Colombo Commercial City Development Plan – 2030

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The City in Water

Volume I

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Colombo Commercial City Development Plan – 2030
Volume 1

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Colombo Commercial City Development Plan – 2030 is delivered through a series of publications; Volume 01, 02 & 03. Volume 01 contains the situational analysis and the explanations on the need of a plan. Volume 02 contains a detailed elaboration on the plan including vision, goals, objectives, broader strategies, strategic projects and implementation mechanism. Volume 03 is a separate document which contains both special and general Planning & Building Regulations applicable to Colombo Commercial City within the period of 2019 – 2030.

Colombo Commercial City Development Plan – 2030 was prepared by Western Province Division and Research & Development Division of Urban Development Authority with the consultation of relevant stakeholder agencies.

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Acknowledgments

Preparation of Colombo Commercial City Development Plan (CCCDP) is a collaborative work undertaken by the Western Province and Research & Development Divisions of Urban Development Authority in consultation with relevant stakeholder agencies. Throughout the process which continued for nearly one and half years, there were many who contributed to CCCDP in numerous ways.

Our sincere gratitude is extended to the Minister of Megapolis & Western Development, Honorable Dinesh Gunewardena for his guidance and support in making this exercise a success. The counsels and support given by Secretary to the Ministry of Megapolis & Western Development and the fellow staff at Ministry are also highly valued at this point.

Our special thanks is extended to the Mayors, Chairmen, Council Members, Commissioners and staff of all 08 Local Authorities; Colombo Municipal Council, Dehiwala Mt-lavinia Municipal Council, Boralesgamuwa Urban Council, Kolonnawa Urban Council, Peliyagoda Urban Council, Wattala-Mabola Urban Council, Wattala Pradeshiya Sabha and Kelaniya Pradeshiya Sabha for their great cooperation and contribution towards CCCDP.

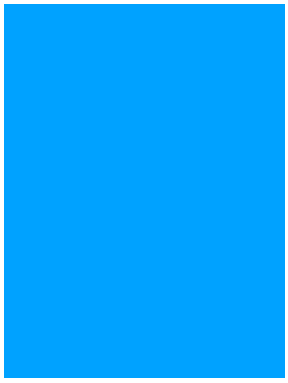
Special gratitude is extended to all relevant key stakeholder agencies of both state and private sector for sharing their comments, suggestions and ideas along with numerous valuable input data without which the CCCDP won't be a reality. The comments, recommendations and suggestions given by general public; especially the Colombo Community in the means of participating in stakeholder meetings, focused group discussions, business forums, through the website and other social media are also highly appreciated.

Chairman of Urban Development Authority, Dr. Jagath Munasinghe is recalled with great appreciation for initiating the process of preparing CCCDP, guidance given throughout by introducing many new innovative planning techniques and applications and for continuous supervision and encouragement given throughout the process. Special thanks is also extended to Director General of UDA, Eng. S.S.P. Rathnayake, Additional Director General, Deputy Director Generals and Directors of all Divisions of UDA for their encouragement, supervision and counsel given throughout. The continuous direct guidance and encouragement given by Director (Western Province & R&D) Plnr. Janak Ranaweera is also remarked with great appreciation.

Special gratitude is extended to Development Planning Division, Research & Development Division, GIS Division, Enforcement Division, Environmental & Landscape Division, Project Management Division and Urban Regeneration Project Office of UDA for their cooperation. In addition, all staff of UDA is remembered with utmost gratitude for their support towards CCCDP in numerous ways.

Further, special thanks is extended to outside parties who worked with us to make CCCDP a reality such as Mr. Indula Jayasekara for 3D visualization of special project areas, mooniak for designing of all publish materials, Ms. Krishani Perera for Strada Modeling and Mr. Gihan Wijewardhana for designing of presentation panels and all who contributed towards CCCDP in numerous ways.

Honorable Minister's Forward



Having established under the Act No. 41 of 1978, Urban Development Authority has completed 40 years of excellence service contributing for the urban development in Sri Lanka. It is at this moment, UDA remarks another milestone which is the completion of Colombo Commercial City Development Plan – 2030. Following to a comprehensive process which was carried out for nearly one and half years by the Colombo Commercial City Planning Team of Urban Development Authority, Colombo Commercial City Development Plan is now ready to be gazetted and implemented in order to direct the future of Colombo in a planned manner.

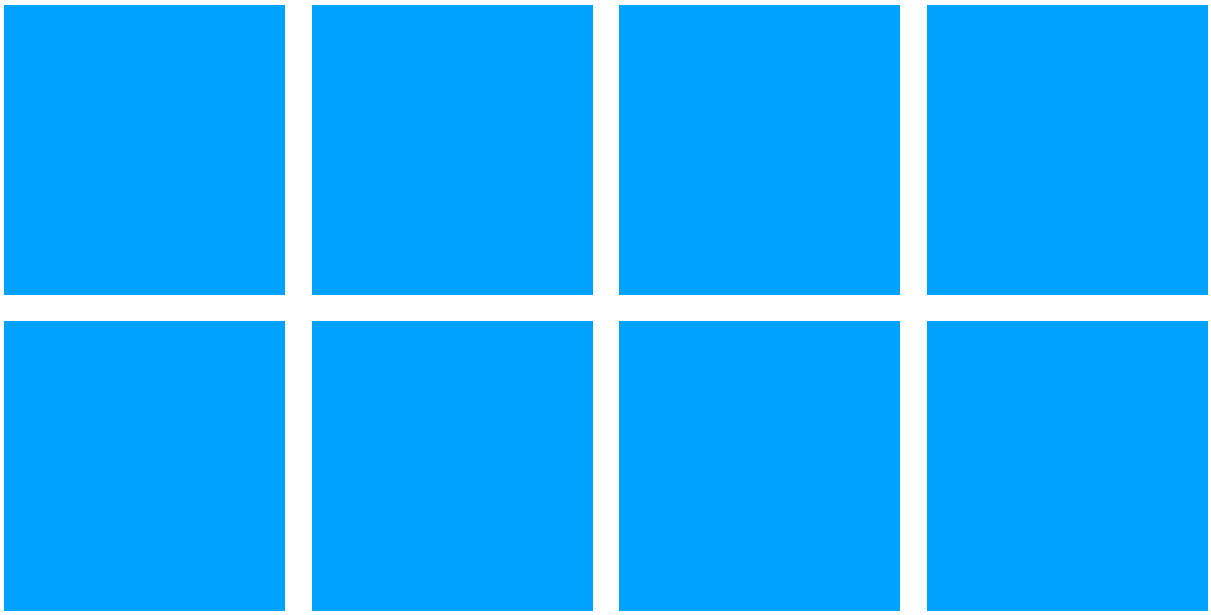
Colombo is the national commercial capital of Sri Lanka and also it has gained a considerable position in the international context as a vibrant South Asian Business Hub. The role of Colombo is very significant for the economy and the overall development of the whole country, thus the Colombo Commercial City Development Plan should be viewed in the perspective of a plan with both national and international scope and interests.

Our effort is to support Colombo's role as an international business hub by shaping up its physical environment while ensuring city livability standards and efficient functioning of the city with upgraded infrastructure facilities. Also, we aim at addressing prevailing city issues with strategic actions. The specialty of this plan is that it doesn't limits to solving of present prevailing issues but attempts to envisage a broader vision for the city while harnessing its untapped potentials so far.

As per my knowledge, this plan has been prepared with the application of numerous innovative contemporary city planning approaches, techniques and tools thus it can be recognized as milestone product of Urban Development Authority. In this regard, I appreciate the extraordinary efforts of the Chairman, Director General, Planning Team and all staff of Urban Development Authority who have contributed in numerous ways to successfully complete this assignment. Also, I appreciate the contribution given by relevant local authorities, state and private stakeholder agencies and general public by working equally on a same platform to make Colombo Commercial City Development Plan a success.

I expect that the Colombo Commercial City Development Plan will be successfully implemented during the coming decade and all stakeholders will jointly work together to ensure its successful implementation.

Message from Mayors and Chairmen of Local Authorities



We extend our gratitude towards Urban Development Authority for the initiative taken to prepare a common plan amalgamating our 08 Local Authority Areas into an integrated planning area as Colombo Commercial City. It is important to understand that the local authority boundaries drawn in legal documents are no longer reflected in real grounds, as all these areas function as a single entity accommodating the overspill of Colombo's urbanization. Hence, we believe, by adopting a single plan, we will be able to develop all 08 Local Authority Areas in an equal way following a shared vision.

We appreciate UDA's attempt to make Colombo Commercial City Development Plan a collaborative and participatory exercise by incorporating the recommendations, suggestions and criticisms given by us; the representatives of general public. Hence, we declare it as our plan and ensure our future collaboration and support in the implementation of Colombo Commercial City Development Plan within the next eleven years. Also, we request all citizens and stakeholders of Colombo Commercial City to act at individual and corporate levels to lead the city towards the shared vision as envisaged by the Colombo Commercial City Development Plan - 2030

Content

Chapter 01
Introduction

1.1. Background

1.1.1. Legality in Planning

Urban Development Authority (UDA) of Sri Lanka in its journey towards a planned, sustained and adored urbanization promotes integrated planning and implementation for economic, social, environment and physical development of the declared urban areas. It is the Act No. 41 of 1978 which grants the legal provisions for the establishment of UDA as well as provides the guidance for its duties and responsibilities. It is one of the mandatory duties of UDA to prepare Development Plans for the declared "Urban Areas".

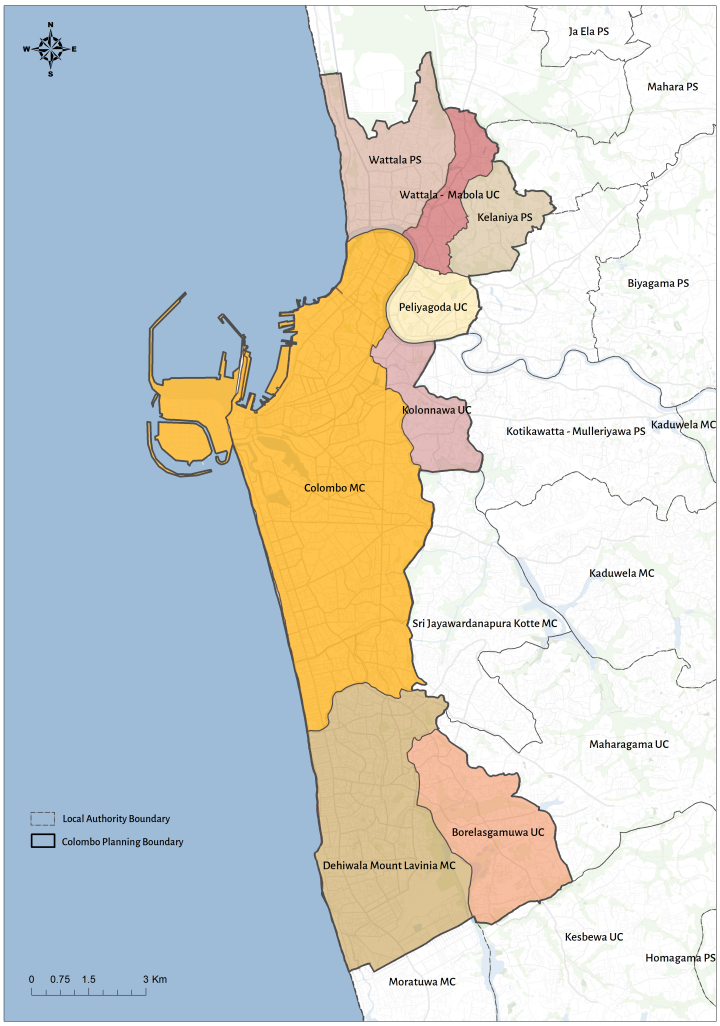


Figure 01: *Planning Area – 'Colombo Commercial City'*

Even though it has been the conventional practice to prepare development plans for each declared "Urban Areas" as separate entities, currently UDA attempts to capture the complications in urbanization trends and patterns which do not confine within the limits of declared "Urban Areas". Hence, when preparing the

development plan for the Colombo Commercial City Area, it includes not only the Colombo Municipal Council (CMC) Area but also adjacent local authorities including Dehiwala Mount-Lavinia Municipal Council (DMMC) area, Borelasgamuwa, Kolonnawa, Peliyagoda, Wattala – Mabola Urban Council areas and Parts of Wattala and Kelaniya Pradeshiya Sabha areas towards which the waves of Colombo urbanization are rapidly moving.

No.	Local Authority	Declaration Details	
		Date of Declaration	Gazette Number
1	Colombo MC	30.09.1978	No. 4/1
2	Dehiwala Mount Lavinia MC	30.09.1978	No. 335/5
3	Boralesgamuwa UC	01.10.1979	No. 56/6
4	Kolonnawa UC	30.09.1978	No. 4/1
5	Peliyagoda UC	14.08.1981	No. 154/13
6	Wattala – Mabola UC	19.04.2002	No. 1231/15
7	Part of Wattala PS	22.08.1995	No. 885/6
8	Part of Kelaniya PS	13.02.2001	No. 1171/10

Table 1: *Declaration of Local Authorities of Colombo Commercial City as "Urban Areas"*
Source: Urban Development Authority– 2018

The declaration of above areas as "Urban Areas" was carried out during late 1970s and 1980s considering their emerging urbanization characteristics and the particular declaration details are mentioned in the Table No. 01. However, gazetted development plans are only available for CMC and DMMC areas whereas the first development plan for CMC area was gazetted on 1986.01.30 under gazette No.386/23 and amended by No. 1090/3 on 1999.07.29 and by No. 1535/4 on 2008.02.06 consequently. The final amendment of the CMC development plan is in effect for the period of 2008 to 2025. The development plan for DMMC area which was gazetted on 2009.03.27 by the gazette No. 1594/32 is in effect for the period of 2008 to 2020. The draft development plans available for Kolonnawa UC (2008-2020) and Boralesgamuwa UC (2008-2025) areas act as the main legal framework for the land use management and regulation of development in these areas. General regulations as per the Common Building and Planning Regulations gazetted on 03.03.1986 are practiced for the rest of the local authority areas for which the draft development plans are not available.

1.1.2. UDA's New Approach

UDA has commenced a new approach in the process of preparing development plans going beyond its conventional methods where it now adopts various advanced technologies and methodologies in evaluating existing urban systems, diagnosing prevailing issues, identifying the most appropriate visionary development solutions and planning out strategic paths to achieve the anticipated transformations. Since the available development plans for CMC and DMMC areas are about to get expired in the near future and there aren't specific updated plans for the rest of the planning areas, and most importantly due to the absence of a single plan addressing the overspill of Colombo urbanization into its adjacent areas, UDA has attempted to prepare a single plan with a holistic vision for all above 08 local authority areas adopting its new planning approaches.

