# 09

# *Wetland Management Strategy*

# 9.1. Introduction

## 9.1.1. Aims & Objectives

Urban wetlands make cities livable in many important ways. They reduce flooding, replenish drinking water, filter waste, provide urban green spaces, and are a source of livelihoods while the rich vegetation contained in them purifies the air and performs various biological functions in favour of the dwellers and users. For example, Colombo wetlands are estimated to carry 39% of the city's storm water thereby functioning as a natural barricade against flooding of the city. By sequestering carbon, it also mitigates climate change. (Rnasinghe, 2018)

The city of Colombo has been declared as a wetland city under the RAMSAR Wetland Accreditation Scheme. The Colombo wetlands network comprises of wetlands in Baddagana, Diyasaru, Heen Ela, Kolonnawa, Kotte, Maddinnagoda, Mulleriyawa and Thalangama Wetlands. However, currently there seems to be a minimum concern on protecting these wetlands. Hence, The Capital City Development Plan is prepared with thorough concerns on wetland conservation and wise-use. Accordingly, it introduces 'Environmental Sustainable Plan' particularly to conserve the wetland character of the Capital City. Further, Environmental Sustainable Strategies are formed as a responsible interaction with the environment to avoid deprivation of natural resources, prevent disasters and assist long-term environmental quality of the planning area.



The natural setting of the capital city in the Kelani River basin could be identified as one of the prominent reasons behind flood inundation. Even though the area consists of natural wetlands to retain the overflow of river during rainy seasons, the unplanned and uncontrolled developments covered wide areas across the city areas aggregate the risk of flood. The reason for these unauthorized developments in the Capital City could be the high demand for land in the area as for the low land value and close proximity to the commercial capital, Colombo. However, the low land availability in the area has encouraged the interested parties to encroach the network of wetland system reclaim canals which increases the runoff of the area gradually. As a result, the natural drainage system has been disturbed, the flood risk has risen and most importantly, investors have been discouraged to invest in the area. Hence, the intention of the Environmental Sustainable Strategy is to create a 'Green Blue Network' in order to develop the capital city among the chain of wetlands while conserving other green and blue characters of the area.

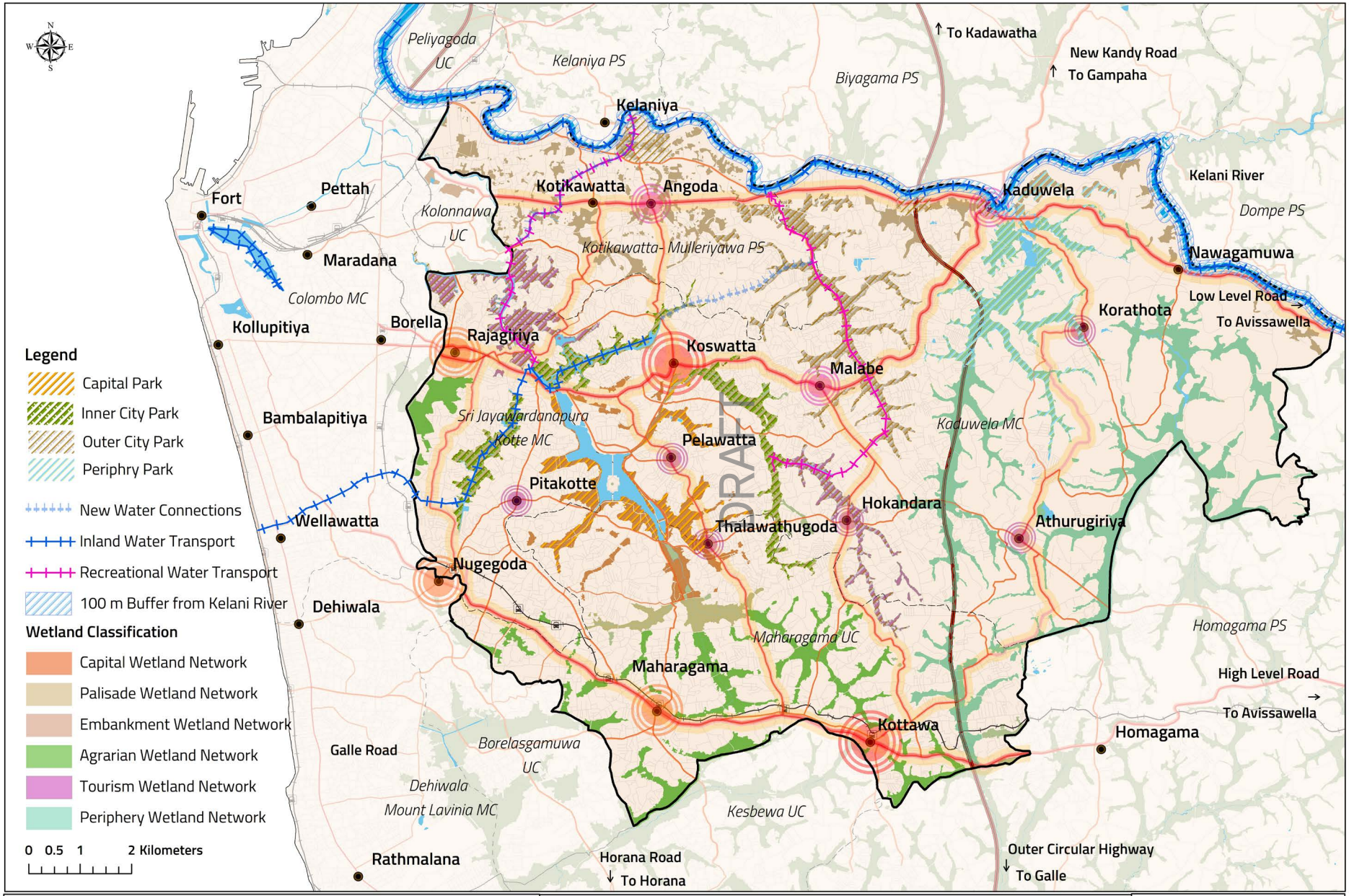
## 9.1.1. The Approach

The 'Capital City Development Plan' emphasizes the goal, 'The experience of a city bloomed in a chain of wetlands' as the inherent strength of 'The Capital City' lies on its prevailing green environment and it is important that this potential is used to the fullest. 'The Capital City Development Plan' has recognized three objectives to initiate the opening up of the eco system in the area to bloom the city with green and blue feature. They are,

- *To conserve 100% wetland ecosystem for the environmental stability by 2030*
- *To create the hierarchical enclosure, through the wetlands by 2030*
- *To open up the wetlands, to achieve the 100% open space demand while increasing the real estate Value by 2030*

# 9.2. Scope

- *The planning framework covered by this strategy includes existing green network and blue network within the planning area.*
- *The strategy introduces 'Environmental Sustainable Strategy' specially to conserve the wetland character of the Capital City.*
- *All strategic projects, proposed in this section of the Development Plan are expected to serve the Planning area within the time durations specified in Chapter 1 of the Development plan. Situations beyond these time durations will have to be dealt with timely updating of the Development Plan.*




**Composite Map**
Wetland Management Stratergy of Capital City Development Plan

**Data Source:**
Urban Development Authority

**Prepared By:**
Western Province Division & Research & Development Division

Urban Development Authority
June 2018

**Map 9.1:** Composite Map of Wetland management Strategy
**Source:** Western Province Division and Research & Development Division, UDA 2018

# 9.3. Strategic Interventions for Wetland Management

Wetland Management Strategy has two strategic Interventions as below:

1. *Strategic Intervention for Green Network Management*
2. *Strategic Intervention for Blue Network Management*

## 1. Strategic Intervention for Green Network management

The main intention of developing Green Network Strategic Intervention is to enhance the capital city bloom splendidly among the wetland chain. It consists of three strategies in order to mitigate flood and open up wetlands to the public while conserving them to future generations. They include,

