
Cultural heritage													x		
Recreation and tourism						x									
Aesthetic value													x		
Spiritual and religious value														x	
Inspiration of art, folklore, .												x			
Social relations						x		x							
Educational and research															
Soil formation												x			
Primary production		x											x		
Nutrient cycling		x											x		
Water recycling	x	x												x	
Photosynthesis														x	
Provision of habitat				x									x		

Table 2. Some indicators of threats to wetlands.

Threat	Indicator
Solid waste disposal	<ul style="list-style-type: none"> <li>• Domestic waste present</li> <li>• Other waste physically observed</li> <li>• Repeated dumping of waste in one area</li> <li>• Establishment of unregulated tracks and roads into wetland allow access for dumping</li> </ul>
Unregulated waste water discharge	<ul style="list-style-type: none"> <li>• Water discharging from pipes</li> <li>• Presence of discoloured or foul-smelling surface water</li> <li>• Dead fish floating on the water surface</li> <li>• Strong smell of ammonia</li> <li>• Algal blooms</li> </ul>
Dredge spoil dumping	<ul style="list-style-type: none"> <li>• Dredge spoil visible on banks</li> <li>• Unvegetated areas along canal bank tops</li> </ul>
Invasive species	<ul style="list-style-type: none"> <li>• (Refer to Technical Report 02)</li> <li>• Invasive species observed</li> </ul>
Unregulated infilling	<ul style="list-style-type: none"> <li>• Bare ground devoid of vegetation present</li> <li>• Establishment of unregulated tracks and roads into wetland allow access for dumping of infill material</li> <li>• Infilling material observed</li> </ul>
Unregulated buildings	<ul style="list-style-type: none"> <li>• Buildings erected in the wetlands</li> </ul>
Change in hydrological conditions - drying	<ul style="list-style-type: none"> <li>• Dry looking vegetation</li> <li>• Dry, cracked bare ground, especially in regular polygons</li> <li>• Change in vegetation from wetland species to more drought-tolerant or upland species</li> </ul>
Overexploitation of fuel wood	<ul style="list-style-type: none"> <li>• Clearance of woody species</li> <li>• Wood piles</li> <li>• Establishment of unregulated tracks and roads into wetland allow access for tree felling</li> </ul>
Agricultural pollution	<ul style="list-style-type: none"> <li>• Presence of discoloured or foul-smelling surface water</li> <li>• Dead fish floating on the water surface</li> <li>• Strong smell of ammonia</li> <li>• Algal blooms</li> <li>• Organic wastes observed being applied to fields</li> </ul>
Unregulated water abstraction	<ul style="list-style-type: none"> <li>• Presence of unregulated pumps with pipes in canals, ditches, ponds etc.</li> </ul>
Road run-off and storm discharges	<ul style="list-style-type: none"> <li>• Oil observed on water surface</li> <li>• Algal blooms</li> <li>• Presence of discoloured or foul-smelling surface water</li> <li>• Dead fish floating on the water surface</li> <li>• Discharges to wetland observed during wet season</li> </ul>

Table 3. Water quality monitoring recommendations.