1.1.3. Planning Colombo

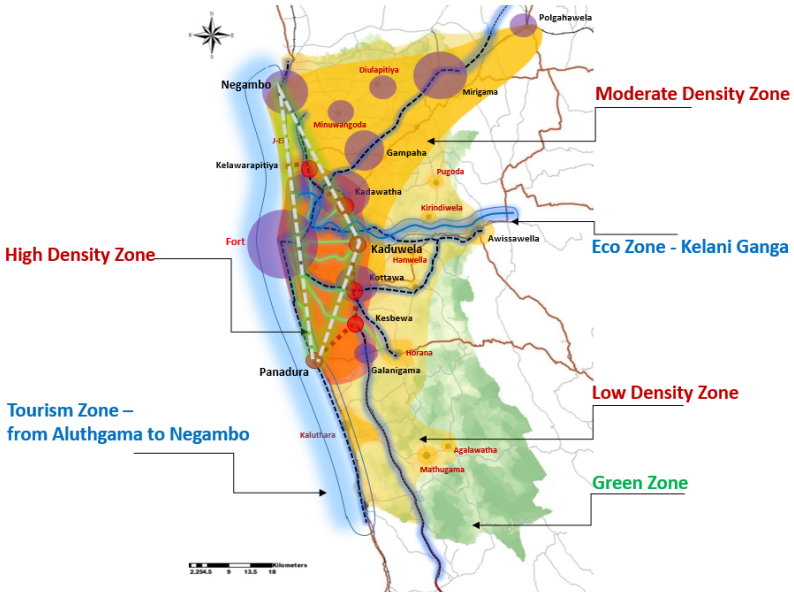


Figure 02: *Western Region Structure Plan - 2030*
Source: Western Province Division, UDA - 2017

The inception of Colombo Commercial City Development Plan (CCCDP) - 2030 is associated with the Draft Western Region Structure Plan (WRSP) – 2030 which was prepared by UDA in 2017. It is the WRSP – 2030 which identifies a part of Western Province as the Core Area and delineates a functional area within it, which now hosts most of the activities of Colombo CBD and acts as the commercial capital of Sri Lanka. This particular functional area boundary is named as 'Colombo Commercial City' and it includes 08 local authority areas as

explained above. The WRSP – 2030 also delineates another planning area named National Capital City which is edged at the east of Colombo Commercial City and includes Kotte Municipal Council and 03 adjoining local authorities.
Planning of Colombo Commercial City and National Capital City was conducted as parallel exercises considering the cross impacts. The planning guidance given by National Physical Plan - 2050 and WRSP – 2030 were considered as the base for these plans. Planning of Colombo Commercial City has been a collaborative exercise where a team of planning expertise from UDA prepared the development plan in consultation with relevant stakeholder agencies and representatives of general public. The preparation of Colombo Commercial City Development Plan was mainly conducted by the Western Province Division of UDA in collaboration with Research & Development Division with the support of Development Planning Division, Enforcement Division and Geographic Information System Division under the direct supervision of Chairman, Director General, Additional Director General, Deputy Director General (Planning). In addition, the directors and officers of other divisions of UDA also engaged with the planning process at different stages through consultation.

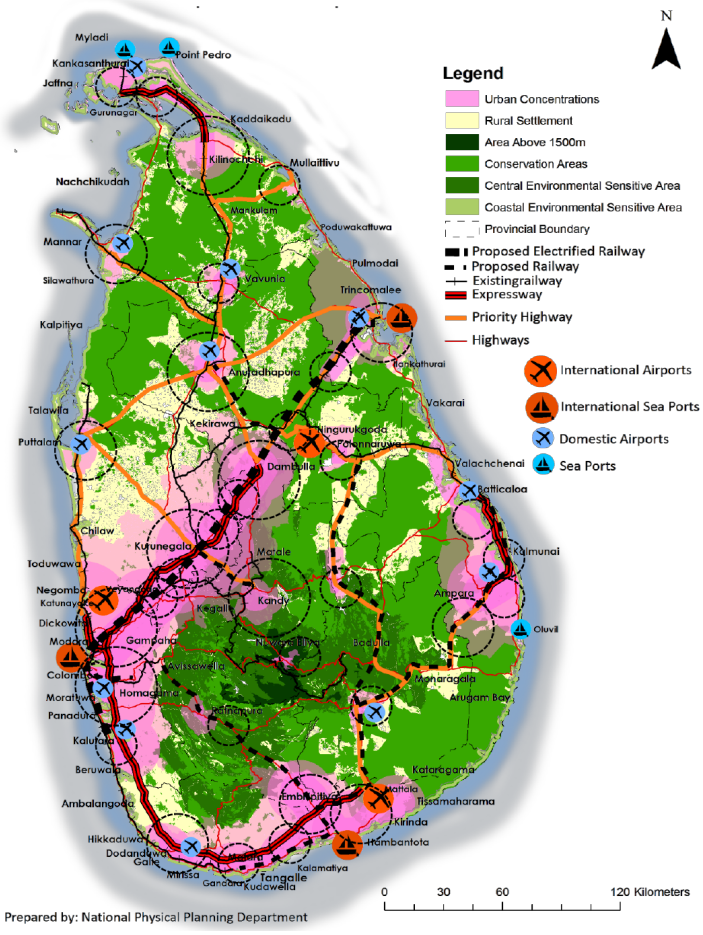


Figure 03: *National Physical Plan - 2050*
Source: National Physical Planning Policy – 2050, 2017

1.2. Stakeholders

'Planning is for people' and people are a part of the plan who contribute for its design, implementation and feedback and it is on them the ultimate effect of the plan is imposed on. Thus, stakeholder consultations were conducted at different stages of the planning process to grab the ideas of people who are a part of the Colombo Commercial City Development Plan.

The main stakeholder group consisted of the co-implementation authorities such as 08 Local Authorities; Colombo Municipal Council, Dehiwala Mt-lavinia Municipal Council, Boralesgamuwa Urban Council, Kolonnawa Urban Council, Peliyagoda Urban Council, Wattala Urban Council, Wattala Pradeshiya Sabha and Kelaniya Pradeshiya Sabha, respective Divisional Secretariat Divisions, Colombo District Secretariat Division, Road Development Authority (RDA), Central Environment Authority (CEA), Sri Lanka Land Reclamation & Development Corporation (SLLRDC), Irrigation Department (ID), Ceylon Electricity Board (CEB), National Water Supply & Drainage Board (NWSDB), Coast Conservation Department (CCD), Sri Lanka Railways (SLR), Sri Lanka Transport Board (SLTB) and Sri Lanka Tourism Development Authority (SLTDB). The ideas of several other stakeholders including state agencies, private parties and general public were gathered in the means of Focused Group Discussions and Public Open Forums as mentioned below.

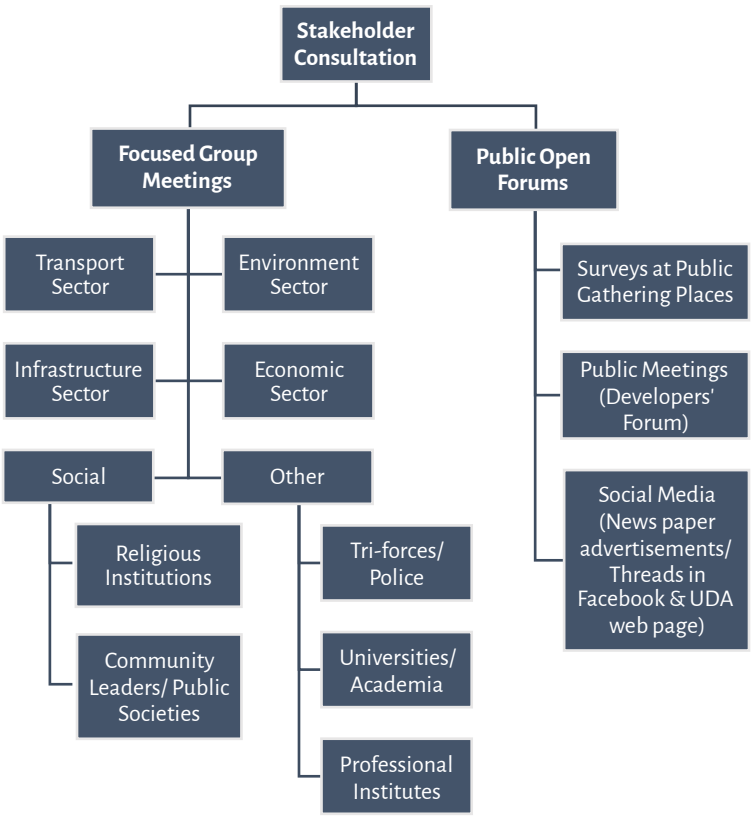


Figure 04: *Stakeholder Consultation Process*

1.3. Scope

1.3.1. Scope in Terms of Scale of the City

Given the natural evolution of City of Colombo in association with the Colombo International Port and other established administrative and commercial activities, Colombo withstands its prominence as the Commercial Capital of Sri Lanka having the capability to compete as an International City entailing a good standard of living compared to other cities of the country. Hence, Colombo was planned in the scope of an international city addressing its requirements to compete in the international context.

1.3.2. Scope in Terms of Geography

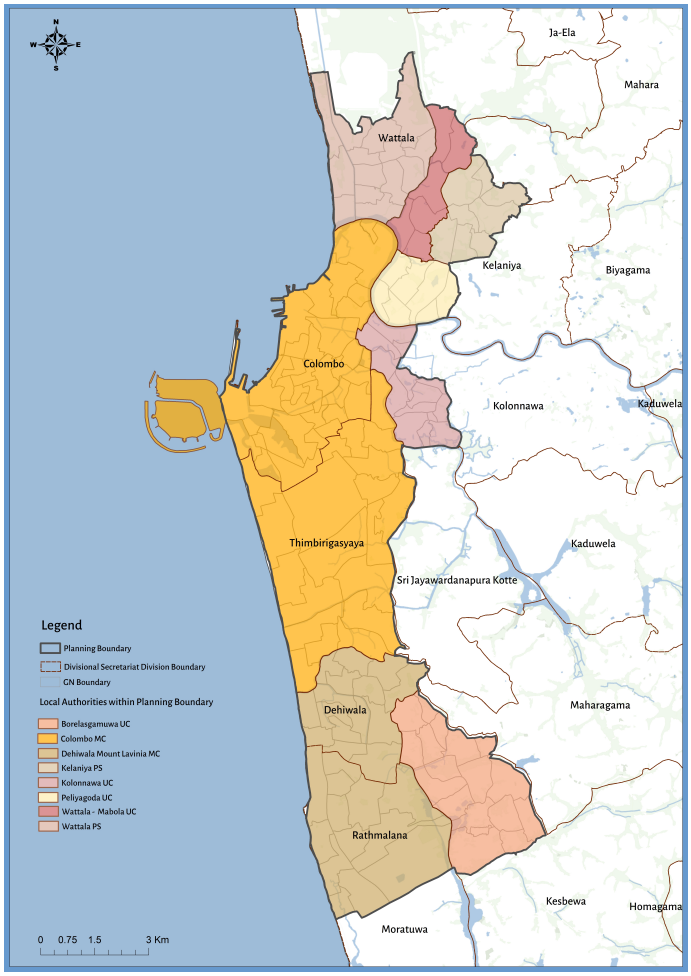


Figure 05: *Administrative Boundaries within Colombo Commercial City*

Topographical boundary of the Colombo Commercial City Development Plan covers the areas falling under the limits of CMC, DMMC, Borelasgamuwa,

Kolonnawa, Peliyagoda, Wattala – Mabola Urban Councils and Parts of Wattala and Kelaniya Pradeshiya Sabhas. (Figure 1) The total land extent covered by the CCCDP – 2030 is 103.71km2. The planning area includes 08 Divisional Secretariat Divisions; Colombo, Thimbirigasyaya, Dehiwala, Ratmalana and parts of Kesbewa, Kolonnawa, Kelaniya and Wattala. Altogether the planning area includes 149 Grama Niladhari Divisions. (Figure 5)

1.3.3. Scope in Terms of Influenced Population

The CCCDP – 2030 directly influences two categories of population including approximately 1.1 Million of residential population and 1.2 Million of daily commuters. However, since Colombo acts as the commercial capital of Sri Lanka, the CCCDP – 2030 indirectly influences 20 Million of Sri Lankans as well as the international community who has particular interests on Colombo which can be regarded as a competing international city.

1.3.4. Scope in Terms of Sectors

Adhering to the mandatory requirements specified in the UDA Act No. 41 of 1978 with reference to the preparation of development plans, CCCDP – 2030 is prepared to guide and manage overall spatial development of Colombo Commercial City while ensuring Environment Management and Economic, Infrastructure, Settlement and Social Development.

1.3.5. Scope in Terms of Timespan

Given that the CCCDP is prepared in the scope of an international city, the plan puts forward the positive measures that will sharpen the future of Colombo through long term physical transformation. Hence, the CCCDP – 2030 which is derived based on an ultimate vision anticipated to be achieved in an approximate time span of 50 years, will form the pathway towards its long-term vision within the next 11 years.

1.3.6. Scope in Terms of Execution

CCCDP – 2030 will be executed within the next 11 years commencing from 2019 in collaboration with the main co-implementation authorities and other public and private sector parties in the means of long-term planning guidelines, policies, strategic projects, private-public partnership programs and planning and building regulations. However, one of the major limitations associated with the preparation of Colombo Commercial City Plan is that, the practical conduct

of each step of planning process was bounded with the constraints in existing technical capacities, availability of data and time and resource constraints.

1.4. Methodology

CCCDP – 2030 was prepared adopting the Strategic Planning Approach which proceeds the plan in three main stages gradually addressing three strategic questions in line.

1.4.1. Where are we now?

This question was attempted to be answered with a comprehensive understanding of the planning context which was gained through background studies and initial public/ stakeholder consultation. As a result, an initial identification of problems and potentials was conducted which followed with preliminary analysis and identification of root causes to derive precise definitions of problems and potentials in terms of context, magnitude and significance.