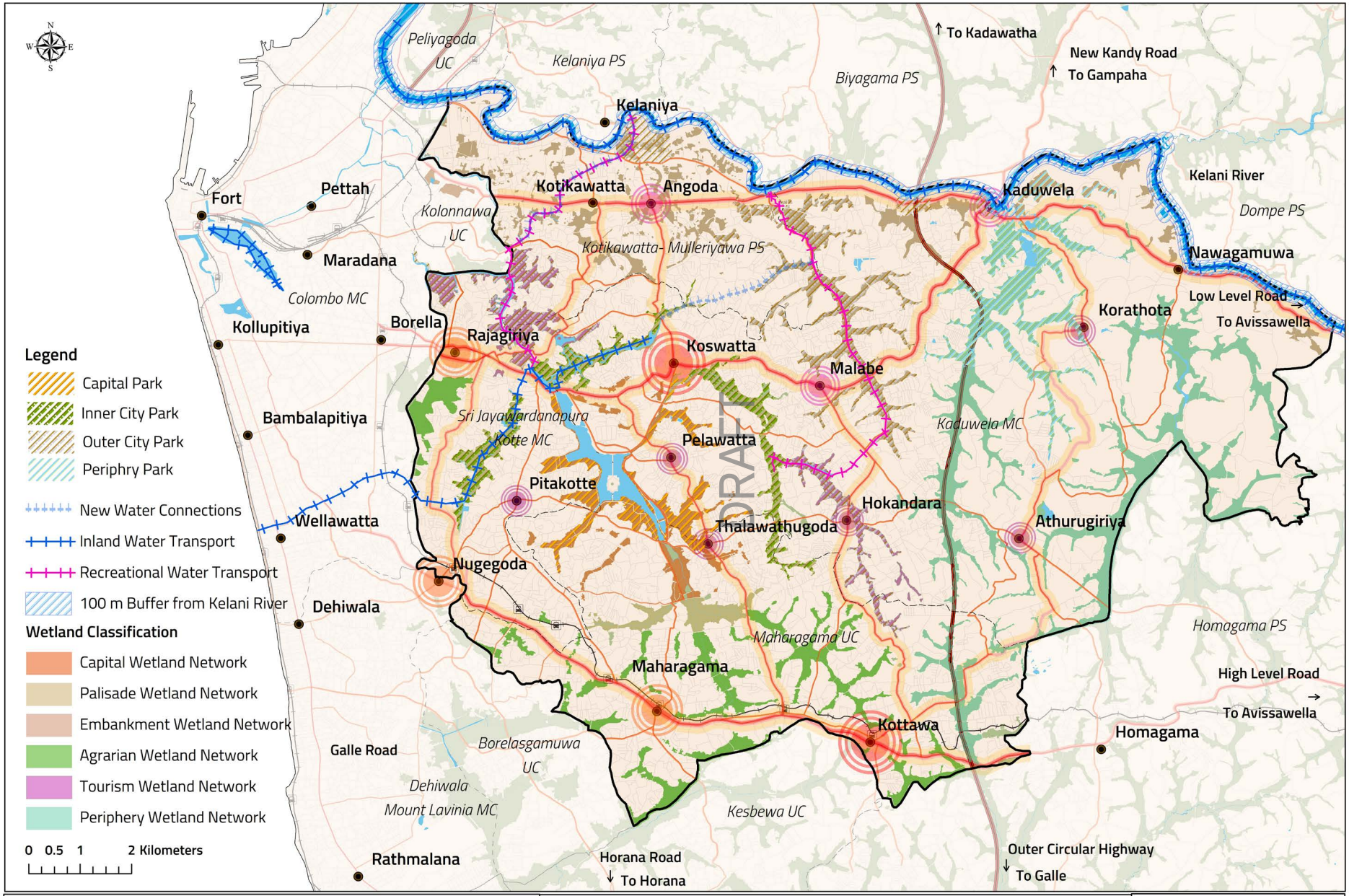
**Strategic Project 1:** *Wetland Classification Strategy*
**Strategic Project 2:** *Park Development Strategy*
**Strategic Project 3:** *Green Preservation Strategy*

## 2. Strategic Intervention for Blue Network Management



In order to mitigate the threat of flood further, 'The Blue Network Strategic Interventio' is developed. Accordingly, three strategies are used. The first strategy is to maintain the buffer along Kelani River. The second is to interconnect the existing reservoirs, water bodies and green feature by connecting missing links and creating new paths to form an extensive water-networked city. Third strategy is to develop the blue infrastructure network.

**Strategic Project 1:** *Buffer Development*
**Strategic Project 2:** *Blue Network Development*
**Strategic Project 3:** *Water Transport Development*