Colombo Water Monitoring Network Design	Needs/Goal	Target/Partner	Estimated cost
<b>Objective:</b> provide an effective water monitoring network to Colombo area <b>Result :</b> monitoring generates information on ecological impacts which can be used to adapt water management policies and other environmental policies in order to improve water quality	By early 2017, all the stakeholders use the data monitoring from SLLRDC team	SLLRDC	
Activity C1: Assess actual water quality monitoring in Colombo area (/ Sri Lanka) <ul style="list-style-type: none"> <li>- Existing Monitoring networks</li> <li>- Means to assess quality (field staff, laboratory, etc.)</li> <li>- Needs and priorities of key users</li> <li>- Database and online information</li> </ul>		SLLRDC, other stakeholders (Ministry, etc.)	60,000 \$
Activity C2: Formulate effectiveness monitoring program/design (objectives, location, frequency, method parameters) and stakeholder's roles (SLLRDC, Ministry...)	By 2017 the program is finalized	SLLRDC	60,000 \$
Activity C3: Training Needs Assessment and Capacity Building program of SLLRDC <ul style="list-style-type: none"> <li>- Increase reliability of actual monitoring</li> <li>- Strengthen team</li> </ul>	SLLRDC is in a capacity to start implementing the monitoring	SLLRDC	100,000\$
Activity C4: Definition of relevant parameters for Colombo area (wetland and brakishwater) and building new indicators (including bio-indicator) and scoring by research institutes/universities partnership <ul style="list-style-type: none"> <li>- Identification of reference stations (access, well spread in the area)</li> <li>- Building and implement scoring system for each chemical parameters</li> <li>- Buying and set up sensor and data transmission system</li> <li>- Assess and improve existing biotic index (based on macro-invertebrates)</li> <li>- Building and implement a new biotic index based on phytoplankton and/or Diatoms, Worms in sediment, etc...</li> </ul>	Availability of relevant hydrological / physico-chemical and ecological data and available resources to conduct specific field investigations to confirm the relevance of reference sites. Scientific publications (taxonomy + bio-statistics) and complementary field studies	Scientific milieu in Sri Lanka and SLLRDC team	800,000\$ including: <ul style="list-style-type: none"> <li>- 200,000\$ sensor</li> <li>- 450,000 new index</li> </ul>
Activity C5: Management of chemical and hydro-biological monitoring database (including physico-chemical, biological and hydro-morphological data) <ul style="list-style-type: none"> <li>- Implementation of the database/GIS with regular updating and active data sharing between users</li> <li>- Foster collaboration mechanism between data producers</li> </ul>	Develop a GIS to be managed by the SLLRDC on a multi-users basis	SLLRDC	50,000\$
Activity C6: Formulate guidelines/white paper which specifies roles of SLLRDC and other stakeholders to monitor water quality		SLLRDC, other stakeholders (Ministry, etc.)	60,000\$
Option O1: Integration on monitoring results into wider water policy including cumulative impact issues and issue relevant regulations	Field observations suggest that the ecological status of most rivers courses has improved		

## **6.4 APPENDIX 4 \_ COMMUNICATIONS PLAN**

## Appendix 4

### Communications plan

#### Introduction

The objective of this communications plan is to provide guidance on possible approaches, actions and audiences to be undertaken in order to promote both the Wetland Management Strategy and the value of the wetlands of Colombo. Key elements are:

- What are the messages?
- Who is the audience?
- Which media should be employed to deliver the right message to the right audience?

The table below summarises the major components of the communications plan and suggests answers for the three questions posed above. The figure describes the process and the structures which should be involved for the communication plan implementation.

According to the multiplicity of structures involved in the creation of communication tools, this Appendix provides the outline elements of a broader communication strategy. It will be possible able to develop more specifics when the organisational and governance structures are better defined.

#### Multiple stakeholders: necessity to standardise the communication

Many organisations are involved in the management of Colombo's wetlands, therefore this expands the variety of communication sources. Each organisation will have its own structure and its own tools, its own communication culture and its own ways of working. This is a great help when targeting audiences, because each entity should know its audience very well and therefore could implement the appropriate tools to communicate; but on the other hand, the conveyed message needs to be standardised in term of both content and presentation.

For efficient communication, messages have to be clear and identical throughout the communication campaign. Therefore, in consideration, it is essential to clearly define the messages and make sure that all stakeholders abide by them. The key policy messages presented at the beginning of the Wetland Management Strategy should be utilised to provide material for use by different media and audiences.

Because presentation is also very important in a communication project, it could be useful to define a unique graphical frame dedicated to the promotion of the wetlands of Colombo. This could include a standardised logo, colours, typography, style, etc. For all these reasons it could be beneficial to centralize communication management, or at least to ensure that there is a strong cohesion across different actors. Such an approach could define the contents and the presentation of the communication tools, with important communication documents being validated by a single entity before being disseminated by the different stakeholders.