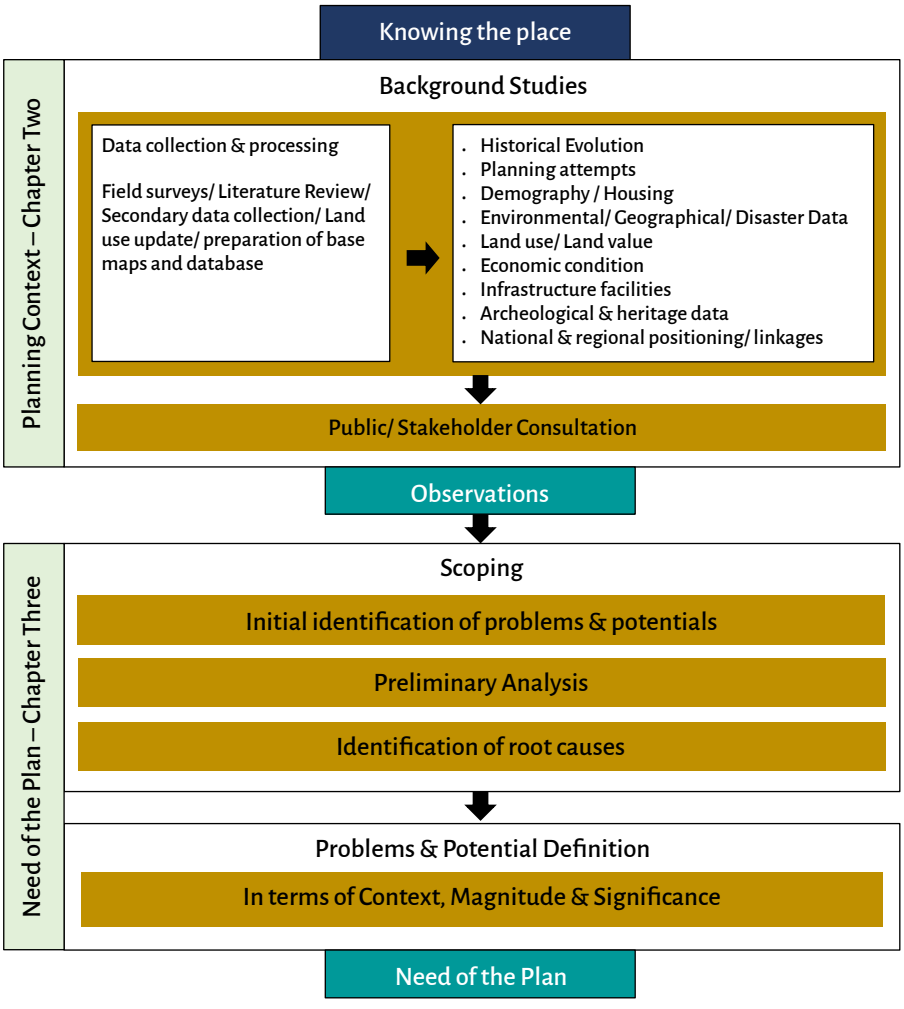


Figure 06: *Planning Process (Where area we now?)*

1.4.2. Where do we want to go?

Following to the derivation of precise definition of need of the plan, the anticipated broader vision that would enable the city to overcome its problems while capturing the potentials in their highest and best use was determined. Then a series of detail analysis was conducted to formulate a SWOT which enabled the evaluation of the anticipated vision in terms of the city's strengths and opportunities which support the vision and weaknesses and threats which barricade it. Consequently, the specific goals and smart objectives were derived with quantifiable indicators based on the SWOT.

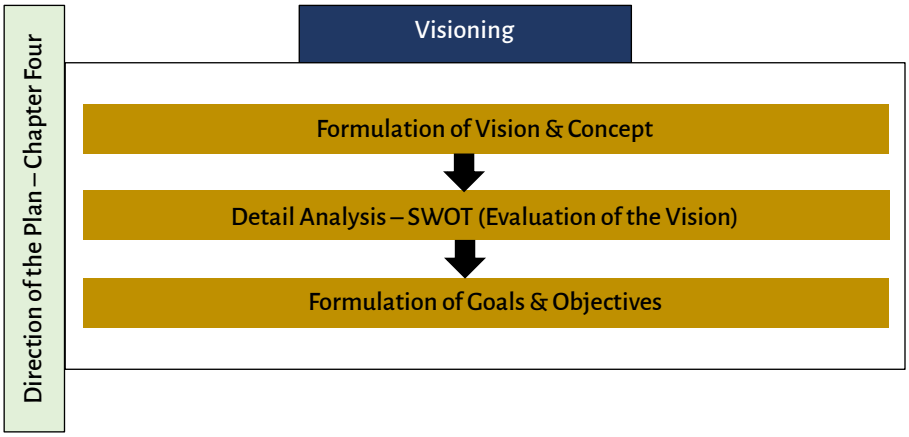


Figure 07: *Planning Process (Where do we want to go?)*

1.4.3. How do we go there?

After determining the direction towards which the city should be guided with the anticipated vision, goals and objectives, the path to accomplishment was designed in terms of broader strategies and strategic actions. SWOT analysis was conducted for each broader goal to derive strategic actions under them. The finalized CCCDP – 2030 has been then processed through the formal procedures as per the guidance given in UDA Act to ensure incorporation of stakeholders' views and smooth delivering of the plan to the public.

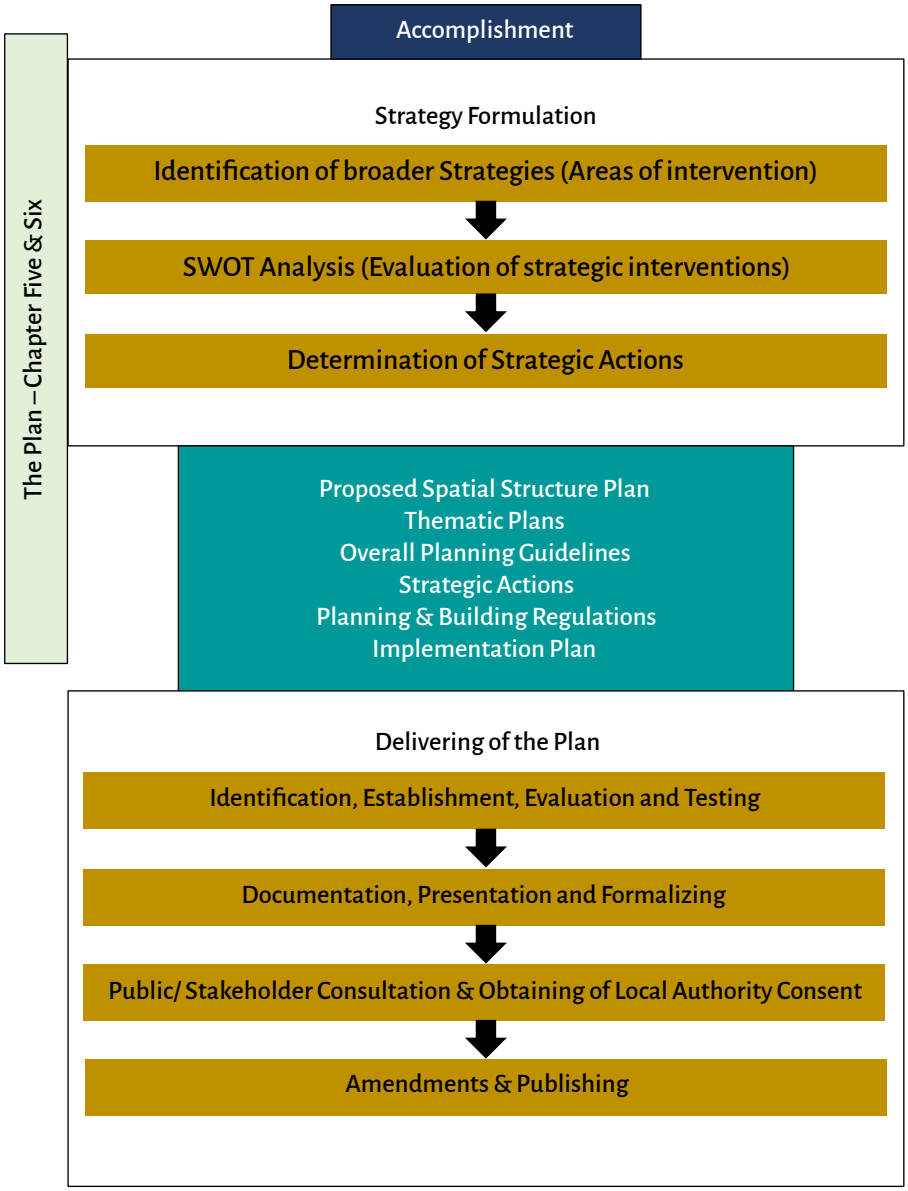


Figure 08: *Planning Process (How do we go there?)*

Chapter 02

Planning Context

2.1. Evolution of Colombo

Colombo is not only a city of future or present, but it is a city with a long antiquity just as Sri Lanka. The name "Colombo", is believed to be derived from the classical Sinhalese name “Kolon thota”, meaning "port on the river Kelani”. Another belief is that the name is derived from the Sinhalese name “Kola-ambo” meaning "Harbour with leafy mango trees" which later turned into Colombo. During the Pre-colonial era, for over 2000 years, Colombo has been a point of interest for many traders: Arabs, Indians, Chinese, Persians, Romans and the Greeks because of its strategic location. Many came to Sri Lanka to establish trade as it locates in the path of the East - West Trade route. The descendants of these traders can be seen within the population composition of Colombo today. The settlements of these traders were located near the sea port and the Kelani River mouth for fishing and trade purposes since the other surrounding areas were marshy lands.

2.1.1. Portuguese Period (1505 – 1656)

The Portuguese explorers arrived in Sri Lanka (Galle) in 1505 and then came to the port of Colombo following the coastal line. By making the natural topographical feature of Colombo as an advantage they built a well-defended fortress town. The fortress was surrounded by water bodies and canals infested with crocodiles. The Portuguese during the 15th century created a “Planned City” covering the Fort and Pettah. The Fort consisted of all administrative functions whereas Pettah was then an elegant residential area. Other settlements were scattered in Modara and Grandpass areas.

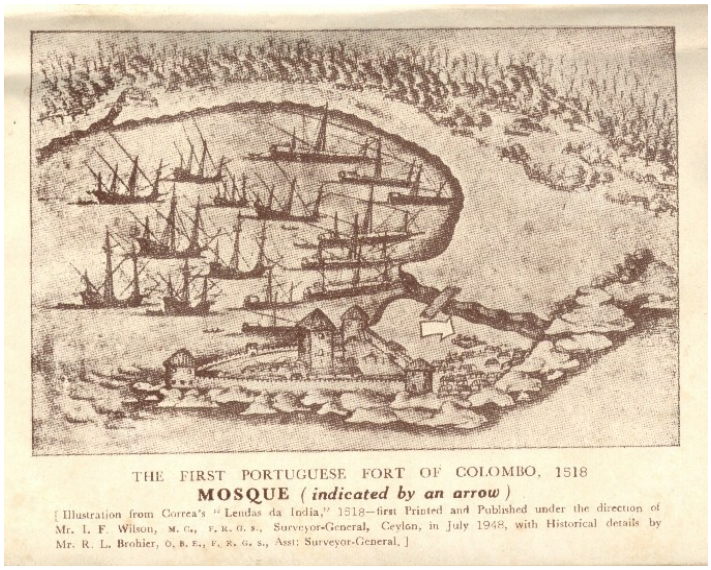


Figure 9: *The first Portuguese Port of Colombo - 1518*
Source: sirimunasiha.wordpress.com

Evolution of Colombo
Portuguese Period (1505 - 1656)

Figure 10: *A drawing of Colombo Fort in Portuguese Period*
Source: http://lankapura.com

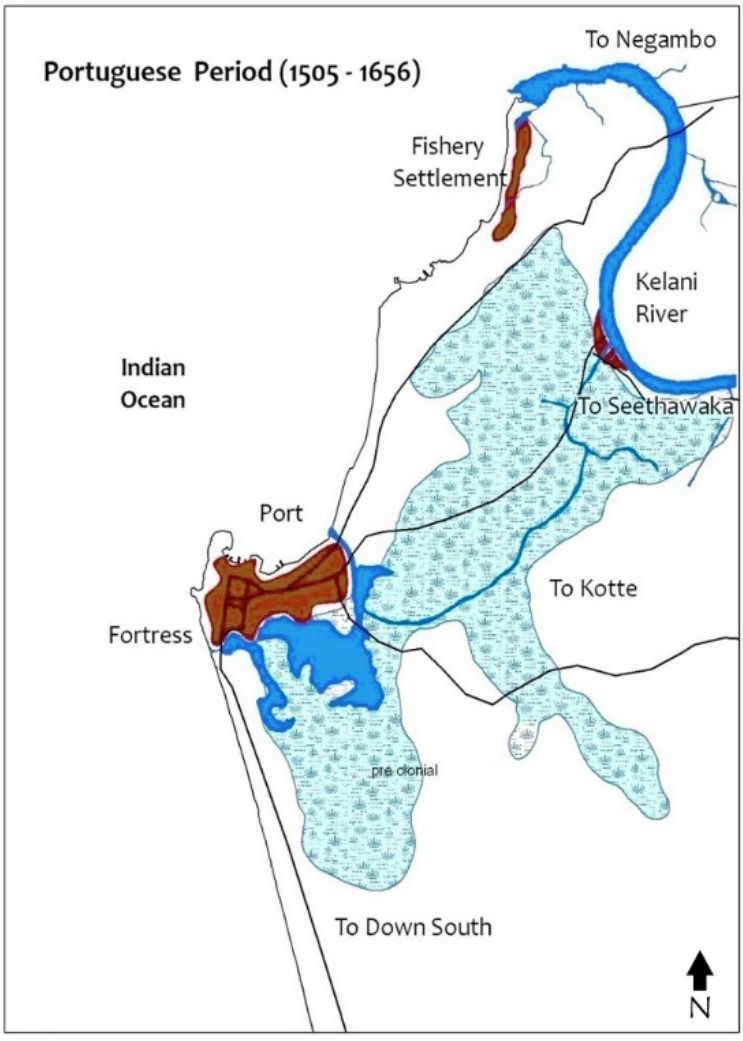


Figure 11: *Settlements Distribution in Early Portuguese Period*

2.1.2. Dutch Period (1656 – 1796)

The Dutch governed Colombo nearly one and half centuries. The Dutch divided the city into two parts as Castle (Fort) and Oude Staad (outer city – Pettah) as two separate entities. Pettah was the location for the native settlements and commercial activities. In city planning history of Colombo, the Dutch should receive greater credit for adding interesting features such as canal network, well – laid regular pattern streets and some iconic buildings. The canal network connecting Beira Lake was used as a mode of transport and a part of storm water drainage system. The present York street was a storm water canal during this period. An extensive system of water bodies was laid, being a key feature of Dutch planning. Modara, Mutval and Grandpass were the dominant residential areas. The contribution by Dutch to city planning, architecture, and storm water drainage has become a part of the historical heritage of the city.