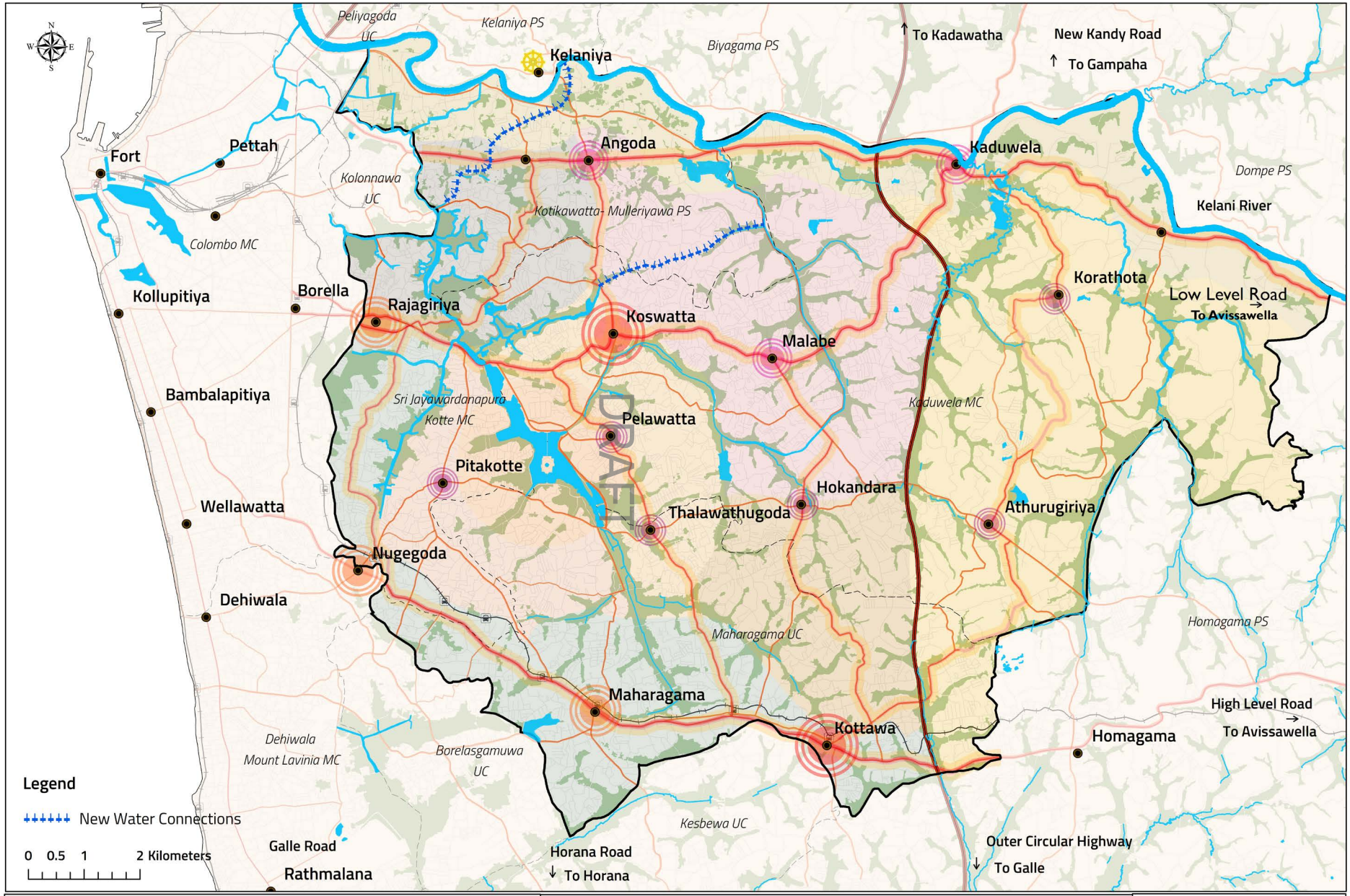

**Composite Map**
Wetland Management Stratergy of Capital City Development Plan

**Data Source:**
Urban Development Authority

**Prepared By:**
Western Province Division & Research & Development Division

Urban Development Authority
June 2018

**Map 9.2:** Composite Map of Green Network Management
**Source:** Western Province Division and Research & Development Division, UDA 2018




**Proposed New Water Network**
Wetland Management Strategy of Capital City Development Plan

**Data Source:**
Western Region Megapolis Planning Project

**Prepared By:**
Western Province Division & Research & Development Division

Urban Development Authority
June 2018

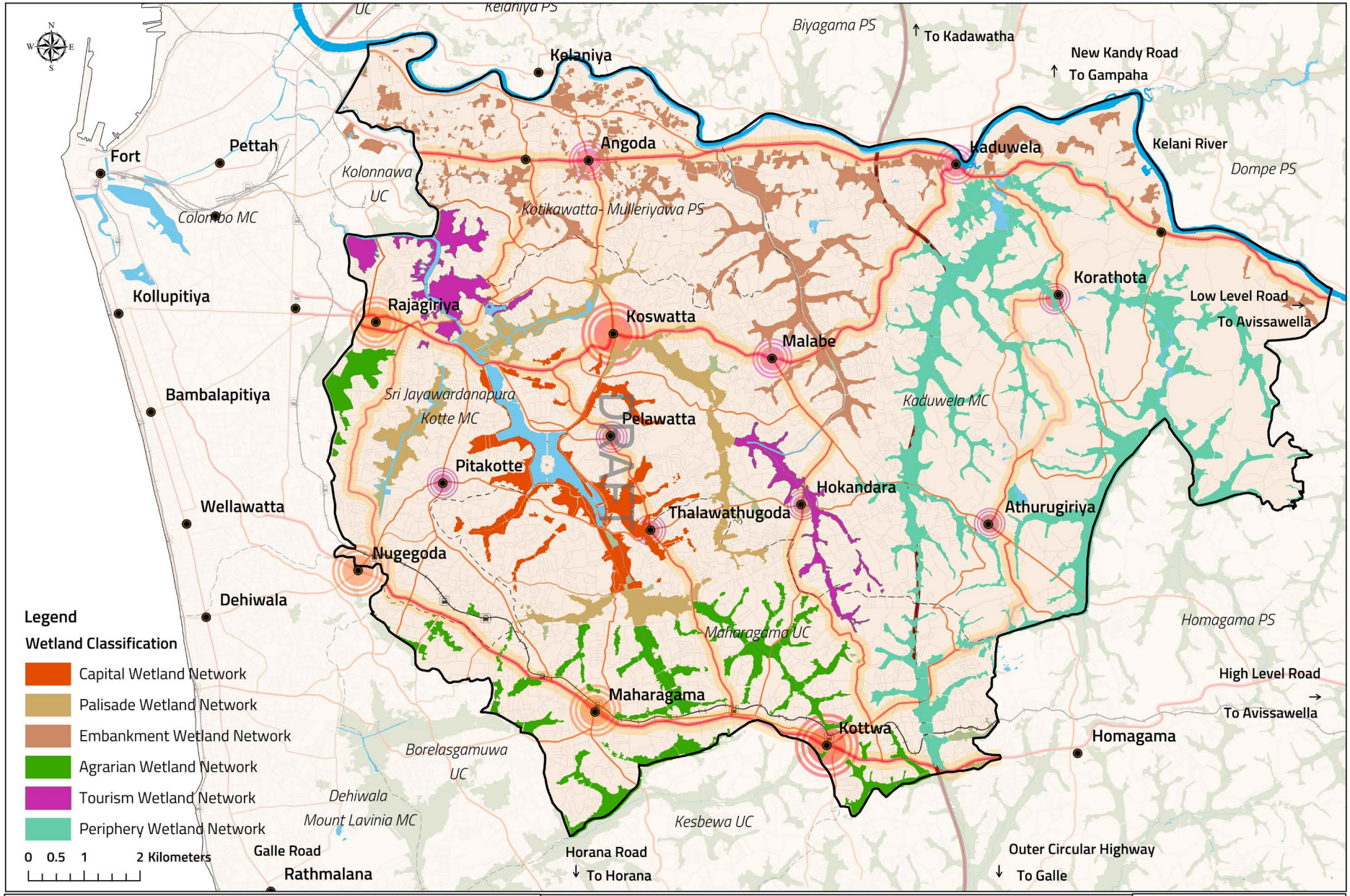
**Map 9.3:** Proposed New Water Network Connection
**Source:** Western Province Division and Research & Development Division, UDA 2018

# 9.4. Strategic Projects in Wetland Management Strategy

## Strategic Intervention 1

### **Strategic Project 1:** Wetland Classification

The intention of wetland classification is to guide the developers of wetlands and form a unique image and identity to each wetland. The entire wetland network which is located within the 'Citadel' is classified as 'The Royal Park'. Through these it is expected to mitigate the threat of flood in the Citadel Area. The wetland network in 'The Inner City' is considered a 'Palisade Wetland Network' which is to convey the feeling of entering 'The Citadel' and enclose the 'The Inner City'. The wetland in 'The Outer City' is classified under three parts including, an embankment wetland network to maintain current retention capacity while reducing the speed of the water flow during the rainy seasons, a tourism wetland network to conserve the green feature and promote tourism related activities and an agrarian wetland network in order to encourage the agriculture related companies to invest on those wetlands for agriculture related activities. The wetland network spread over 'The Periphery Area' is specially to serve 'The Residential Zone' of the Capital City. The wetlands identified as paddy fields and the ones which do not fall under the above classifications are expected to remain unchanged.