## Utilising existing communication tools and the need to create specific tools

Although there are many kind of awareness documents created by the different stakeholders, including CEA, Wildlife department, SLLRDC, etc., there are currently no communication tools specifically dedicated to Colombo's wetlands, with the except of the two projects managed by the SLLRDC and UDA, namely the Thalawatugoda Biodiversity Study Park and Bedaggana Biodiversity Park in Kotte.

### Biodiversity parks

These parks represent the first formal attempts to develop facilities fully dedicated to promoting Colombo's wetlands. They represent major communication tools for Colombo's wetlands and they should become a central element of communications. Multiple communication tools, media and events could be developed around these parks and a large range of targets could be addressed.

### A resource centre

The biodiversity parks could be developed as central elements of communication about Colombo's wetlands. They could also be developed as dedicated resource centres. In this way, they could act as a focal point where knowledge and activities in relation to Colombo's wetlands could be concentrated. These resource centres would be of benefit to children and students, but they could be a central element of communication wider audiences. In such resource centre the following elements could be developed:

- A library dedicated to the Sri Lankan wetlands (biodiversity, hydrology, history, etc.) with coffee table books, books for children, etc.;
- Touristic information (local and national);
- Videos presenting the wetlands;
- Documentation about wetlands such as scientific publications, legislation, reports, etc.;
- Simple research laboratory;
- Facilities for conferences and events.

## Strategic orientations by main target

### Children/students - a significant target audience

In a global approach of environmental education, a lot of communication tools are developed for children. The awareness and education department of the CEA is very active and has been producing educational material and has organised events for 30 years. The Department of Wildlife Conservation is also involved in environmental education for children and has for example developed awareness programs for schools.

Children, and through them, parents are today the most identified and targeted audience. This long term communication strategy should continue and be developed, and should be based on three key points:

- harmonization of the communication tools (messages, graphic design, etc.)
- creation of new tools (as thematic posters) fully dedicated to the wetlands (provided services by the wetlands, biodiversity, etc.) for the classrooms and adapted to scholar programs
- the biodiversity parks are essential elements in the development of communication for children through the organisation of workshops dedicated to the children:

- school trips
- workshops: testing water quality, wildlife discovery, etc.
- lessons by scientists
- organisation of events in the biodiversity park (scavenger hunt, drawing contests, etc.)
- develop a dedicated web page (host in the biodiversity park website) for children. This page could be used to prepare the visit, to access information about wetlands (with videos), to learn by doing quizzes or playing pedagogic video games, etc.

It is important for this target to “feel” and “see” the wetlands, as this makes their protection and value real. An immersive field experience for the children is probably the best way to increase their involvement in the conservation and understanding of the wetlands.

Children and young adults are also concerned by new technologies, videos and social networks. This should be taken into consideration when developing these media, such as a website and dedicated Facebook pages. The idea is to encourage the feeling that being aware of the environmental stakes is important, interesting, modern and even fun.

i.

#### **The local population - The “Villages wetlands management committees”**

Currently, local communities and residents are actively involved in the management of the wetlands. The “Village wetlands management committees” are operational and they represent a good opportunity to raise awareness in the whole local population. Such opportunities could be developed further with local civil society organisations such as the Green Movement. It could also be possible to use the committees not only for surveillance purposes but also as a relay to transmit the main ecological notions to residents.

In the existing guideline provided by the CEA (to train the village committee members), it would be interesting to focus on the environmental stakes concerning wetlands conservation, and particularly to present the short term benefits of protecting wetlands. Specific tools should be created as schemes and visual elements that members of wetlands management committees can easily transfer and explain to local population.

#### **General public**

In order to engage the local population with the wise use of wetlands it will be essential to raise awareness about the benefits provided by healthy wetlands. Often, notions such as global warming and climate change are not tangible enough to encourage people to be involved in wetlands conservation. Therefore it is preferable to present stories and evidence about concrete and tangible services provided by the wetlands. These could include many of the headline messages presenting the key policy section of the WMS.