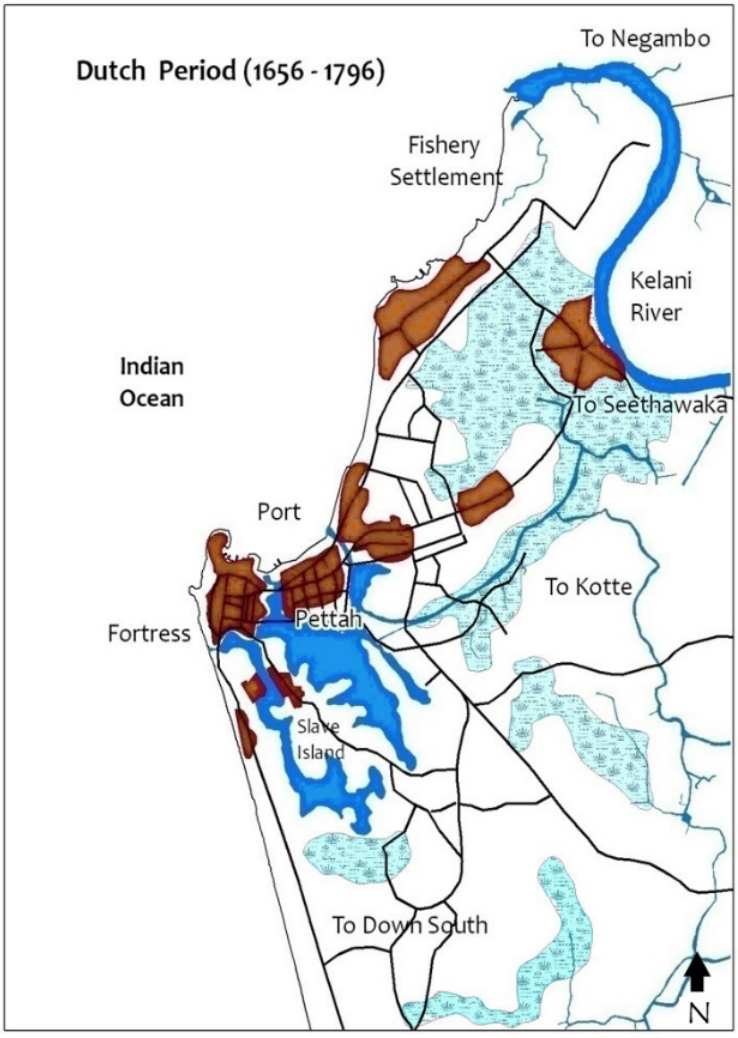


Figure 12: *Settlements Distribution in Dutch Period*

Figure 13: *Dutch Colombo (1775), Sri Lanka. Johannes Kip c. 1775*
Source: http://www.colonialvoyage.com

Figure 14: *Dutch Houses in Pettah, Colombo*
Source: http://www.serendib.btoptions.lk

2.1.3. British Period (1796 - 1948)

British occupation of nearly 150 years influenced the development of City of Colombo into its present mode. The basic structure of the city on which the present city is being built, was initially laid out by the British. The British expanded the city from what the Portuguese and Dutch had already built. One of the most interesting features of British period was creation of a vast extent of public open spaces such as Victoria Park (Viharamahadevi Park in its present terms), Galle Face Green, golf courses and many cricket grounds that act as the green lungs of Colombo even today. The development of port during this period was a critical factor in the transformation of Colombo especially in northern and central Colombo.

Evolution of Colombo
British Period (1796 – 1948)

Another interesting phenomenon that occurred during the British rule was shifting of settlements from place to place following the growth pattern of the city. The gradual deterioration of the residential character in northern Colombo took place with the expansion of port related activities to North of Colombo. Kollupitiya, Wellawatte, Bambalpitiya and Maradana became new attractions for residential uses, while Cinnamon Garden became the residential area of elite class. The most significant contributions made by the British were the development of infrastructure comprising roads, railways, water supply, storm water drainage and waste water management. The British rulers filled marshy lands and paddy fields losing some of the distinctive waterfronts in the region. Degrading the image of Beira Lake by reclaiming it to reduce its original size was another negative impact made during British rule.

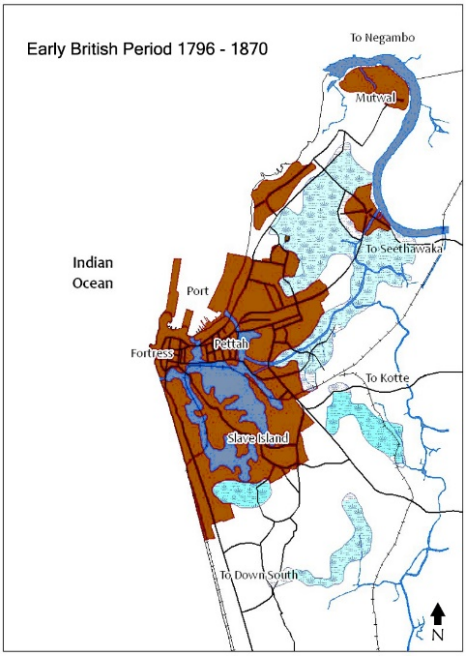


Figure 15: *Settlements Distribution in Early British Period*

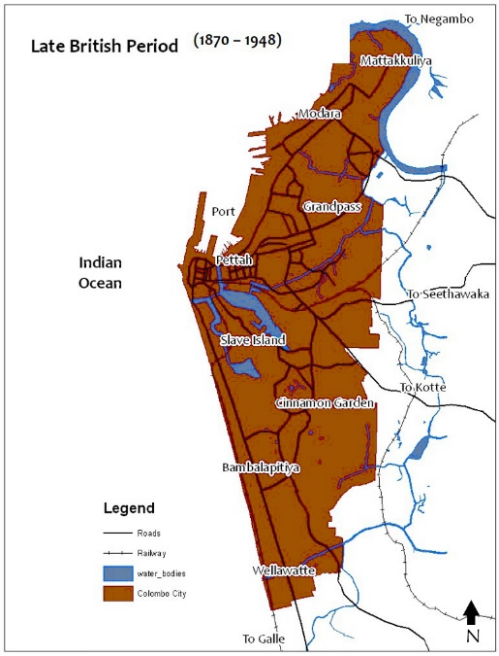


Figure 16: *Settlements Distribution in Late British Period*

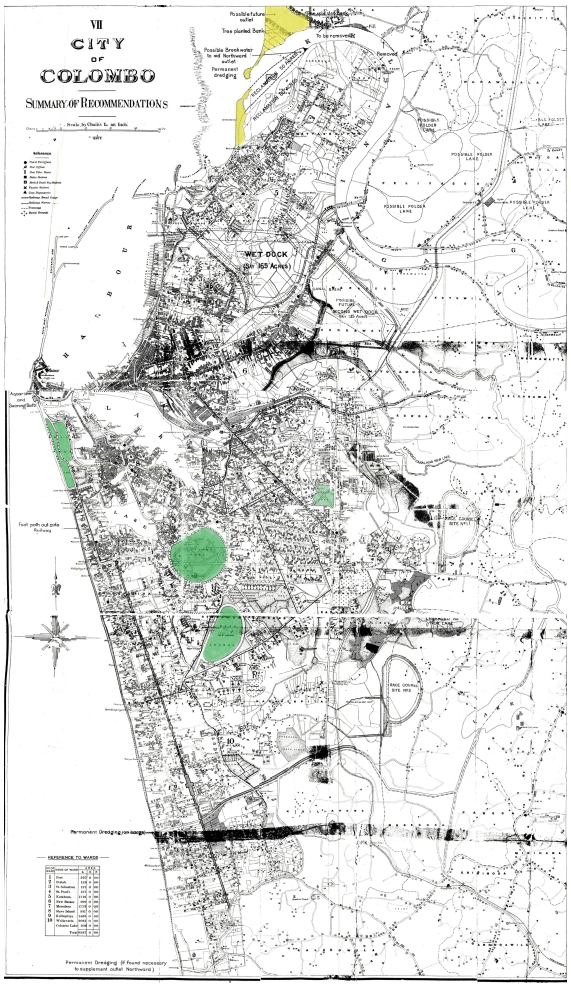
Figure 17: *Prince Street – Colombo Fort in 1800s - British Streets*
Source: http://www.lankapura.com

2.2. Interventions to Plan Colombo

In response to the rapid development and expansion of City of Colombo which took place in the latter part of British rule, British rulers made the first comprehensive planning attempts in Colombo to avoid unplanned growth and regularize the foreseen developments based on a planned city structure.

2.2.1. City Plan by Sir Patrick Geddes - 1921

The first planning attempt was made by Sir Patrick Geddes in 1921, introducing a new vision for the City of Colombo as "The Garden City of the East". In his plan, Geddes considered the development of port as a strategic intervention to influence the spatial development pattern of Colombo and also attempted to address the prevailing issues of Colombo at that time such as increasing need for housing and one third of the city is being prone for floods.



Establishment of Town Hall with a dignified appearance at a geographically central location of Colombo overlooking the Victoria Park (now known as Viharamaha-dev Park), improvement of Galle Face Green, proposal to construct a Relief Road (presently known as Duplication Road) parallel to Galle Road and construction of a foot path along the southern railway line (which gradually led to the development of Marine Drive) are few milestone proposals of this plan.

Figure 18: *City Plan by Sir Patrick Geddes 1921*
Source: Colombo Metropolitan Regional Structure Plan—UDA, 1998

Proposals to construct an aquarium at the Old Parliament roundabout, two new race courses, a zoological garden, polder lakes in Peliyagoda for flood retention, two wet docks for port expansion at Bloemendhal area and Orugodawatta (latter two were not implemented as those lands were reclaimed for urban development purposes) are some of the examples of Geddes' attempts to make Colombo a Garden City dominated with water bodies. The tree lined streets (Bauddhaloka Mawatha) within the grid system of roads in Cinnamon Gardens radiating from the central garden; Victoria Park, are legacies of this plan which still contributes to its prominence as a highly sought residential and commercial area with premium character.

2.2.2. Plan by Clifford Holiday – 1940

Clifford Holiday who arrived to Sri Lanka based on an invitation of the Colombo Municipal Council made the next planning attempt for Colombo. This plan laid much emphasize on controlling the people movement by "Zoning", which he assumed would regulate and stabilize the future growth of Colombo. Commercial, industrial and residential areas were provisionally defined in this plan. Decentralization of certain functions and regulating activities by developing a legal framework is a predominant feature of this plan. Planning area was expanded up to Moratuwa, Ja-Ela & 14 miles towards inland through this plan. Perhaps the most influential proposal of his works was providing a legislation framework for town planning in Sri Lanka, incorporated in the Town & Country Planning Ordinance which was enacted in 1946.

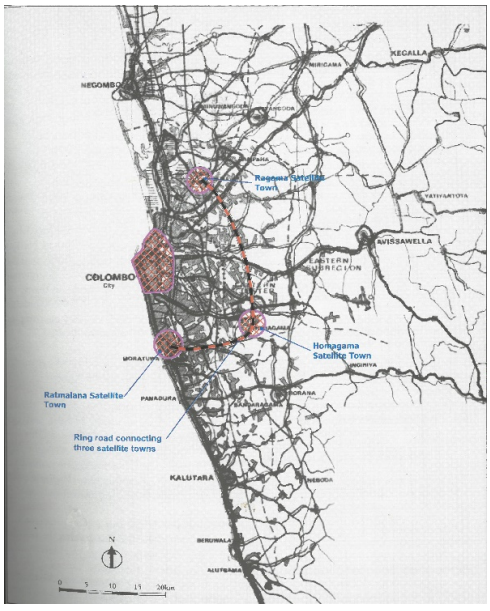


Figure 19: *Regional Plan by Patrick Abercrombie -1948 | Source: Colombo Living High; A City in Transition, N.P Herath & D. Jayasundara, 2007*

2.2.3. The Regional Plan by Patrick Abercrombie – 1948

By this time, central built-up area had been overcrowded having resident population around 350,000 and provision of healthy and convenient housing for all had been a challenge. The inundation of one third of land still remained an issue making vast areas of Colombo unsuitable for building developments. Facilitation of around 125,000 daily commuters to the city with available inadequate infrastructure was also seen as a challenge at this time.

In response to these issues, Patrick Abercrombie prepared a town planning scheme for the City of Colombo based on the principle of decentralization of urban activities. This plan proposed a concept of "Region" which consists of 220 square miles in extent and covering land area of 14 miles in radius from Colombo port. The plan proposed to decentralize city functions into three new town satellite towns of Colombo city such as Rathmalana, Ragama and Homagama. The plan included a ring road to link these towns and the shifting of central administrative functions to Ratmalana. The Zoning Proposals introduced in the plan were based on character and density and divided the region into three distinctive uses such as urban, semi-urban and rural.

2.2.4. UNDP Assisted Colombo Master Plan - 1978

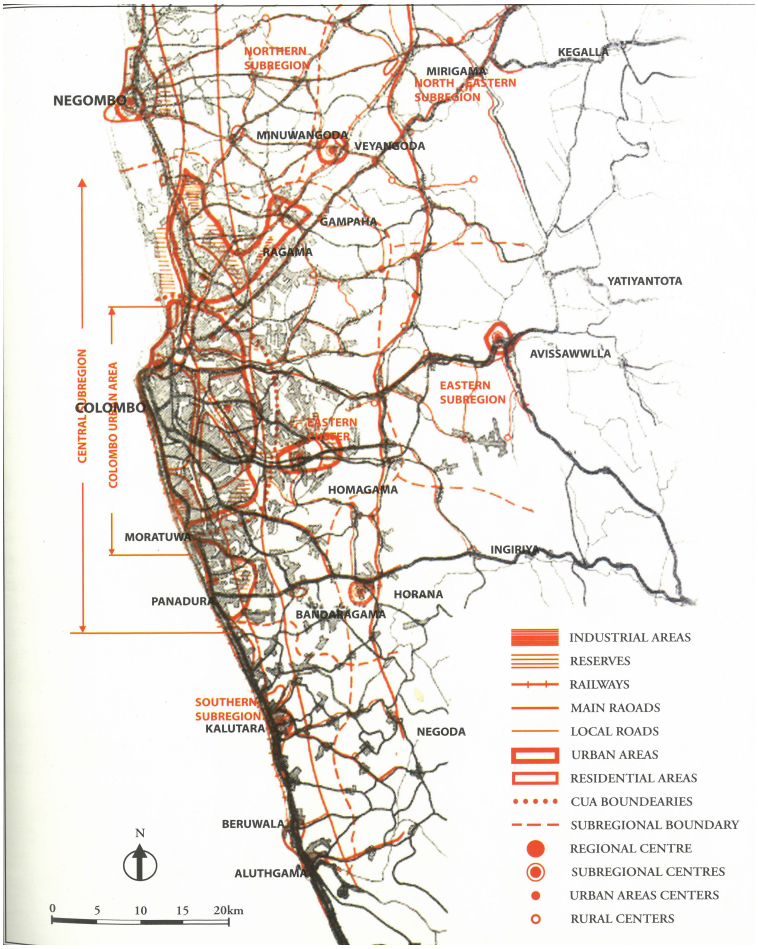


Figure 20: *UNDP Assisted Colombo Master Plan - 1978*
Source: UNDP Colombo Master Plan - 1978

The gradual urban sprawl beyond Colombo City limits which was influenced by the decentralization of urban activities promoted by the Abercrombie's Plan was well evident within the region at this time. Also, with the introduction of open economic policy by the Government in 1977, the city went through rapid changes

Interventions to Plan Colombo
UNDP Assisted Colombo Master Plan – 1978
City of Colombo Development Plan – 1985

resulting booming property development and increasing land values. It is in this context the Colombo Master Plan was prepared by a team of consultants under United Nations Development Program (UNDP) in collaboration with local planners with the objective of promoting a balanced regional growth and an accelerated economic development in the Colombo region.