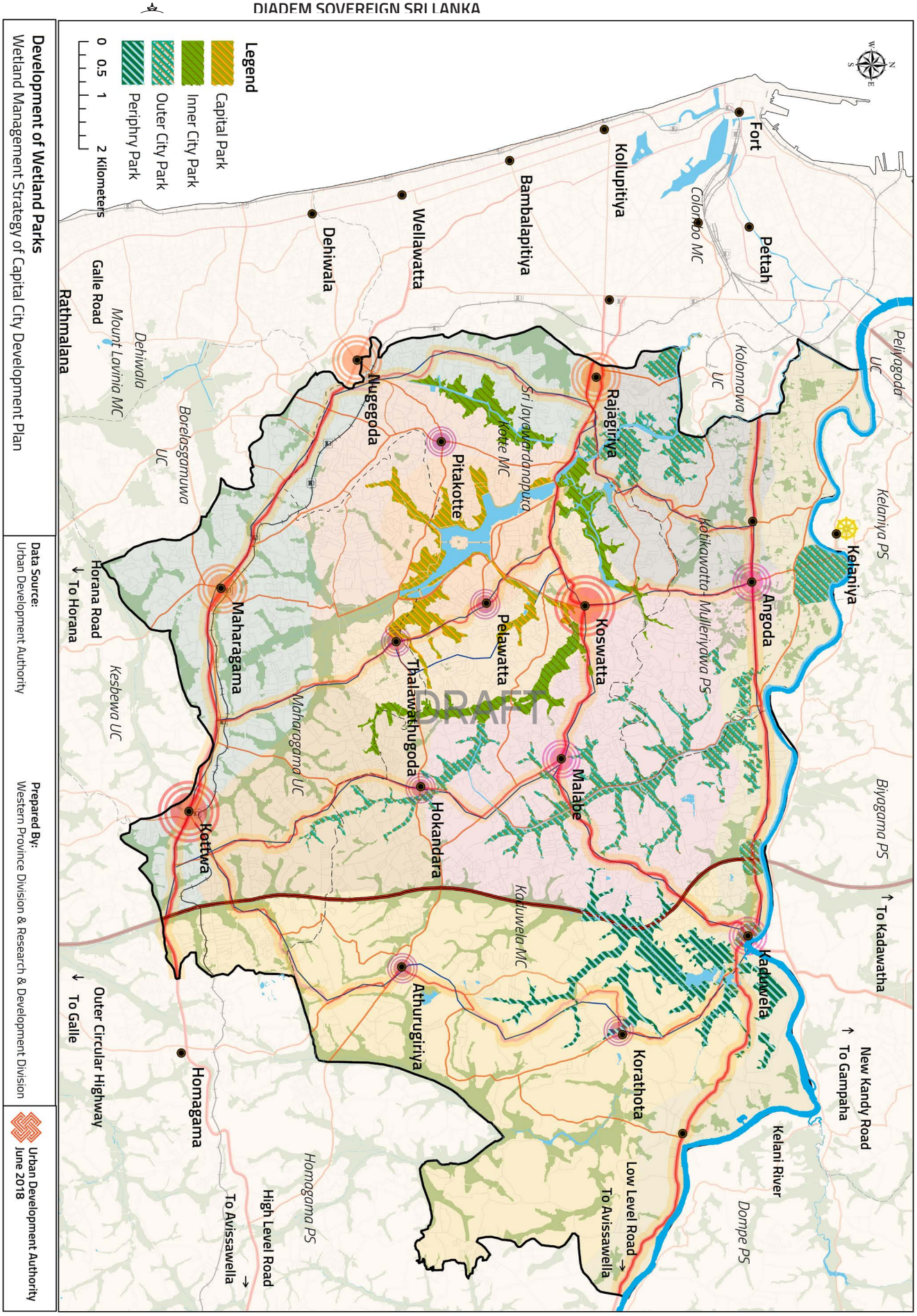

**Wetland Classification**
Wetland Management Strategy of Capital City Development Plan

**Data Source:**
Urban Development Authority

**Prepared By:**
Western Province Division & Research & Development Division

Urban Development Authority
June 2018

**Map 9.4** Wetland Classification in Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018




**Map 9.5:** Proposed Wetland Parks in the Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018

The second strategy of the wetland conservation is the proposal of 'Park Development.' This strategy ensures wetland conservation and fulfills the open space demand of the area. Accordingly, four types of parks are proposed with different characters based on the hierarchical level of royalty.

- **Center Park**

The Center Park is a connection of Baddagana Marsh, Bird Park Marsh and Parliament Road marsh and with an area of 2.94km2. Through the intiatives It is expected to reduce the flood risk of the area.


**Figure 9.1:** Image of Center Park in Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018

- **Inner city Park**

Two Inner City Parks are proposed for Thalangama Marsh, Kotte Marsh and Diyatha Uyana Marsh with A total area of 2.96km2.

**Figure 9.2:** Inner City Park in Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018

- **Outer City Park**

Outer City Parks are proposed for wetlands located in Kolonnawa, Madinnagoda, Thalangama, Malabe, Mulleriyawa and Kelanimulla. Specifically, a part of Thalangama Wetland is to be developed as a tourist related park, Malabe and Mulleriyawa to be developed as an office space development park and the unclassified marsh in Kelanimulla wetland to be developed in order to reduce high flood risk in the area while performing as a facilitator to the newly proposed third order city in Kottikawatta- Angoda Node and conveying the sense of the Capital City for the travellers who process towards the Capital City from Gampaha district .


**Figure 9.3:** Outer City Park In Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018

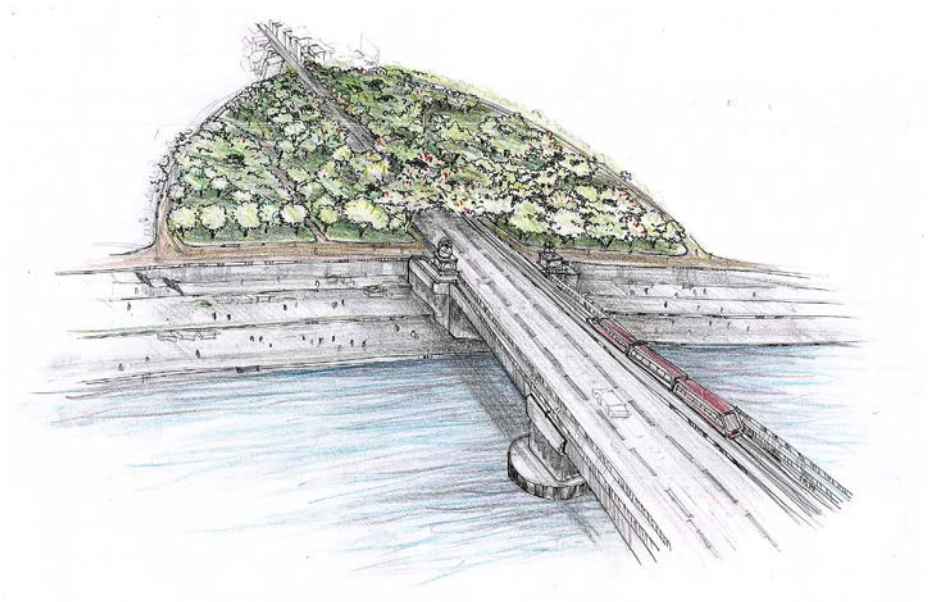


**Figure 9.4:** Outer City Park in Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018

- **Periphery Park**

The Periphery Park is proposed for Kaduwela Marsh within a total area of 3.22km2 to develop as an adventure park to serve the dwellers and visitors.