A range of media could be used to engage with the local communities. Any approaches need to consider language, literacy, religious and ethnic issues, gender equality and other socio-political contexts within which media are to be developed.

#### **Local scale – politicians**

Urbanization of Colombo’s wetlands is one of the most significant threats to these natural habitats. Politicians and municipalities leaders have to consider the wise use of wetlands in their planning and

political decision-making. Their level of understanding and awareness should make this message a priority. Therefore, politicians need to be provided with good “political arguments” which clearly explain “Why wetlands are so important?” Again, the key policy messages presented at the beginning of the WMS should form the basis of this approach.

A key element in this would be the production of a short but targeted policy brief which could provide politicians and local decision-makers with cogent arguments for protecting the remaining wetlands.

### **National scale – Colombo: an example**

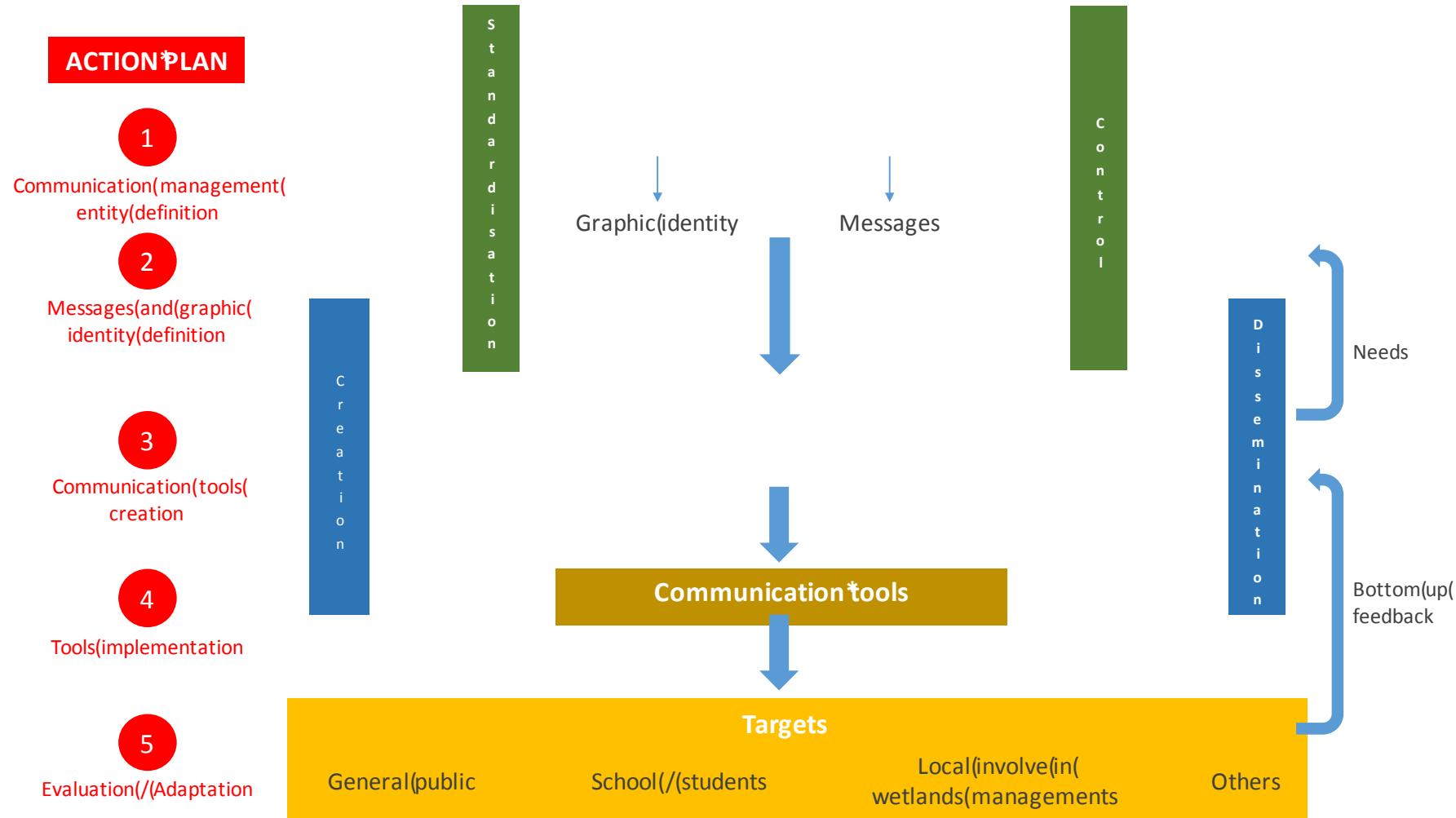
The involvement and the success of the Colombo’s wetlands management could be an example at a national scale. The work done in Colombo should incite others municipalities to manage their own wetlands areas. To this end, it will be important to communicate at a national scale about the success of the Colombo’s wetlands management strategy. This communication could be organised through meetings, conferences, and participation to national and international events such as the Ramsar World Wetlands Day.