The planning area included three districts; Colombo, Kalutara and Gampaha and the whole region was divided into two main components as Central sub-region and Outer region. Central sub-region was again divided into Colombo Urban Area and Outer region which consisted of towns outside the city such as Panadura, Bandaragama, Homagama, Ragama and Gampaha. The plan consisted of two main components including Regional Structure Plan and Urban Area Development Plan covering the Central sub-region.

However, the strategy of the balanced spatial development, was not successful. Unchecked urban sprawl continued at a rapid rate than in the past and the Colombo urban area continued to expand beyond its physical limits as defined in the Colombo Master Plan. Even though it was anticipated to attract around 500,000 population per each center in the outer region naming Negombo, Veyangoda, Avissawella, Horana and Kalutara, these centers failed to achieve the expected accelerated development. Two significant outcomes of the Colombo Master Plan are implementation of Peliyagoda Integrated Urban Development Project which influenced several planning decisions in following decades and establishment of Urban Development Authority in year 1978.

2.2.5. City of Colombo Development Plan – 1985

Realizing the need of a new set of plans to address the changes due to rapid urban growth, UDA prepared the City of Colombo Development Plan with the assistance of UNDP Master Plan team in year 1985. This plan which incorporated zoning and planning and building regulations, can be identified as the foundation of the present development plan that is being practiced for City of Colombo. The plan was prepared for the Colombo Municipal Council area which was divided into 47 municipal wards for detail planning and development control purposes.

The main objectives of the plan were to ease the traffic congestion, relocate obsolete land uses such as industries and administrative functions, sensibly locate and lay out wholesale and retail trade activities and open up waterfronts and create vistas. In addition, the plan also proposed to redevelop identified slums and shanty areas as special project areas.

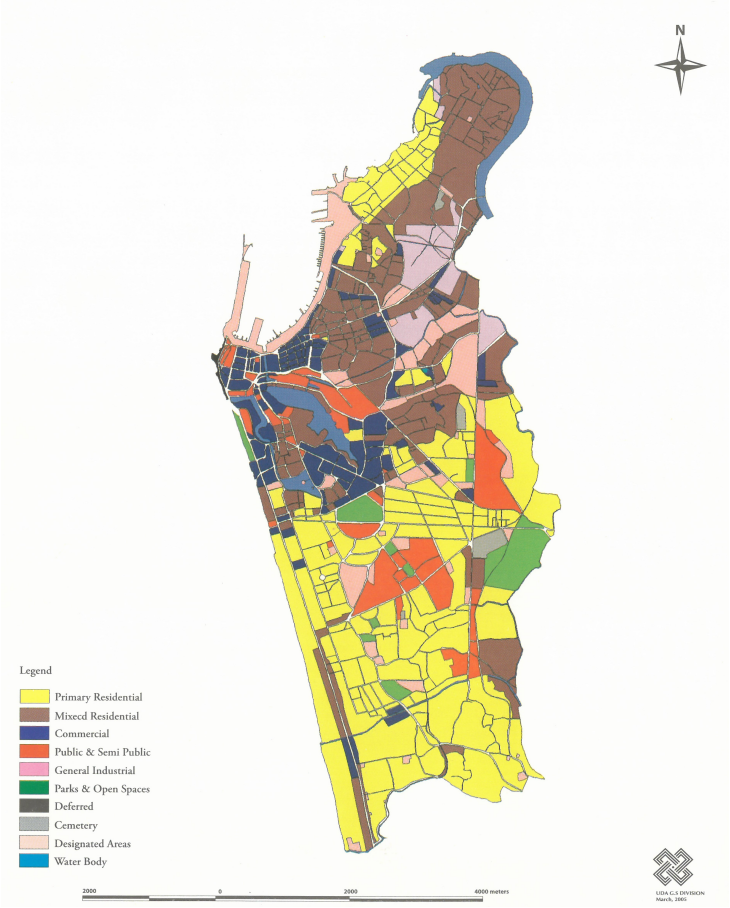


Figure 21: *City of Colombo Development Plan 1985*
Source: City of Colombo Development Plan 1985

2.2.6. Colombo Metropolitan Regional Structure Plan (CMRSP) - 1998

In 1996, UDA developed Colombo Regional Structure Plan also well known as "CMRSP" plan. It was the first time that a plan of such magnitude was prepared entirely by local planners. This plan was influenced by the three pillars of sustainable development concept namely Social, Economic and Environment. Further, the identification of hierarchical order of regional town centers as 1st order to 4th order based on the services provided by each town centers has helped to identify several urban agglomerations in different parts of the region for potential development.

The plan further identifies that these urban agglomerations are useful to promote regional economic growth centers to cater the country's economy. This plan outlines a central urbanized "Core area" and six outlying areas namely Negombo, Gampaha, Biyagama, Homagama, Horana and Mathugama as "Growth centers". The core area which was designated as the urban hub of the country, consisted of City of Colombo and Sri Jayawardanepura Kotte. The Core

Area has been approved by the Cabinet of Ministers in July 1998 as the Capital Territory of the Country

Interventions to Plan Colombo
Colombo Metropolitan Regional Structure Plan – 1998

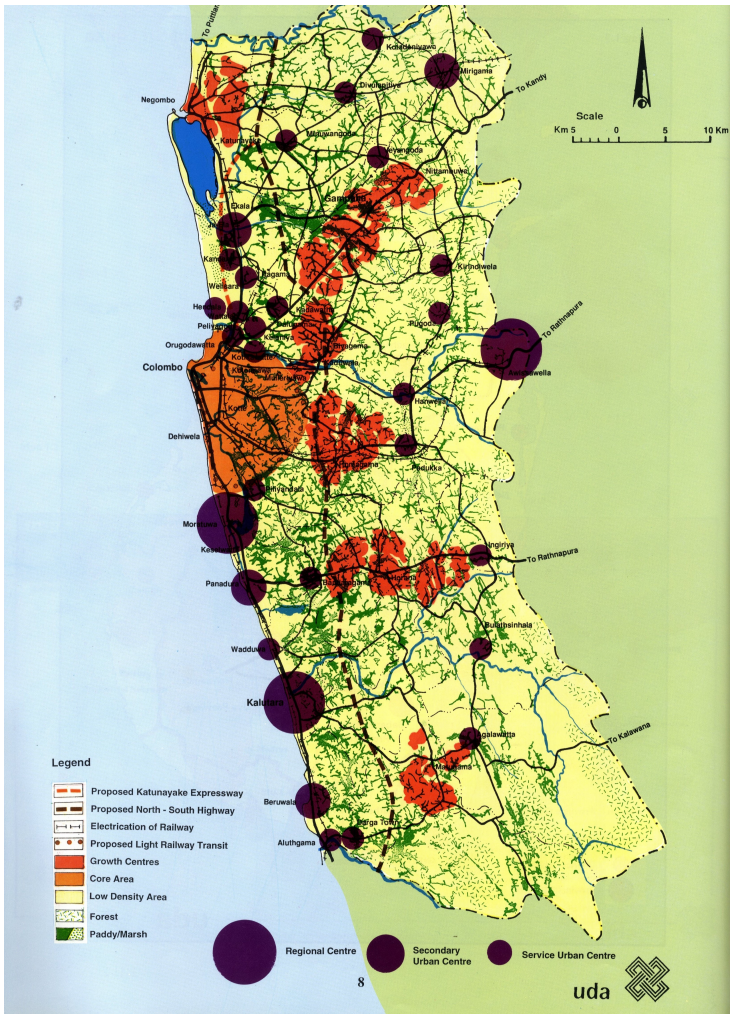


Figure 22: *Colombo Metropolitan Regional Structure Plan 1998*
Source: Colombo Metropolitan Regional Structure Plan, 1998

The main objective of this plan was to make the City of Colombo as the financial, commercial and a main shipping hub of South East Asia. Colombo Katunayake Highway, a Circular Light Rail system covering the core area, a Marine Transport System from Colombo to Panadura and electrification of existing railways were some of the key proposals of this plan. However, the CMRSP was not fully implemented, thus many of the above proposals were not realized until very recent times.

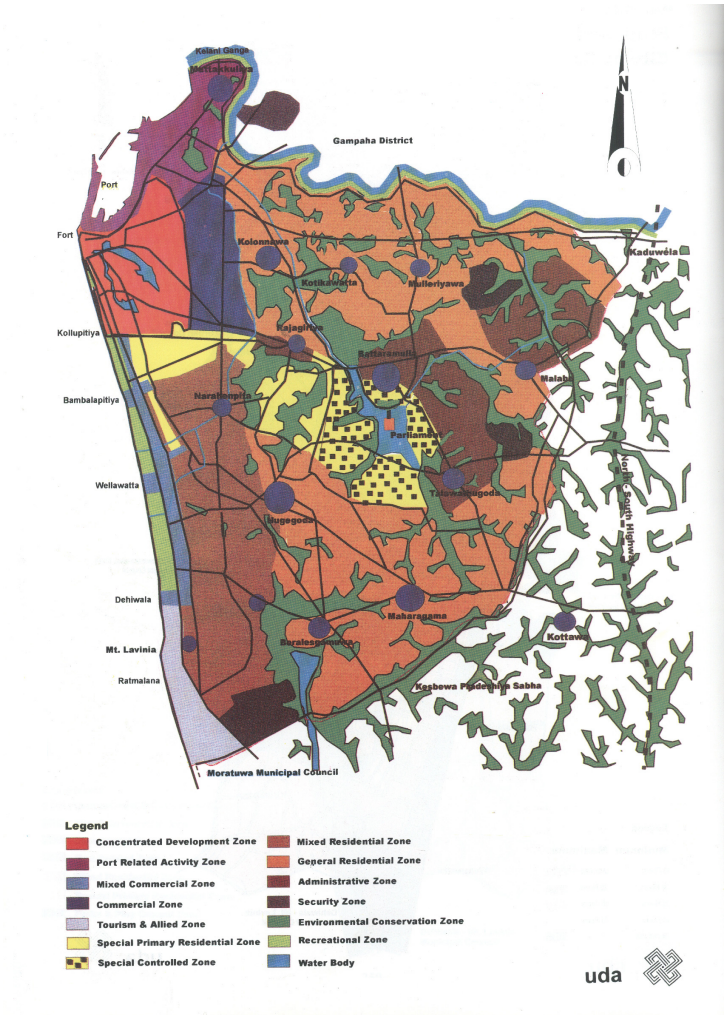


Figure 23: *Colombo Core Area, CMRSP- 1998*
Source: Colombo Metropolitan Regional Structure Plan, 1998

2.2.7. City of Colombo Development Plan - 1999

As the planning issues in the city were complex, a comprehensive planning approach was crucial, to address all urban issues such as inadequate infrastructure facilities, pollution, traffic congestion, urban sprawl and inappropriate distribution of activities in the city as well as those that were likely to emerge in the future. The City of Colombo Development Plan – 1999, was prepared by the Urban Development Authority as an amendment to the Colombo City Development Plan – 1985. It was prepared based on the Core Area Plan of CMRSP – 1998 hence, follows its planning guidance given for City of Colombo.

The 1999 Development Plan had been developed to address above issues and to ensure a viable economy, supported by more conducive and aesthetically friendly environment with much-improved quality of life and to develop the city as the financial and commercial hub of the South Asian region. The plan introduced

Interventions to Plan Colombo
City of Colombo Development Plan – 1985
Colombo Metropolitan Regional Structure Plan – 1998

Land use Zoning & Building Regulations, Building Density Regulations and especially Development Guide Plans which incorporated urban design aspects for the city. The plan also included Traffic & Transportation, Infrastructure and Environment & Housing strategies.

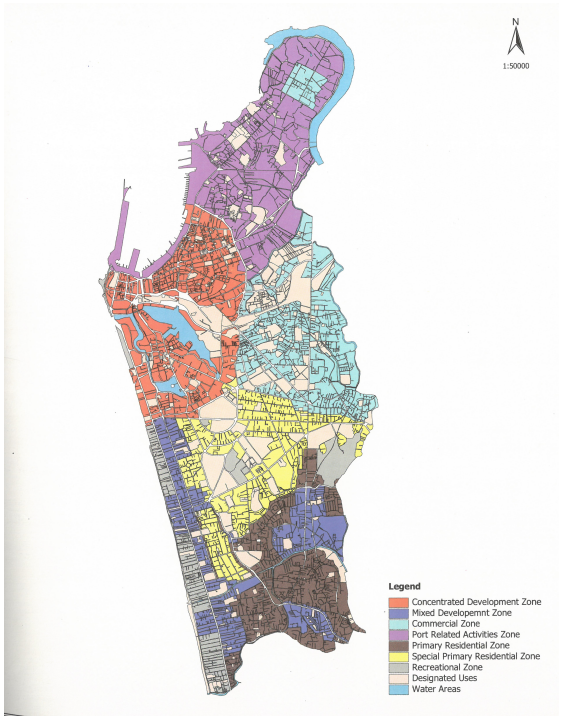


Figure 24: *City of Colombo Development Plan 1999*
Source: City of Colombo Development Plan

This plan designated an identified area in proximity to Port as Port related Activity Zone making more lands available for development of port related activities. Central Business District was zoned as Concentrated Development Zone to promote high-rise developments. In addition, a Special Primary Residential Zone was introduced with special regulations to preserve the existing Garden City Character in Colombo 07 area. One of the important outcomes of this plan was the promotion of high-rise developments within identified places in Colombo.

2.2.8. Western Region Megapolis Plan (CESMA) - 2004

In 2004, a foreign consultancy team under the purview of Board of Investment of Sri Lanka, prepared Western Region Megapolis Plan which is commonly known as "CESMA Plan" among Planners. The objective of preparation of this plan was to make Colombo a modern city that would play a key role in the South Asian Region. Accordingly, the vision of the plan was, "An oasis of aspiration, heritage, recreation and glorious living".

The Plan was based on three planning concepts. These were decentralization of direct development to the eastern, southern and northern parts of the region with Colombo as the core development area, development of the city based on Garden and Green Finger Concepts and adoption of 'Live, Work, Play' concept to

Figure 25: *Western Region Megapolis Plan 2004 – Zoning Plan*
Source: Western Region Megapolis Plan - 2004

promote a better quality of life by enabling many people to live close to their areas of work.
According to the CESMA plan, it was envisaged to transform the City of Colombo into a world-class city, globally recognized as a thriving, dynamic and attractive regional hub that is the centerpiece of 21st Century Sri Lanka. According to this plan, lands in the Western Region were earmarked as a Business Corridor for trade and services and a Technology Corridor and an Industrial Corridor for employment generation.

2.2.9. City of Colombo Development Plan (Amendment) - 2008

This plan may be cited as the City of Colombo Development Plan (Amendment) - 2008, prepared under Section 8H and approved under Section 8F of the Urban Development Authority (UDA) Law No. 41 of 1978, with a view of promoting and regulating the integrated planning and physical development in the Colombo Development Area, declared under Gazette Notification No. 4/1 dated 30th September 1978, containing provisions in respect of the matters in the schedule to the Law, and has been in effect since 6th February 2008.