**Figure 9.5:** Periphery Park in Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018



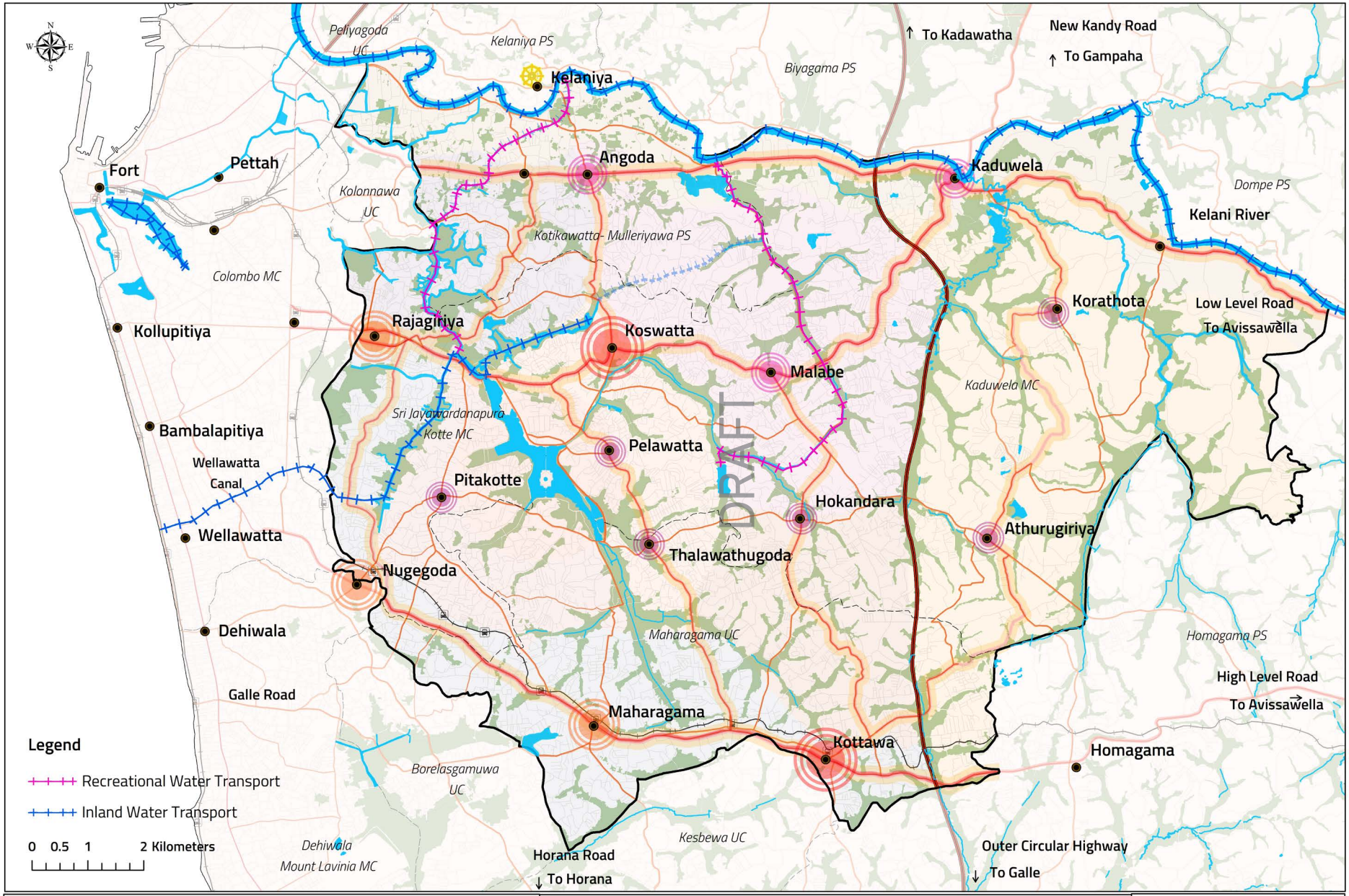
## Strategic Intervention 2

### **Strategic Project 01:** Buffer Development

A 100m buffer zone is proposed along the Kelani River including an area of 5.41km2 and a length of approximately 25km in order to reduce the disturbance on water flow. As per the Land Development Ordinance No: 19 of 1935, the following specifications are considered for stream reservation.

| River with (m) | Width of stream reservation (m) |
|---|---|
| Less than 4.6 | 20 from the bank each side |
| 4.6 – 15.2 | 40 from the bank each side |
| More than 15.2 | 60 from the bank each side |

**Table 9.1:** River width and Width of stream reservation according to Land Development Ordinance
**Source:** The Land Development Ordinance No.19 of 1935




**Inland Water Transport System**
Wetland Management Plan of Capital City Development Plan

**Data Source:**
Western Region Megapolis Planning Project

**Prepared By:**
Western Province Division & Research & Development Division

Urban Development Authority
June 2018

**Map 9.6:** Map of Inland Water Transport
**Source:** Western Province Division and Research & Development Division, UDA 2018


**Proposed Reservation Area of Kelani River**
Wetland Management Strategy of Capital City Development Plan

**Data Source:**
Urban Development Authority,2018

**Prepared By:**
Western Province Division & Research & Development Division

Urban Development Authority
June 2018

**Map 9.7:** Proposed Reservation Area of Kelani River
**Source:** Western Province Division and Research & Development Division, UDA 2018

The width of Kelani River is more than 15.2m. Permanent structures are restricted within the buffer of 60m and remaining 40m is released for development under special regulations. The proposed landscaping project is designed to discourage encroachments and gain visual access of the river. Moreover, the Kelani River Bridge is given special attention to be re-designed with a royal architectural touch as it connects two districts, Colombo and Gampaha.


**Figure 9.6:** Expected Image on Kelani River Reservation
**Source:** Western Province Division and Research & Development Division, UDA 2018

## **Strategic Project 02:** Blue Network Development

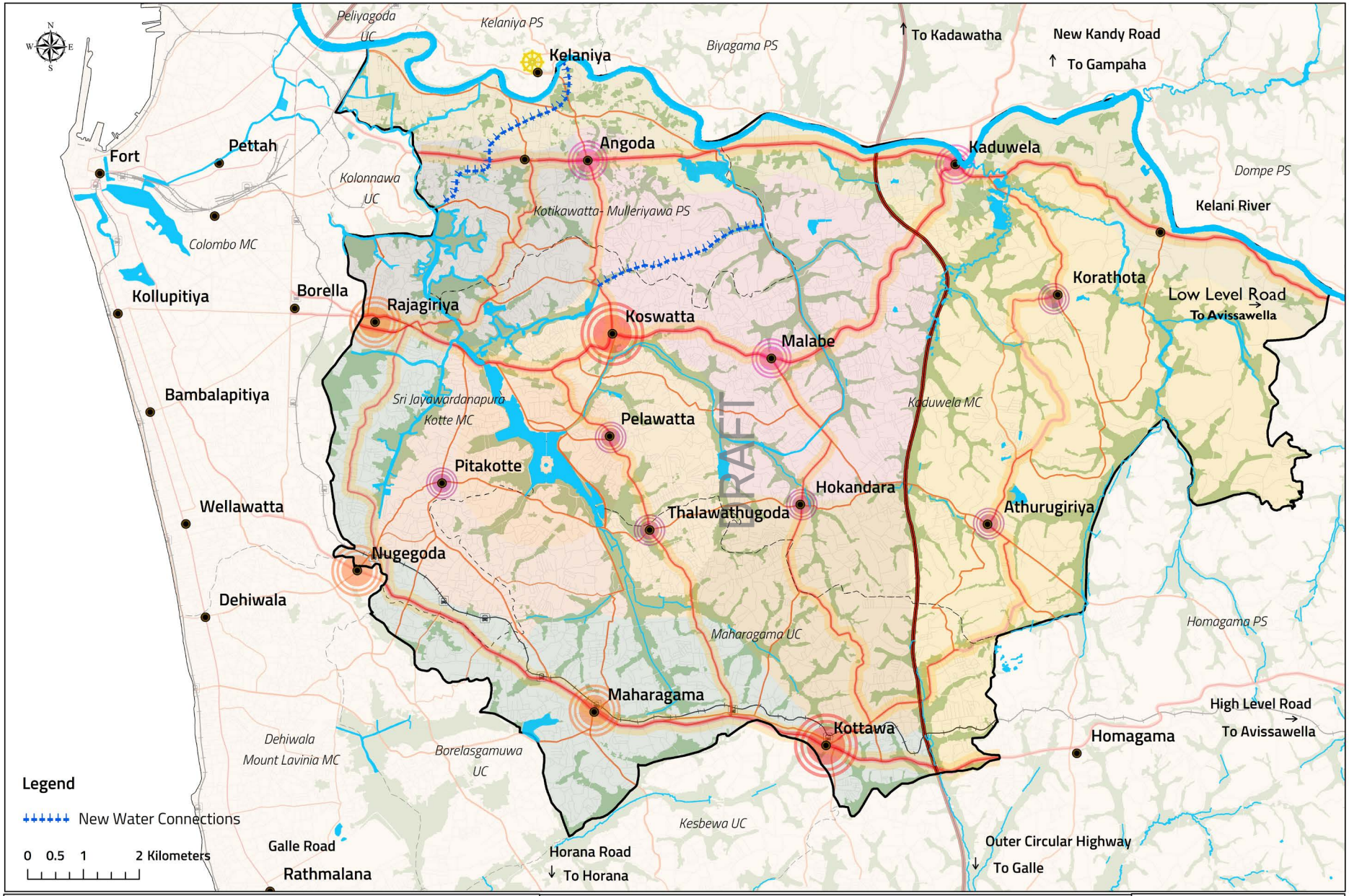
According to The Flow Direction Analysis, the length of missing links along the canal network is 7km. The plan proposes to develop the above mentioned missing links with the purpose of maintaining the exact green and blue network. Further, it is expected to mitigate the flood risk and create a pleasant natural environment which could enhance the image of capital city.