### **International scale**

Colombo is a city built on wetlands. The potential exists to promote the city’s wetlands to two key audiences: local and international tourists and wetland managers across the region and Asia.

Efforts need to be made to engage with the tourism sector and to develop communications programmes and activities which promote the values of the wetlands. By making connections between the promotion of wetlands and economic development, in roads into the tourism sector could also assist with developing new financing systems.

The work conducted in Colombo is unique for urban wetlands in the region and across Asia. Opportunities exist to promote Colombo as a centre of excellence for the management and protection of wetlands. By working across the region, and possibly with assistance from the Ramsar Secretariat, efforts should be made to promote not just the multiple values of the wetlands but also the process of securing these benefits for future generations.

**Figure 1: How to organise the communication tools creation process**

Overall objective	Specific aims	Audience			Expected outcomes (what we want the audience to DO or KNOW to achieve the goal)	Special messages	Means	
		General	Specific	Strongly influential audiences			Tools/notions to be developed	Existing tools
To increase awareness regarding the value of wetlands in Colombo	Make known the program (Strategy for Wetlands and Carrying out an Assessment of Water Quality in the Inland Waterways and Lakes within Metro Colombo Area)	Wetlands management stakeholders	Politicians	Local constitutional responsibility Municipality of Colombo	To be informed that there is a governmental management project for Colombo's wetlands	There is a government political wish to protect Colombo's wetlands	<b>Presentation leaflet</b> of the program : - Origin - Legal framework - Who is concerned - Stakes of its implementation - What does it mean concretely	Nothing seems to exist yet to present the program itself
							This leaflet should be systematically distributed by the program stakeholders during meetings, presentations, events, etc.	
			Academics/ Scientists/ Students	University's professors Central Environment Authority	To increase the interest for the wetland monitoring, researchers and conservation	The wetland management strategy is an opportunity to study wetlands	<b>A presentation of the project on the SLRDC website</b> (same information as in the leaflet) : <a href="http://www.landreclamation.lk/web/index.php?option=com_content&amp;view=category&amp;id=100&amp;Itemid=133&amp;lang=en">http://www.landreclamation.lk/web/index.php?option=com_content&amp;view=category&amp;id=100&amp;Itemid=133&amp;lang=en</a>	
							<b>A presentation of the project on the CEA website</b> (same information as in the leaflet) : <a href="http://www.cea.lk/web/index.php/en">http://www.cea.lk/web/index.php/en</a>	
		Government Institutions	Ministry of Environment Board of Investment Ministry of Agriculture SLRDC Ministry of Lands Urban Development Authority Ministry of Provincial Councils & Local Government National Aquatic Resources Agency Ministry of Defence & Urban Development North Western Provincial Environmental Authority Ceylon Tourist Board Ministry of Fisheries Road	To consider the recommendations of the management strategy in their actions	The wetland management strategy is a tool to help you in the wetlands management	Provide the information (with the leaflet or during meetings) to the eminent professors in : - Hydrology - Environment/Ecology - Urbanism		
						<b>Presentation of the program in the Sri Lanka's of the Department of Wildlife Conservation journal</b> : Sri Lankan Wildlife		
				To disseminate Colombo's experience (in wetland management) to other districts and other countries	The wetland management strategy is a tool which can help your confreres in other districts	Organise a <b>workshop</b> with the different stakeholders to present the strategy results and the impacts on the activities of each department		
						Talk about the project : - Ramsar conferences - International specialized networks		