Mainly, this plan includes the amendments to the City of Colombo Development Plan – 1999 and it is the current plan in effect for the City of Colombo. As per the plan, there are 07 zones such as Concentrated Development Area, Commercial Zone, Mixed Development Zone, Port Related Activity Zone, Primary Residential Zone, Special Mixed Residential Zone and Special Primary Residential Zone. In addition, the plan also introduced two Development Guide Plan Areas for surroundings of Beira Lake Area and Independence Square Premises.

Interventions to Plan Colombo
City of Colombo Development Plan (Amendment) – 2008

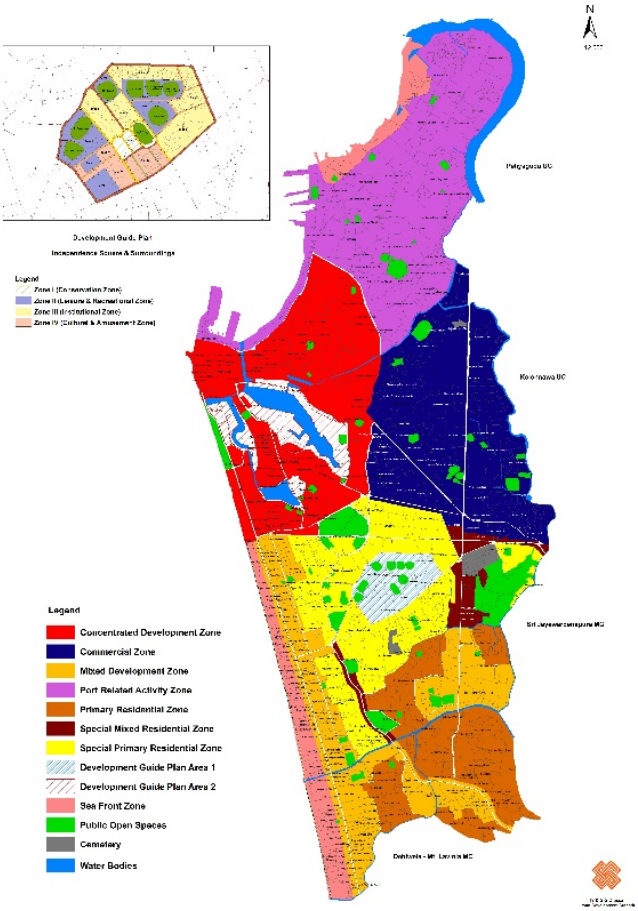


Figure 26: *City of Colombo Development Plan - 2008*
Source: City of Colombo Development Plan (Amendment) - 2008

2.2.10. Western Region Megapolis Master Plan - 2030

Western Region Megapolis Master Plan is the most recent planning attempt which makes an impact on the Colombo Commercial City Area. Megapolis Master Plan is prepared considering whole Western Province as a single planning entity. The vision of the plan is 'From Island to Continent' and its main focus is on three main national goals such as

- addressing the prevailing issues due to congestion pressures being exerted on urban infrastructure, services, amenities and environment
- development and transformation of physical and institutional infrastructure and national economic structure to enable the nation to reach the status of 'high-income developed country'
- harness the benefits of knowledge-based innovation driven global economic environment

Aligned with 07 broader goals, the plan identifies 13 detail sub planning areas with different themes. Among them, Central Business District (CBD) and Inner Core Area fall within the area of Colombo Commercial City. As per the guidance given by the Megapolis Master Plan, CBD is the business centre, international gateway and the heart of the region with a very high density development and good quality environment and infrastructure whereas Inner Core Area is expected to be the high density commercial and mixed residential development area. In addition, the coastal belt of Colombo Commercial City falls within the Marine Corridor identified by Megapolis Master Plan.

2.3. The Present Colombo

The present Colombo is a reflection of its evolution which was composed of chains of different influences made by the past custodians of different eras. The following section attempts to describe the city's present direction of evolution with reference to its current status and development trends of different sectors.

2.3.1. Colombo as an International City

2.3.1.1. Colombo Port in the International Sea Route

Colombo Port which is one of the busiest maritime hubs of South Asia, connects the City internationally where it has been ranked among the ***world's best 25 harbors in accordance with the Alphaliner rankings in 2017.*** The port's natural geographic location is strategically positioned on the main East-West shipping route, linking the far East with Africa, Europe, and the East Coast of the US, providing ideal connections to the trade in the Indian sub-continent. This makes the Port of Colombo a superb strategic hub. Colombo port has the potential to be

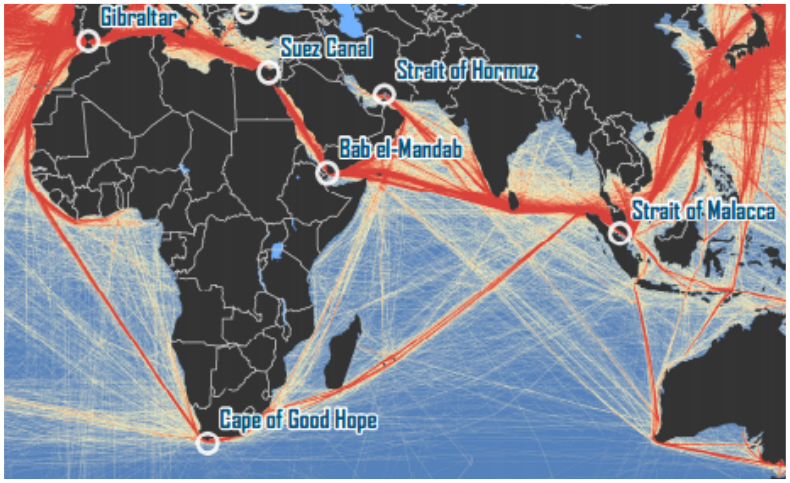


Figure 27: *Sri Lanka's location in Maritime Shipping Routes*
Source: https://transportgeography.org; Maritime Shipping Routes & Strategic Passages, Geography of Transport Systems

developed as a prominent transshipment hub/ LNG hub in the South Asian Region upon its already prominent sea-port in the region.

Colombo Port can be designated as the most important element of Colombo which contributed to the development of the city since its inception and which has the steering power to direct Colombo's future towards an outstanding city with an international recognition.

Figure 28: *A collection of photos of Port of Colombo*
Image courtesy: securityspecifiers.azurewebsites.net, ft.lk by Shehan Gunasekara, Lloyd's List Maritime Intelligence Informa, dailymirror.lk

2.3.1.2. Colombo as a South Asian Business Hub

No:1 in the **South Asian region in Mercer's 2017 Quality of Living** survey.

Colombo ranks **number 132 globally out of 231 cities** surveyed by ***considering the factors*** including ***political stability, crime levels, economic environment, personal and cultural freedom, health services, standard of education, transportation, housing and environment.***

The Global Livability Report 2017 released by 'The Economist Intelligence Unit' (EIU), showed that Colombo stood at **fifth place in the list of 'five biggest improvers'** for having successfully transformed its landscape over the last five years.

Colombo is the **second most expensive city** in **South Asia**, and **108th most expensive in the world** according to Economist Intelligence Unit, 2017.

Colombo is regarded as a **Gamma + city**, which link smaller economic regions into the world economy.

With the comparatively high GDP growth rate of 8% to 9% that was earned during the first three years of 2010s, Sri Lanka was upgraded into the class of middle-income countries by the International Monetary Fund. This was accomplished in the context where the civil war of 30 years had ended in mid-2009, leading the country's economy towards a strong growth trajectory supported with rebuilding measures, surging tourism and increased investor confidence. Being the Commercial Capital of Sri Lanka, Colombo acts as a centerpiece of the nation. This has been proved with the above rankings of Colombo which designate it as a Gamma + City that link the smaller economic regions with the world economy, the second most expensive city of South Asia which represents the demand for the city and being the fifth in the "five biggest improvers" for having successfully transformed the Colombo's landscape.

The GDP contribution of Colombo is mainly based on finance, tourism, real-estate, IT/ITES industries, services and retail which take place in relatively high magnitude and intensity than other neighboring cities. The great majority of Sri Lankan corporations have their head offices, restaurants and entertainment venues located in Colombo CBD including Colombo Stock Exchange which significantly contribute to the national economy. Colombo having many branches of multi-national financial, service, industrial, tourism sector corporations, is the main portal which connects the city globally.

2.3.1.3. Colombo as an International Tourism Destination

The tourism industry of Sri Lanka signposted an upsurge in the beginning of 2010s with the increased tourists' arrivals resulted with the end of civil war in 2009. As per the recent records, the tourism industry of Sri Lanka has reached a new limit of over 2 million (2,050,832) arrivals in 2016, which is an increase of 14.0 per cent over last year's 1,798,380 arrivals. Colombo being the Commercial Capital of the nation which is composed of various financial services, modern facilities, branches of multi-national corporations, chained-brand hotels, tourist destinations such as public open spaces, historical sites, shopping complexes and branded fashion and food outlets, attracts a significantly a large percentage of tourists visiting Sri Lanka. Jones Lang LaSalle Report – 2016 states that the tourists who spend an average of 10 days in Sri Lanka stay at least 2 days in Colombo and spend around USD 100 per day.

Figure 29: *A collection of various tourist attractions in Colombo*

2.3.2. Colombo as the State Capital

Colombo connects with other parts of the country in various means such as transport flows, material flows and population flows which also define Colombo's positioning in the national and regional context as well as the connection in between Sri Lankan citizens and Colombo and the way they perceive the city.

2.3.2.1. Transport Flows

Transport network of the country is an important element which facilitate the movement of population and materials throughout the country. Hence, the transport connectivity that Colombo has with other parts of the country or its positioning in the national transport network is an important factor which determines its overall national and regional importance.

Colombo is the nuclear of the country in terms of connectivity as it is linked with other regional centers by a network of main roads, expressways and railway lines. The city is linked with most of the commercial hubs and major tourist destinations of the country revealing a large span of potentials rooting for rapid city development.

Figure 30: *The major modes of transport connecting City of Colombo with other regions*

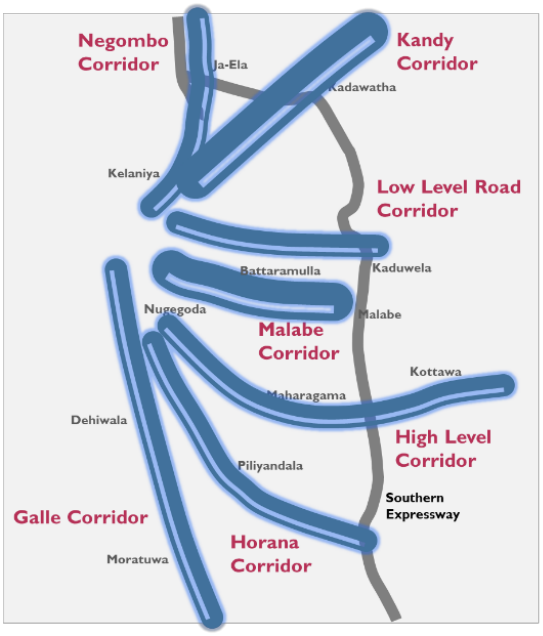


Figure 31: *Seven Corridors*
Source: CoMTrans Urban Transport Plan – 2014

1. Roads

In terms of road connectivity, Colombo is mainly connected with the adjoining and distanced regions of the country by seven major corridors namely Negombo, Kandy, Low level road, Malabe, High level road, Horana and Galle.

Road Name	Road Section	Number of Lanes	Road Width*(m)	Length (Km)**
Negombo Road (A3)		4	20	37.8
Kandy Road (A1)	1. Colombo-Kadawatha	4	18–20	13.7
	2. Kadawatha	2	13	41.8
Low Level Road (B435)		2	10–12	24.5
Malabe Road (A0 – B240)	1. Colombo - Battaramulla	6	18–25	8.1
	2. Battaramulla-Malabe	2	12	27.8
High Level Road (A4)	1. Colombo-Kottawa	4	12–18	20.8
	2. Kottawa	2	12	41.2
Horana Road (B84)		2	12	28.0
Galle Road (A2)	1. Colombo - Ratmalana	4	18–25	
	2. Ratmalana - Moratuwa	6	30	48.5
Baseline Road		6	28–30	8.0

Table 02: *Section Details of Major Roads in Colombo Commercial City*
Source: RDA, Western Province Council Ministry of Road Development, CMC

As per the information of National Transport Commission (NTC), there are around 680 intra-provincial bus routes and 400 inter-provincial bus routes in Western Province of which one third of these intra-provincial bus routes have one of their ends in the Pettah area of Colombo where three major bus terminals are located. It has been recorded that around 7,400 intra-provincial buses depart and arrive at Pettah while around 3,300 inter-provincial buses depart and arrive at Pettah. The number of passengers departing from Pettah bus terminal is estimated to be around 38,000 per day for inter-city bus services while 14,000 passengers per day for intra-city bus services. As per the CoMTrans Urban Transport Plan – 2014, the vehicle flows entering the City of Colombo from seven corridors are as follows.