## **Strategic project 03:** Water Transport Development

It is expected to promote a water transport service with a total length of 14km for the area through the connection improvement done. It is assumed to reduce the reclamation of canals in the area. The SLLRDC has proposed a passenger transport service connecting from Wellwatta to Battramulla via Wellawatta canal and Diyawanna Oya. Hence, UDA has proposed a small scale new canal connection for the purpose of passenger transport from Battaramulla to Kelani River and from Malabe to Thalangama tank. However, the proposed canal is not suitable for large scale passenger transport due to the depth of the canal. Hence, it is expected to be used for leisure activities. Along with the canal improvement project, it is anticipated to landscape beside the canal to change the character of Kotikawatta Area in order to match the character of proposed Capital City.



**Figure 9.7:** Expected Improvement along the Canal in Capital City
**Source:** http://www.midlandsinbusiness.com/2017/07/residents




**Proposed New Water Network**
Wetland Management Strategy of Capital City Development Plan

Data Source:
Western Region Megapolis Planning Project

Prepared By:
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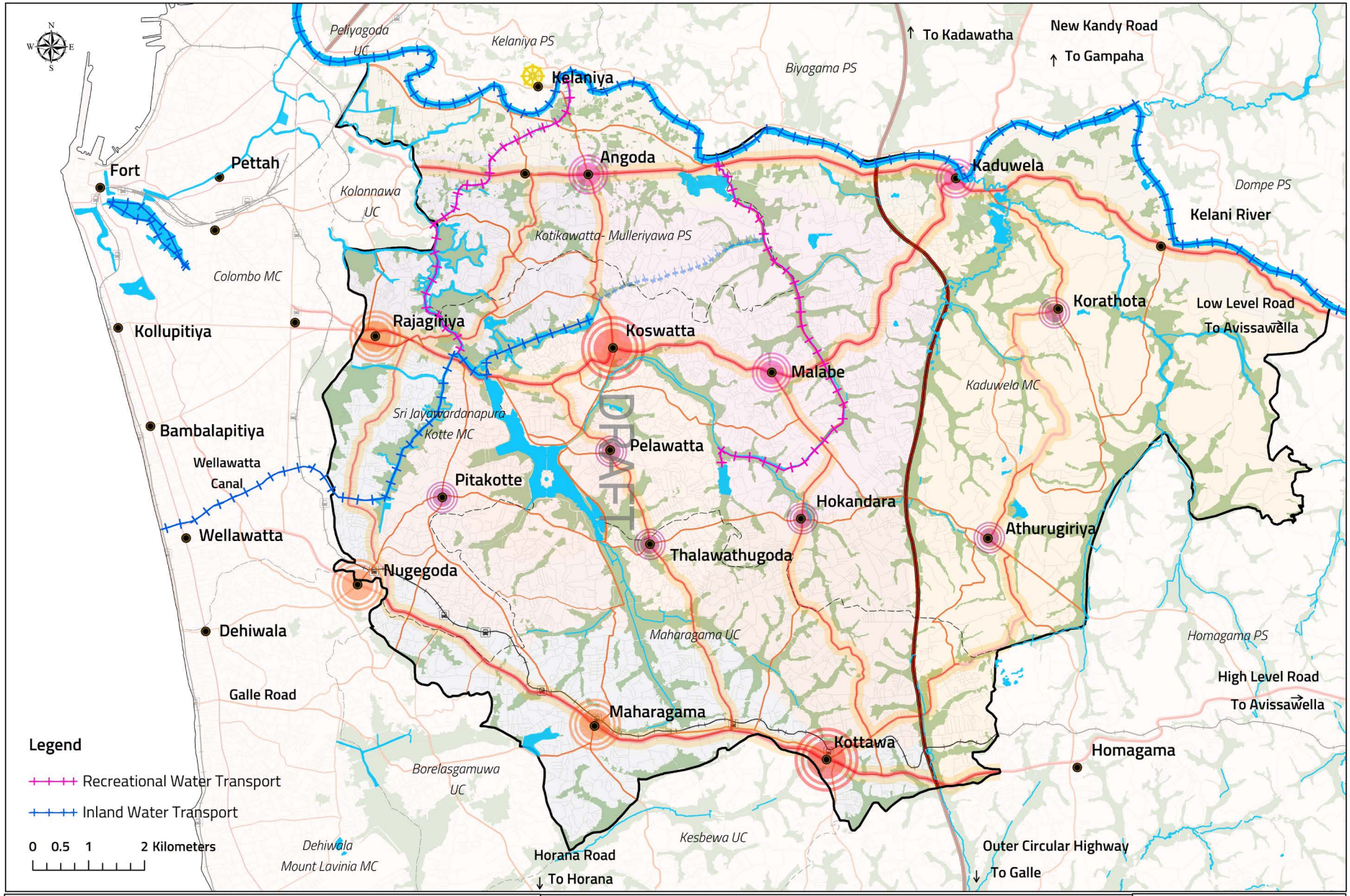
June 2018

**Map 9.8:** Proposed New Water Network Connection
**Source:** Western Province Division and Research & Development Division, UDA 2018




**Inland Water Transport System**
Wetland Management Plan of Capital City Development Plan

**Data Source:**
Western Region Megapolis Planning Project

**Prepared By:**
Western Province Division & Research & Development Division

Urban Development Authority
June 2018

**Map 9.9:** Canal Improvement in Capital City Plan
**Source:** Western Province Division and Research & Development Division, UDA 2018

| Project Type | Project Code | Project Name |
|---|---|---|
| Green Network Management | SI-W-1 | Thalangama Marsh related Park Project |
| | SI-W-2 | Capital City Park Project |
| | SI-W-3 | Canal Regeneration Project |
| | SI-W-4 | Kolonnawa Tourism Development Marsh related Park Project |
| | SII-W- 6 | Diyatha Uyana Extension Park |
| | SII-W- 7 | Eco-friendly Nature Park Project |
| | SII-W -8 | Megoda Kelaniya Marsh related Park Project |
| | SII-W -9 | Kaduwela Marsh related Park project |
| | SIII-W-12 | Malabe Marsh related Park Project |
| | SIII-W-13 | Green Walkway Project at Thalangama Tank |
| Blue Network Plan | SII-W- 5 | Maintain Buffer along Kelani River |
| | SII-W -10 | Interconnection of Missing links of water bodies |
| | SIII-W-14 | Redesign Kelani River Bridge |
| | SII-W -11 | Passenger Transport Development (Wellawaththa to Baththramulla) - SLLRDC |

**Table 9.2:** Strategic Projects in Wetland Management Strategy
**Source:** Western Province Division and Research & Development Division, UDA 2018



## 9.5. Impacts of the wetland Management Strategy

The Wetland Strategy intents to conserve the green and blue components with main tasks, namely, mitigation of flood risk, protection of bio diversity, supply of open space demand and enhancement of real estate market in the area. These initiatives are used to conserve 100% of the wetland network as the area is prone to flood risk. Further, this proposal is able to maintain the identified retention capacities of the identified catchments.