				<p>Development Authority Central Environment Authority; Natural Resources Energy and Science Authority Department of Wildlife Conservation National Chamber of Commerce Coast Conservation Department National Planning Department National Physical Planning Department Forest NWSC</p>	To increase the possibility of national funding	The wetland management strategy is an opportunity of development at a national level	Each person involved in the strategy have to speak about it during meetings and presentation. This informal communication is very important, it's a background work	
					To be informed that there is a governmental management project for Colombo's wetlands	There is a government political wish to protect Colombo's wetlands	<p><b>Presentation leaflet of the program</b></p> <ul style="list-style-type: none"> <li>- Origin</li> <li>- Legal framework</li> <li>- Who is concerned</li> <li>- Stakes of his implementation</li> <li>- What does it mean concretely</li> </ul> <p>This leaflet should be systematically distributed by the program stakeholders during meetings, presentations, events, etc.</p>	
					To be informed that there is a governmental management project for Colombo's wetlands	Wetlands are protected areas, it's important to preserve them	<p>Provide the SLLRDC website with documentation about the program.</p> <p>Include for example a presentation document of the program in all the downloads in relation with wetlands planning</p>	
<p><b>To present issues of Wetland Conservation and to increase general awareness</b></p>	<p>Wetland management stakeholders</p>	<p>Politicians</p>	<p>Local constitutional responsibility Municipality of Colombo</p>	<p>To consider the wetland issues in their politics : land-use, social and economical</p>	<p>Present the <b>services provided (advantages)</b> by the wetlands :</p> <ul style="list-style-type: none"> <li>- Safety stake : flood control</li> <li>- Social/economical resources : agriculture, tourism</li> <li>- Environmental resources : water quality, carbon storage, attractiveness of the municipalities, education</li> <li>- Cultural heritage</li> </ul>		<p>Application for the RAMSAR award for wetland conservation</p>	<p>Nothing seems to exist yet for this audience</p>
					<p>To involve local organisations in the wetlands preservation</p>	<p>The collaboration with the "village management committees" and the raise of their awareness is one of the success keys of the wetlands management</p>	<p>Meetings with local authorities in the vicinity of wetlands to present the stakes regarding wetland management and present <b>concrete examples of provided services</b> (short-term benefits provided)</p>	
				<p>To increase the awareness of the politicians themselves</p>	<p>Wetland preservation involves a better understanding of the wetlands</p>	<p>Meetings with the "Village Management Committees" to :</p> <ul style="list-style-type: none"> <li>- present the stakes regarding wetland management and present <b>concrete examples of provided services</b> (short-term benefits provided)</li> <li>- involve the committees in wetland surveillance</li> </ul>		