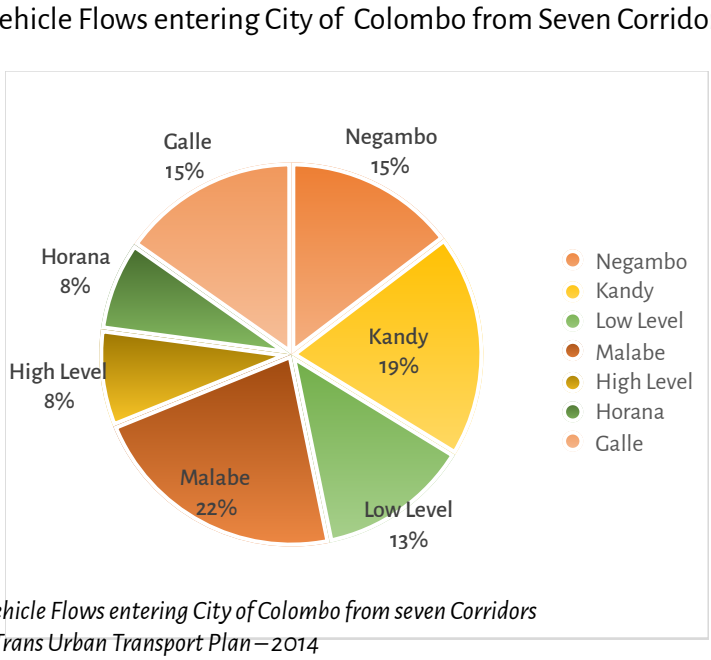


Figure 32: *Vehicle Flows entering City of Colombo from seven Corridors*
Source: CoMTrans Urban Transport Plan – 2014

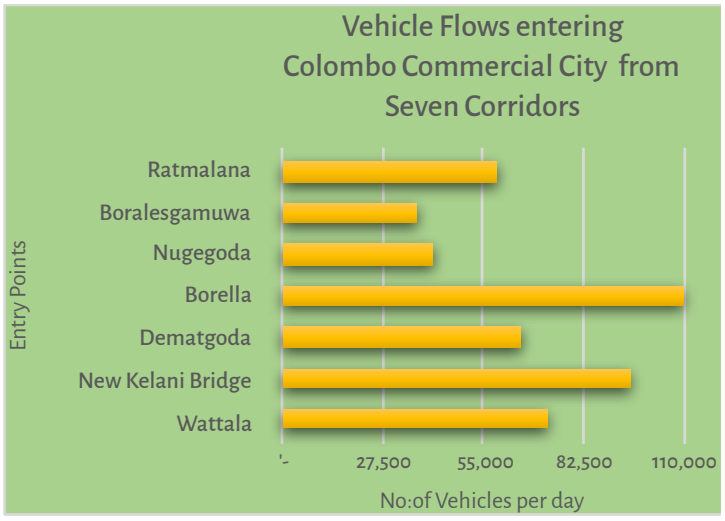


Figure 33: *Vehicle Flows entering Colombo Commercial City from Seven Corridors*
Source: CoMTrans Urban Transport Plan – 2014

Out of total vehicles entering to the City of Colombo, 6% of them are buses which carry around 62% of passengers while 94% of them are cars, three-wheelers, Motor cycles and other utility vehicles which carry around 38% passengers. (Weerawardhane, 2011)

2. Expressways

The major expressway linkage in the planning area is the Colombo – Katunayake Expressway which starts from Peliyagoda. Peliyagoda interchange is very important as it acts as the main gateway connecting the Colombo city with the Expressway Network of Sri Lanka. Other than Peliyagoda interchange, proposed Kerawalapitiya expressway interchange located in close proximity at the periphery of the planning area will provide access to Outer Circular Highway (OCH) which connects Colombo – Matara Expressway, Colombo – Katunayake Expressway and Colombo – Kandy Expressway in near future.

3. Railway

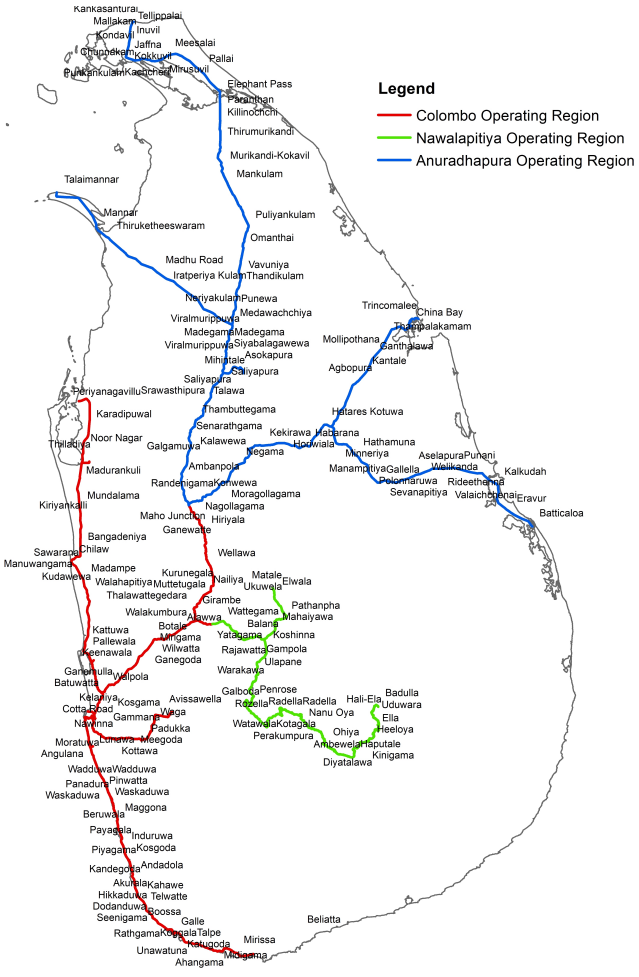


Figure 34: *Railway Network in Sri Lanka*

Colombo also acts as the nuclear of the Railway Network of Sri Lanka, as all main railway lines radiating through the country coincide at main railway stations located within the planning area such as Fort Railway Station, Maradana Railway Station and Dematagoda Railway Station. These railway lines are the Main Line running towards northern, eastern and central parts of the country, Puttlam Line, Kelani Valley Line running up to Awissawella and Coastal line running up to Matara.

As per the estimated sectional daily passenger volume determined by UoM based on ticket sale data, the highest passenger volume for both directions of 152,000 is observed in the section between Dematagoda and Ragama, followed by Fort – Maradana section with 136,000 passengers and Maradana – Dematagoda section with 121,000.

4. Domestic Air Transport

Ratmalana Airport plays an important role in domestic air transport and military transport of Sri Lanka as it is the primary domestic airport serving the Colombo Commercial City. It was the country's first Interntaional Airport until the establishment of BIA, Katunanayake. It also facilitates aviation training for several organizations. The Ratmalana Airport is of strategic significance with related to Colombo Commercial City as it caters the high-end tourism and business travels needs of High Net Worth Individuals.

At present, there are around four passenger flights which fly to regional destinations such as Anuradhapura, Batticalo, Trincomalee, Hambantota, Jaffna, Koggala and Sigiriya. In addition, the air taxi services operated by Sri Lankan Airlines also act as a prominent transport mode connecting Colombo with other regions.

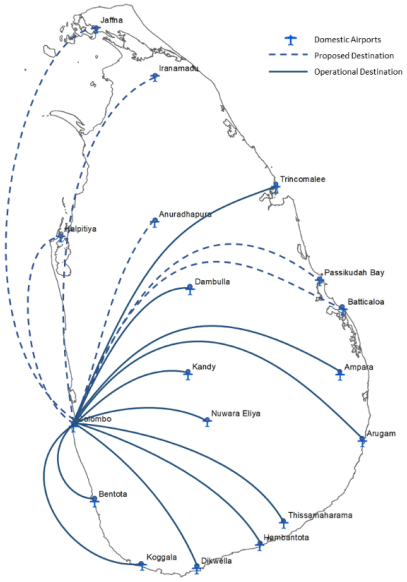


Figure 35: *Domestic Air Routes*
Source: www.srilankan.com/airtaxi

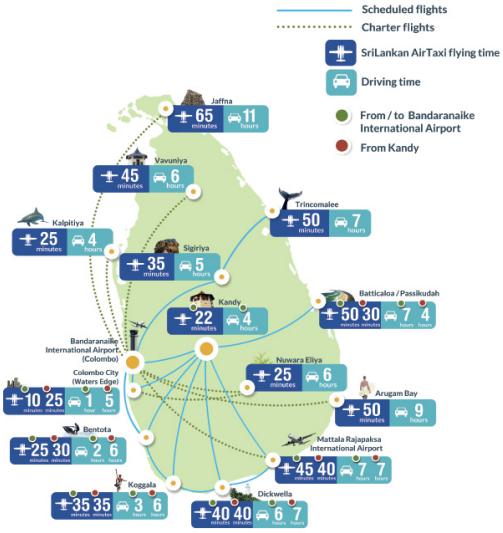


Figure 36: *Sri Lankan Air Taxi Flight Schedule*
Source: www.srilankan.com/airtaxi

2.3.2.2. Material Flows

Colombo plays a dominant role in the material flow system of Sri Lanka due to the existence of Colombo Harbor which is the main national harbor operating the export and import of goods as well as one of the major ports in the region facilitating transshipment of cargo.

1. Logistics Activities in Colombo

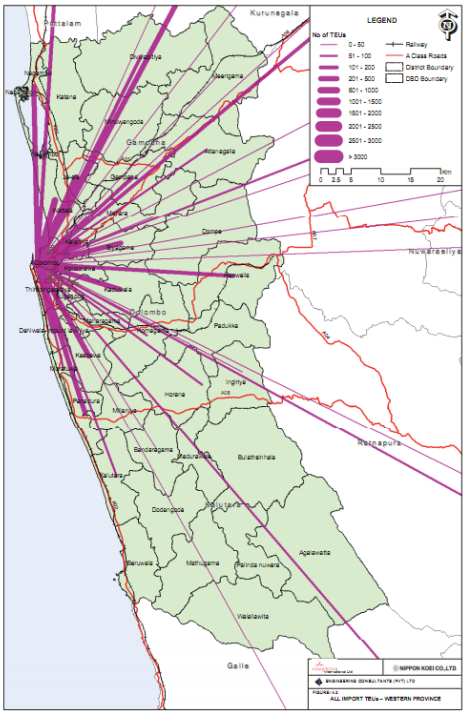


Figure 37: *Destinations of Import Cargo*
Source: NIPPON KOEI CO. LTD & Engineering Consultants (Pvt) Ltd

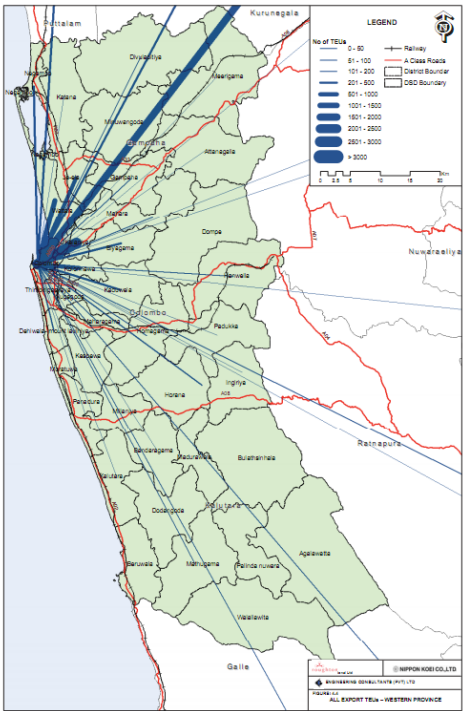


Figure 38: *Origins of Export Cargo*
Source: NIPPON KOEI CO. LTD & Engineering Consultants (Pvt) Ltd

Export Cargo		Import Cargo	
Region	**% of Export Cargo**	**Region**	**% of Import Cargo**
Kelaniya	24.7	Kelaniya	21.6
Wattala	11.6	Colombo	17.0
Colombo	9.5	Wattala	7.7
Ja-ela	7.4	Dehiwala – Mt Lavinia	6.0
Kolonnawa	6.6	Ja-ela	5.1
Negombo	2.9	Biyagama	3.3
Biyagama	2.8	Kaduwela	3.2

Table 03: *Origins and Destinations of Export and Import Cargo*
Source: NIPPON KOEI CO. LTD & Engineering Consultants (Pvt) Ltd

The above maps show that Kelaniya, Colombo CBD and Wattala act as key locations of domestic cargo flows. Major inter – city cargo trip demands are to/ from the Colombo Port. The reason is the high concentration of custom inspection sites, warehouses and related industries within these areas. Namely, Colombo Fort, Pettah, Maradana, Dematagoda, Kotahena, Maligawatta, Mattakkuliya, Orugodawatta, Bloemandhel, Peliyagoda, Hendala, Hekitta, Kerawalapitiya, Kelaniya and Wattala have the highest concentration of warehouses and related industries.

It has been pointed out by transport studies that Customs Inspection Facilities located within Dematagoda, Orugodawatta and Kotahena areas contribute to the generation of heavy domestic container traffic within the area. According to Truck OD interview survey conducted by CoMTrans study at Colombo Port, the destinations of the trucks are Puttlam District (27%), Gampaha District (23%), CMC (17%) and Colombo District (12%). At present, heavy vehicle to/from Colombo Port are passing through the northern part of CMC and this contributes to the traffic congestion in the city centre.

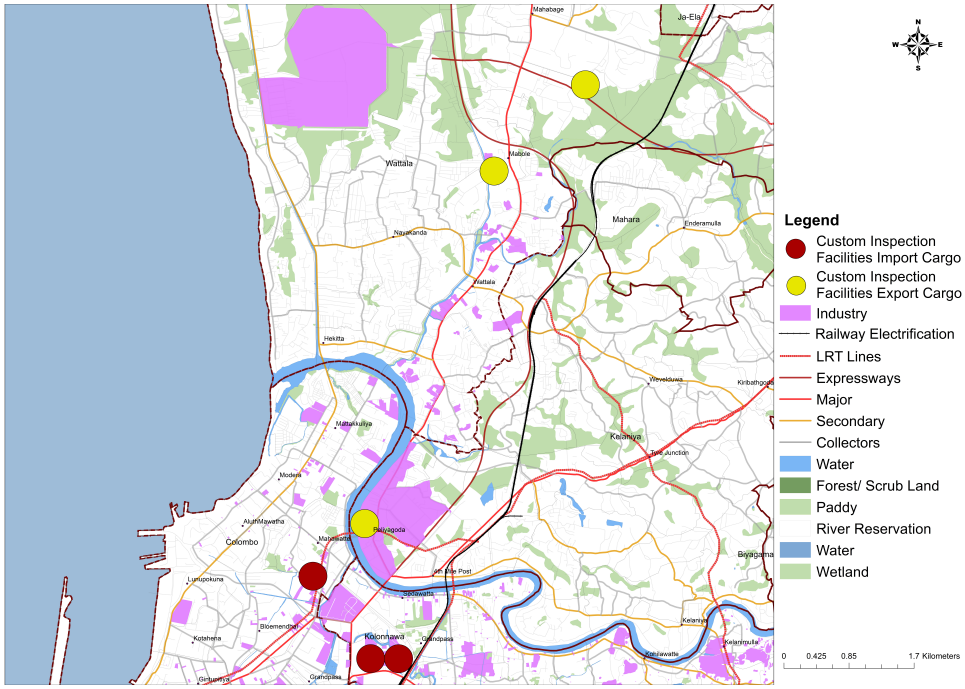


Figure 39: *Logistic Related Activities in North Colombo*
Source: Western Province Division, UDA

2. Colombo Wholesale Markets

Pettah Bazaar, Manning Market, Peoples' Plaza, Panchikawatta Motor Spare Parts Market, Galwala Street Hardware Market, Colombo Gold Center and Peliyagoda Fish Market etc. are some of the examples of largest and most active wholesale market spaces within Colombo Commercial City area. Most of the above wholesale markets are located in close proximity to Colombo Harbor as

they are established based on the imported products. The existence of these wholesale markets contribute largely to the daily influx of commuters to Colombo Commercial City.

Pettah bazaar is the most hectic shopping borough in the heart of Colombo. Pettah open air fresh market includes a configuration of specialized streets of wholesale markets of knick knacks, clothing, fresh fruits & vegetables, electronics & electrical items, dvds, leather products, grocery products, dried salted fish, freshly ground spices and massive crowds of people to purchase their necessities in order to make the life living and also to purchase products at wholesale prices for the purpose of re-selling. Pettah Bazaar is possibly the best place in Colombo to get initiated into the local Sri Lankan hustle and bustle, to ingest the sounds and smells, and to get a flavor of life in Colombo. Specialized streets of Pettah Bazaar area are as follows.