**Consideration :**

*Total Area of Wetlands of Capital City: 33467890sqm2*
*Area of Metro Colombo Region wetland: 19091336sqm2 (57.04%)*
*Area of Remaining Wetland of Capital City: 14376554sqm2 (42.9%)*
*Metro Colombo Region Wetlands Network retain 30.42% of storm water*

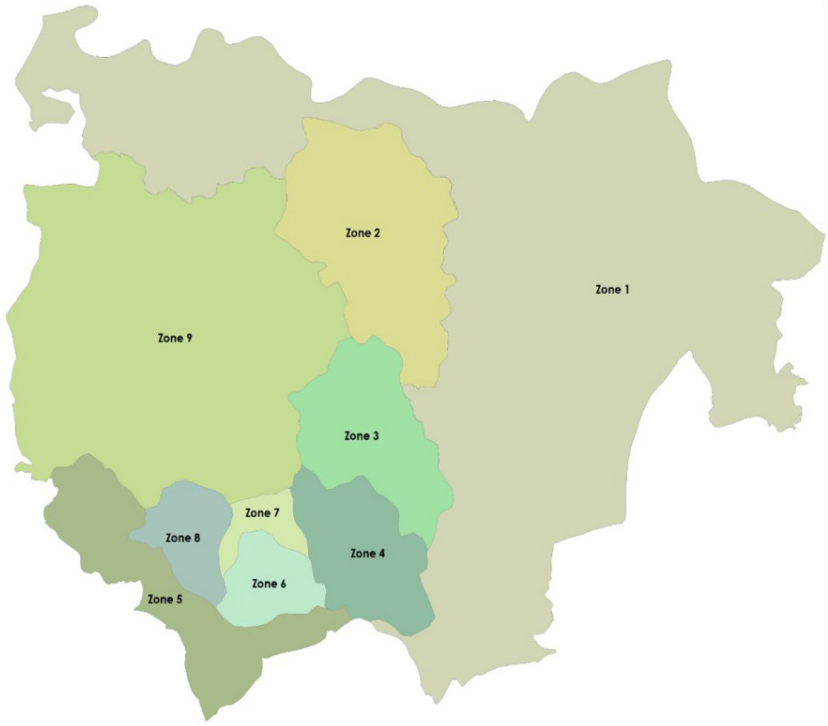



**Figure 9.8:** Water Catchments of the Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018



| Catchment | Wetland Area | Retention Capacity |
|---|---|---|
| Zone 1 | 15560000 | 20.76356299 |
| Zone 2 | 2590000 | 3.456145767 |
| Zone 3 | 1400000 | 1.868186901 |
| Zone 4 | 1170000 | 1.561270482 |
| Zone 5 | 1164000 | 1.553263967 |
| Zone 6 | 680000 | 0.907405066 |
| Zone 7 | 9690000 | 12.9305222 |
| Zone 8 | 440000 | 0.587144455 |
| Zone 9 | 8440000 | 11.26249818 |
| **Total** | **41,134,000** | **54.89** |

**Table 9.3:** Retention Capacities of the Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018

According to the analysis of Sri Lanka Land Reclamation and Development Corporation, the annual GDP loss for Colombo is expected to be 1.3% as a result of the reduction of wetlands in Metro Colombo Region

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**WETLAND MANAGEMENT STRATEGY**

Impacts of the wetland Management Strategy

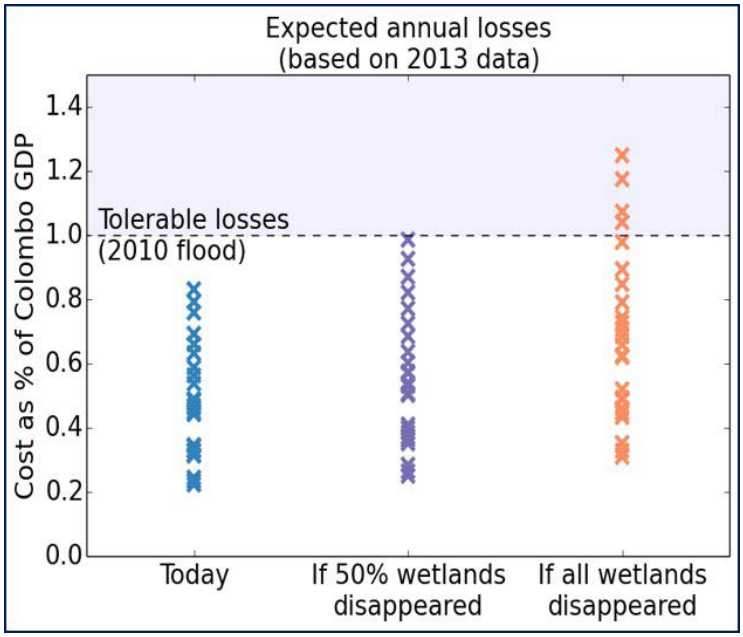



**Figure 9.9:** Expected Annual Losses by Flood
**Source:** Western Province Division and Research & Development Division, UDA 2018

Then annual Colombo GDP loss of the area is assumed to be 1.94%, if the entire wetland network disappears in the Capital City Planning area. The wetland network assists to maintain the drainage system of the area as follow,



| Catchment | Total land area(sq.m) | Runoff of the Area CIA | Retention Capacity% | Retention Capacity m3/h | Remaining Runoff of the Area |
|---|---|---|---|---|---|
| Zone 1 | 79,950,533.59 | 5,190,563.78 | 20.73 | 1,076,003.87 | 4,114,559.91 |
| Zone 2 | 38,402,609.08 | 2,469,717.78 | 3.45 | 85,205.26 | 2,384,512.51 |
| Zone 3 | 13,359,593.11 | 818,735.19 | 1.86 | 15,228.47 | 803,506.71 |
| Zone 4 | 8,019,271.59 | 504,881.50 | 1.56 | 7,876.15 | 497,005.35 |
| Zone 5 | 9,118,129.74 | 625,182.42 | 1.55 | 9,690.33 | 615,492.10 |
| Zone 6 | 3,198,472.57 | 138,068.90 | 0.91 | 1,256.43 | 136,812.47 |
| Zone 7 | 1,563,162.43 | 138,068.90 | 12.93 | 17,852.31 | 120,216.59 |
| Zone 8 | 3,054,445.82 | 254,922.07 | 0.58 | 1,478.55 | 253,443.52 |
| Zone 9 | 6,519,974.75 | 549,895.40 | 11.26 | 61,918.22 | 487,977.18 |
| **Total Area** | **163,186,192.69** | **10,690,035.95** | **54.89** | **5,867,760.73** | **9,413,526.36** |

**Table 9.4:** Runoff of the Capital City with Existing Land Use
**Source:** Western Province Division and Research & Development Division, UDA 2018

The conservation of wetland network in the area contributes to cater 100% open space demand in the Capital City area as follow.