		National	To consider the wetland issues in their politic : land-use, social and economical	<b>Wetland management is a national stake for the development of the country :</b> - Safety stake : flood control - Social/economical resources : agriculture, tourism - Environmental resources : water quality, carbon storage, attractiveness of the municipalities, education - Cultural heritage	<b>Events :</b> - Organisation of "Colombo's wetland day" - Organisation of conferences/workshops with scientists, politicians and wetland management stakeholders	
	Government Institutions	Board of Investment Ministry of Agriculture Ministry of Lands Urban Development Authority Ministry of Provincial Councils & Local Government National Aquatic Resources Agency Ministry of Defence & Urban Development North Western Provincial Environmental Authority Ceylon Tourist Board Ministry of Fisheries Road Development Authority National Chamber of Commerce National Planning Department National Physical Planning Department	To consider the wetland issues in their politics : land-use, social and economical at a national level	<b>Wetlands management is a national stake for the development of the Sri Lanka :</b> - Safety stake : flood control - Social/economical resources : agriculture, tourism - Environmental resources : water quality, carbon storage, attractiveness of the municipalities, education - Cultural heritage	<b>Events :</b> - Organisation of "Colombo's wetland day" - Organisation of conferences/workshops with scientists, politicians and wetlands management stakeholders	Nothing seems to exist yet for this audience
	Non-governmental and civil society organisations - International and national NGOs - Local community groups - Local religious groups	NGOs are already aware of the wetland management stakes Village wetland management committees	Involve local organisations in wetland preservation	You are an important stakeholder in wetland preservation	Involve local groups in wetlands surveillance and management. Increase awareness of these groups by organising a <b>training day</b> or a workshop with the responsible of each group	Nothing seems to exist yet for this audience
	Direct beneficiaries in the vicinity of the wetlands	Farmers (paddy fields, vegetable cultivation, etc.)	To have wetland friendly practices	<b>Concentrate on short-term benefits</b> - Services provided by wetlands - Development of the organic culture - Where to find assistance and information - Economical opportunity	Leaflet and/or presentation with : - environmental and economical issues - need to preserve wetland to continue to cultivate - wetland friendly agricultural practices - concrete examples of wetland friendly farmers with good results	Use the NGO's existing network to provide information to the right peoples. Green movement for example
					Creation and promotion of an award or label for wetland friendly farmers recognizable by consumers. For example "Colombo Organic Wetland Label"	

		Residents of Colombo and of the wetlands (close to the wetlands)	To consider the value of the wetlands To respect the natural environment, waste management	<b>Present the services provided by wetlands (short-term benefits first)</b>  - Safety stake : flood control - Social/economical resources : agriculture, tourism - Environmental resource : water quality, carbon storage - Cultural heritage	<b>Interpretive trail in Colombo wetlands</b> presenting the services provided : - development of the "biodiversity park" - creation of interpretive panels for places frequented by a large audience : Parliament Lake for example	"Biodiversity park" - project underway
	Teachers		To include the wetlands preservation stakes to the teaching program	Teachers have to increase the awareness level of the children's concerning the wetland preservation	<b>Events</b> : - organisation of "Colombo's wetland day" - organisation of a wetland photo (or artistic representation) contest : the awarded works will be exposed in Parliament Lake or in the "Biodiversity park" for example	
	Youth / School children	Students children -	To increase children's awareness level on wetland preservation	Wetlands are a treasure which it is necessary to protect	<b>Media</b> : - create a press kit presenting the different stakes - invite the media to events	
					<b>Create thematic posters</b> on the wetlands : - provided services - biodiversity	Documents provided by the Environment Education and Awareness division of the CEA
					<b>Create the "Wetland Resources Centre"</b> of Colombo (in the biodiversity park for example) with :  - library dedicated to the Sri Lankan wetlands (biodiversity, hydrology, history, etc.) - touristic information - videos presenting the wetlands - documentation about wetlands - organisation of conferences and events - a dedicated website (biodiversity website) - a dedicated Facebook page	
					<b>Organise workshops</b> with the children :  - school trip to the wetlands - workshop in the "biodiversity park" : testing water quality, wildlife discovery, agriculture in wetlands - classroom presentation by scientists	"Biodiversity park" - project underway

## 7 TECHNICAL REPORTS

- 01. Institutions and policy**
- 02. Ecological Status of the Colombo Wetlands**
- 03. Physical features – Hydrologic and hydraulic issues**
- 04. Physical Features – Water quality, lake, sediment and soil issues**
- 05. Physical Features – Soil survey**
- 06. Socio-economics of the wetlands of Colombo: Linking ecosystem services to human well-being**
- 07. Wetland Classification Maps**