According to the Urban Development Authority standards, it is essential to provide 1.4 ha of open space for 1000 people in order to attain 100% open space demand. It can be achieved as below.

| Area | Population | Required Open Spaces(Acres) | Provision of Open Spaces (Acres) |
|---|---|---|---|
| Citadel Area | 46617 | 160 | 930 |
| Inner & Outer City Area | 644713 | 2231 | 5386 |
| Periphery Area | 202858 | 701 | 2311 |

**Table 9.5:** Open Space Demand of the Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018

According to the 'American Planning Association - 2018 Standards for Outdoor Recreational Areas.' [ONLINE] Available at: https://www.planning.org/pas/reports/report194.htm. (Accessed 18 September 2018), the estimated park needs of a city for 100,000 people are as below,

| Recreational Uses | Area (acres) |
|---|---|
| Reservations | 700 |
| 1 large city park | 400 |
| 10 neighborhood parks | 250 |
| 50 playgrounds | 100 |
| gardens and squares | 50 |
| **Total** | **1500** |



**Table 9.6:** Standard of the Recreational Uses
**Source:** www.planning.org/pas/reports/report194.htm

| Citadel Area | Population | Required Open space (Acres) | Provision Of Open Space |
|---|---|---|---|
| Passive Open Space | 46,617 | 350 | |
| Active Open Spaces | | 400 | 930 |
| Total Open Spaces | | 750 | 930 |
| **Inner City & Outer City** | **Population** | **Required Open space (Acres)** | **Provision Of Open Space** |
| Passive Open Space | 644,713 | 4513 | 236,441 |
| Active Open Spaces | | 5158 | 68,839.75 |
| Total Open Spaces | | 9671 | 305,280.75 |
| **Periphery** | **Population** | **Required Open space (Acres)** | **Provision Of Open Space** |
| Passive Open Space | 202,858 | 1430 | 86,352.9 |
| Active Open Spaces | | 1643 | 32,249.37 |
| Total Open Spaces | | 3043 | 118,602.27 |

**Table 9.7:** Open Space Demand of the Capital City
**Source:** Western Province Division and Research & Development Division, UDA 2018

The intervention of park development is to influence the prices of real estate market. According to the research carried out by The Department of Estate Management and Valuation, 'Real Estate Market Responses in Urban Change in Administrative Capital', 41% of land value has increased for residential use and 77% land value has increased for commercial use within the least distance of 0.5 km from Diyatha Uyana Park. Based on this scenario, it can be assumed that same result would apply for the area of 81 km2 by the proposed park development of Capital City Development Plan.



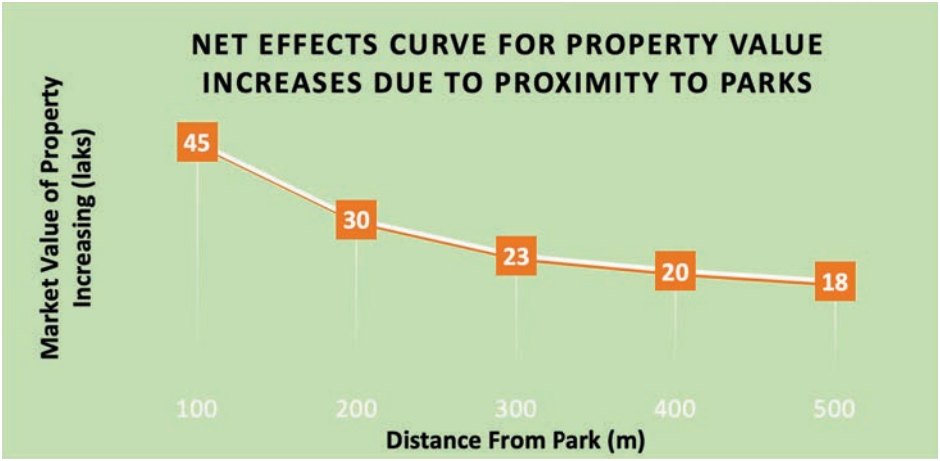
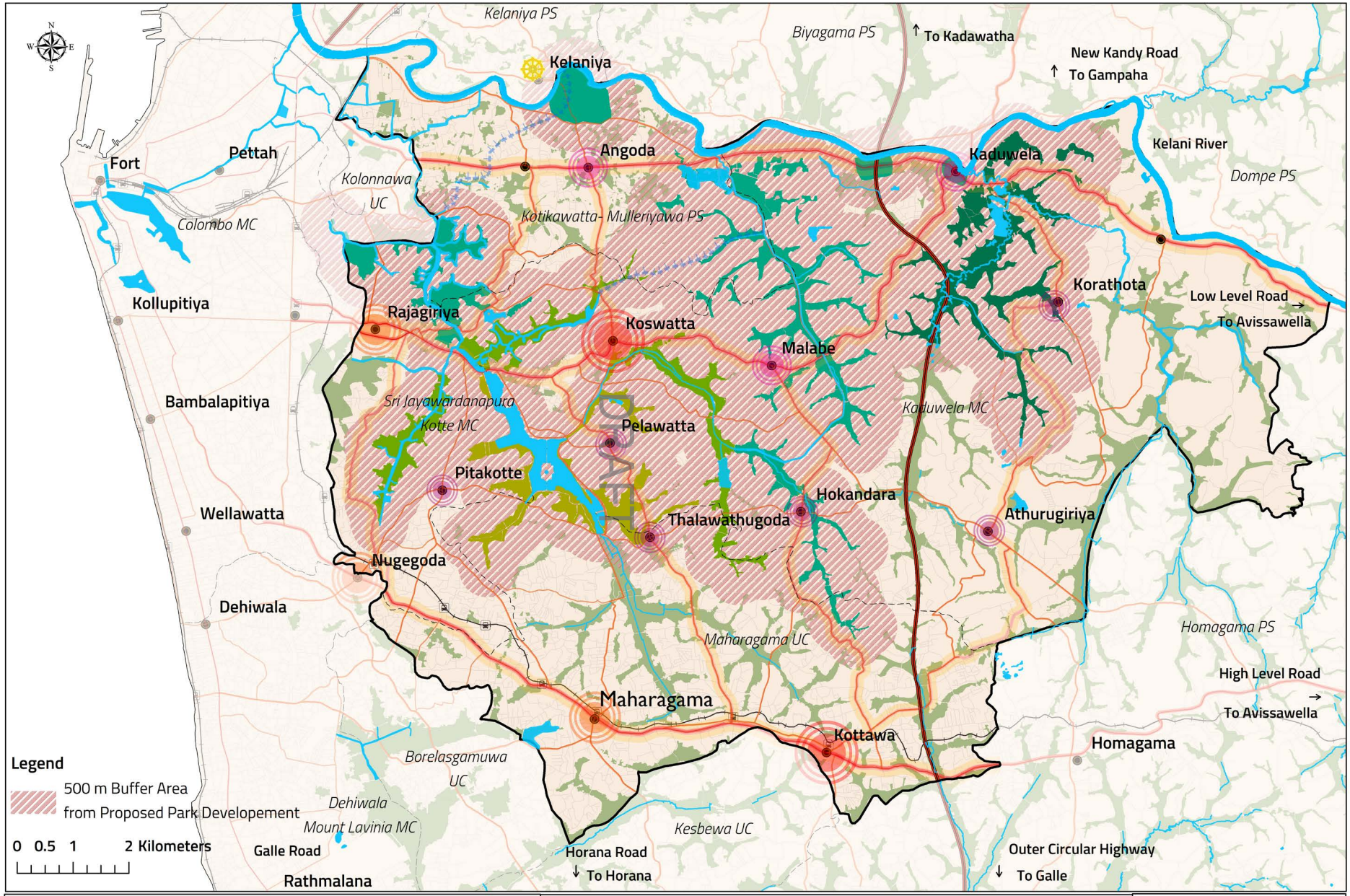



**Figure 9.10:** Poperty Value Changes with the wetland Improvement
**Source:** Western Province Division and Research & Development Division, UDA 2018




**Land Value Vs Urban Park Development**
Wetland Management Strategy of Capital City Development Plan

Data Source:
Urban Development Authority

Prepared By:
Western Province Division & Research & Development Division

Urban Development Authority
June 2018

**Map 9.10:** Impact of the Capital City with the wetland park improvement
**Source:** Western Province Division and Research & Development Division, UDA 2018

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**Impacts of the wetland Management Strategy**

Apart from major impacts generated through the green network conservation, it would be able to maintain the bio-diversity, maintain the ground water level and combination of air particles of the atmosphere. Most importantly, the blue network transport service proposals would be able to reduce the traffic generation of the area.