- Leather: Front Street, Main Street
- Clothes, Shoes, Bags: Front Street, Main Street, 2nd Cross Street
- Electronics: 1st Cross Street, Prince Street
- Party stuff: China Street
- Toys: Prince Street
- Stationery: Maliban Street, 2nd Cross Street
- Vegetables, Fruits: 5th Cross Street Market

Figure 40: *A busy street in Pettah Bazaar*
Source: https://www.flickr.com/photos/nazly/

Manning Market which is located adjoining the Olcott Mawatha and Bestian Mawatha in Pettah is one of the busiest wholesale vegetable markets in Sri Lanka. It acts as a central point of collecting vegetables, fruits and other food items from agricultural areas and redistributing them to all parts of the island. There are around 800 wholesale stalls and 200 retail stalls which are being

supplied with vegetables from various distanced agricultural areas by around 1000 number of suppliers. It has been revealed that within the peak hour of operations, around 120 large lorries, 35 medium lorries, 30 small lorries enter the Manning Market premises. There are around 2000 Porters (Nattamis) attached with Manning Market functions who are considered as important agents operating in the Pettah Bazaar area. However, due to space limitations in future expansions and improvements of the market, its impact on traffic movement in Pettah and considering the potential of developing a standard wholesale market with modern facilities in a better location, it is proposed to relocate the Manning Market to Peliyagoda.

Figure 41: *Manning Market, Pettah*
Image courtesy: gettyimages by Peter Stuckings, Tale of Pettah by Vidumina Ihalagedara Photography

Peliyagoda Fish market is the primary hub for fresh seafood in the city, which is incredibly popular, for trucks full of fresh fish. Fishermen lay out their catches, and the fish market get ready for business in early hour of the day and the market is not just for fish and fishmongers but also for smaller vendors and little tea shops. Lorries packed with blood-tinged ice and fish arrive from coastal areas of the country and reach to the inlands. There are around 150 wholesale stalls, 130 retail stalls facilitated with a 25 mt ice factory and fisheries equipment stalls.

Figure 42: *Peliyagoda Fish Market*
Image Courtesy: exploresrilanka.lk

Figure 43: *Panchikawatta Roundabout*
Image Courtesy: flickr.lk by ceylonerana

Panchikawatta Motor Spare-parts market is a specialized market established along Panchikawatta Road, Maradana which has an assortment of both formal and informal motor spare parts of a variety of collection. Panchikawatta Motor Spare Parts market is a highly sought-after market which is famous among all Sri Lankans for any type of motor part of any generation at relatively cheaper costs.

3. Industry Space of Colombo

Around 5% of developable foot print of Colombo Commercial City is utilized for industrial activities which are largely concentrated in areas such as Ratmalana, Wattala, Peliyagoda, Kelaniya and Kolonnawa. There is a Mini Industrial Estate having manufacturing sector industries such as steel, toiletries, herbals and stationery established at Ratmalana which had been planned to be promoted as an industrial area by Abecrombie's Plan in 1948. With the influence of this plan, large land plots have been planned out in Ratmalana to be allocated for

Figure 44: *Maliban Biscuit Factory - Ratmalana*
Image Courtesy: malibanbiscuit.com

industries. Maliban Biscuit Factory, Associated Battery Manufacturers (Ceylon) Ltd, Elcardo Industries Ltd (steel/ roller doors), Siddhalepa Ayurveda Exports (herbal products), Dynamic Technologies (road tankers), Asian Chill Equipment (supermarket displays), Deto Surfacts (industry detergents) are some of such examples of industries located in Ratmalana.

Figure 45: *Kolonnawa Petroleum Refinery*
Image Courtesy: ceypetco.gov.lk

Figure 46: *Kelanitissa Power Plant*
Image Courtesy: lntsnl.com

Kelanitissa Power Plant, Kolonnawa Petroleum Refinery are the industries of national importance located within the planning area. These industries also play a significant role in the material flow in and out of Colombo Commercial City due to the transportation of raw materials and end products.

2.3.2.3. Population Flows

It has been estimated by the CoMTrans study that the total person trip production in Colombo Metropolitan Area would increase up to 12.2 million per person trips per day which would be a 1.75 times of present person trip demand of 6.9 million trips per day. The total commuters travelling to City of Colombo is estimated to be 1.2 million while the total commuters travelling to and through the city is estimated to be 2.0 million.

	Number of Daily Passengers entering CMC (CoMTrans Study – 2013)
Corridors	
Negombo Road	245,880
Kandy Road	437,120
Low Level Road	150,000
Malabe Road	348,000
High Level Road	174,000
Horana Road	130,000
Galle Road	298,000
Non-Corridors	
Kolonnawa Road (B096)	89,335
Kirimandala Mawatha	27,051
Narahenpita Road	47,623
Polhengoda Road	14,857

Table 04: *Number of Daily Passengers entering CMC*
Source: CoMTrans Urban Transport Plan – 2014

Figure 47: *train carrying morning commuters to Colombo | Image Courtesy: alamy.com*

However, Colombo being the Commercial Capital of the country which has 28% of commercial space consisting of office space, retail/ wholesale space and tourism space, 5% of industrial space and 8% of institutional space accounting for 41% of total developable foot print of the area, attracts a large number of commuters from all parts

of the island for major three reasons such as employment, to obtain services and for entertainment and recreational purposes.

1. Colombo as the Most Popular Employment Destination of the Island

Around 70% of night time population of Colombo District are engaged with services sector while 28% are engaged with industrial sector and 2% are engaged with agricultural sector. The employment categorization of the night time population of Colombo Commercial City is as follows.

DSD	Night time Employed Population				Share (%)		
	Primary Industry	Secondary Industry	Tertiary Industry	Total	Primary Industry	Secondary Industry	Tertiary Industry
Colombo	500	13,200	56,700	70,400	0.7	18.8	80.5
Dehiwala-Mt. Lavinia	100	5,200	20,300	25,600	0.4	20.3	79.3
Kesbewa	1,300	31,400	95,100	127,800	1.0	24.6	74.4
Kolonnawa	600	20,200	90,700	111,500	0.5	18.1	81.3
Rathmalana	600	10,100	31,600	42,300	1.4	23.9	74.7
Thimbirigasya ya	300	12,300	56,900	69,500	0.4	17.7	81.9
Kelaniya	900	23,000	40,500	64,400	1.4	35.7	62.9
Wattala	1,900	30,600	47,900	80,400	2.4	38.1	59.6
Total	**6,200**	**146,000**	**439,700**	**591,900**	**1.0**	**24.7**	**74.3**

Table 05: *Employment Categorization of Residents of Colombo Commercial City*
Source: Department of Census & Statistics, 2012

It is evident that a considerably a large number of Managers/ Senior Officials and Legislators, Professionals and Technicians and Associate Professionals are residing in Colombo Commercial City which reflects the relatively high concentration of office and institutional space. Even though, there is a national policy to shift administration establishments to Kotte Capital City area, yet there are considerable number of state establishments such as ministries, state departments, authorities, organizations and institutions located in Colombo.

With regard to private office establishments, housing the headquarters of several national and international banking and financial institutions, makes City of Colombo the most prominent commercial office destination in the country.

It has been revealed in the report 'Real Estate in Sri Lanka Prospects and Potential' by Jones Lang LaSelle in 2011, that the demand for office space is primarily driven by growth in the banking, financial services, IT/ITES and tourism sectors in Colombo.

According to the ComTrans study, the estimated commuter students and employed workers of Colombo will be 841,900 in 2035 which is about 59% increment than 2013.

2. Colombo as the Most Sought Services Destination of the Island

Colombo is the most sought services destination in the country, due to existence of many national level administrative establishments, high standard health service institutions of both private and public sector and number of education institutions of national prominence. In addition, Colombo's retail market consisting of both local product based street markets and imported branded product based high-end retail markets, attracts a large number of both local and foreign visitors for shopping purposes.

Education Services

Colombo Commercial City area has a high concentration of schools accounting for total of 188 including 38 National Schools, 58 Provincial Schools, 48 International Schools and 34 Private Schools. A considerable number of schools in Colombo fall under the popular schools category, thus do not literally serve only the students of Colombo Commercial City but also the students of western region and other parts of the island who daily travel through train, buses, school service and private transports or temporary reside in school hostels, boarding places etc. These popular category schools which have maintained their prominence due to long existence and relatively high standard facilities can be identified as one of the key elements which attract a large population to the city permanently, temporary and daily. However, it is important to highlight that the school students of Colombo Commercial City are important partners of the city who make the city alive and vibrant with their presence on streets at morning

Figure 48: *Royal College, Colombo 07*
Image Courtesy: info.shalanka.com

Figure 49: *Ananda College Parade, Maradana*
Image Courtesy: youtube.com

Figure 50: *Musaeus College, Colombo 07*
Image Courtesy: musaeus.lk

Figure 51: *Students of Sirimavo Bandaranaike Vidyalaya, Colombo 07*
Image Courtesy: pmdnews.lk

and afternoon hours and add color to the city with their own activities such as school parades, walks, matches, exhibitions and camping etc.

The high concentration of relatively large number of schools within City of Colombo, has been identified as one of the major reasons contributing to peak hour traffic in Colombo streets. As per the CoMTrans Study the estimated day and night time student population of Colombo Financial City in 2035 is as follows.

Student Category	Night Time Student Population per Day	Day Time Student Population per Day
School Students (Kindergarten to A/L)	295,300	438,100
University Students	24,000	72,900
Total	**319,300**	**511,000**

Table 06: *Estimated Student Population of Colombo Commercial City in 2035*
Source: CoMTrans Urban Transport Plan – 2014

As per the above data, it can be expected that a total of 511,000 of students will be engaged in education activities within Colombo Commercial City in 2035 and among them, 190,000 of students will be daily commuters.

When considering higher education institutions, there are two main state universities; Colombo University and Kothalawala Defense University and many other state higher education institutions such as Technical Colleges, Research Institutions, Post-graduate Institutions of other state universities etc. In addition, there are number of internationally recognized private universities and educational institutions which attract large number of student population to the city.

Figure 52: *University of Colombo, Colombo 07*
Image Courtesy: cmb.ac.lk

Health Services

Colombo plays a major role in the country's health sector due to the existence of the national hospital, nationally and regionally serving 05 state hospitals and around 20 private hospitals. The National Hospital of Sri Lanka is located at the Hospital Square of Maradana, and it acts as the main referral for most of the health issues of the country. In addition, there are two main state hospitals serving at national level such as Lady Ridgeway Hospital for Children and Castle Street Hospital for Woman. Colombo South Teaching Hospital Colombo located at Kalubowila is also one of the prominent state hospitals located within Colombo Commercial City area which serves a large population of southern parts of it. Colombo is considered as one of the best health services destination of South Asia, where people from India, Maldives and other South Asian countries visit to obtain health services especially from standard health establishments of private sector such as Nawaloka Hospitals PLC, Asiri Central Hospital, Lanka Hospitals, Durdans Hospital and Hemas Hosoitals etc.

Figure 53: *National Hospital of Sri Lanka*
Image Courtesy: visitsrilanka.com

Administration Services

Even though, there is a policy decision to shift nationally and regionally serving administrative services to Administrative Capital of Sri Jayawardhanapura Kotte, still there are considerable number of administrative establishments located within Colombo Commercial City Area such as ministries, departments, state boards, authorities and institutions. However, it is proposed to shift 214 government institutions of Colombo Commercial City area to Kotte Administrative Capital City Area.

In addition to the state administrative establishments, Colombo also houses number of international institutions such as embassies, headquarters of

international and non-government organizations. Also it houses headquarters of national organizations and private sector financial companies, which keep attracting a considerable number of daily commuting employees and occasionally commuting service seekers from other parts of the country.

Retail & Commercial Activities

Retail establishments of Colombo are largely located along the high streets, either in traditional retail areas like Pettah, Dematagoda or in upmarket established retail areas like Colpity, Bambalapitiya and Wellawatta. Up-market and branded shopping destinations are largely found towards the south of the City Center along Galle Road and Duplication Roads. However, with the establishment of large shopping malls such as Majestic City, Liberty Plaza, Crescat Boulevard, Arcade Independence Square and recently established Colombo City Centre and similar malls coming in future, Colombo offers considerable amount of up-market retail space which caters both locals as well as tourists.

Figure 54: *A Branded Shopping Outlet at Liberty Plaza, Colombo 03*
Image Courtesy: msnarchitects.lk

Figure 55: *Majestic City Shopping Mall, Colombo 04*
Image Courtesy: visitsrilanka.com

3. Colombo as the Most Vibrant Entertainment and Recreational Destination of the Island

Public Open Recreational Spaces and entertainment venues are special elements of any city, which act as the points of relaxation in busy and highly congested city life. Usually, large cities tend to have more recreational and entertainment options due to the gathering of large population. Most of the time, these recreational and entertainment places are both designed and perceived to be as special attractions not only for the city community but also for larger threshold including regional and national population. Colombo has many such vibrant entertainment and recreational destinations which attract population from all over the island, contributing to the daily and seasonal influx of commuters to the city.

The major Public Open Spaces

- Galle Face Green

Figure 56: *Galle Face Green*
Image Courtesy: olankatravels.com

Galle Face Green was initially laid out by the Dutch as a means to enable their cannons a strategic line of fire against the Portuguese, where in meantime it had also been used for horse racing, as a golf course and for other sports such as cricket, polo, football, tennis and rugby. As per the historical data, the Galle Face Green had extended over a much larger area than it exists today. It had been bounded to the north by Beira Lake, the ramparts of Colombo Fort and the city's cemetery and to the south by Galle Face Hotel.

At present it is an ocean-side urban park of around 12 acres which stretches for 500m along the coast. It is the city's largest open space providing a panoramic view of the Indian Ocean within the Colombo CBD. Galle Face Green is a popular recreational destination of all types of people, thus it can be identified as the largest public open interaction space of the city. It is a popular recreational destination of not only the city dwellers but also of both local and foreign tourists. The Galle Face Green has its unique genius loci composed of the actions of various every day and occasional users such playing children, mischievous teenagers, lovers, unified families, relaxing adults, vendors, beggars, sight-seeing tourists, large packs of local tourists visiting Colombo for day trips from distanced areas. In addition, Galle Face Green is used to host many national level events and functions such as Independence Day Celebrations, Kite Festivals, Religious Events, Carnivals, Mega Concerts and New Year Celebration events etc.

- Viharamahadevi Park

Figure 57: *Viharamahadevi Park*
Image Courtesy: Wikipedia / yamu.lk

Viharamahadevi Park, which was built during British Period, was considered as the central point of Colombo when applying the Garden City Concept to the city by Sir Patrick Geddes in 1921. The park was formerly known as Victoria Park, and it had been occupied by the British Army during World War II. However, it had been opened up to the public again in 1951. Viharamahadevi Park is the oldest and largest park of Colombo which provides the experience of a small wood within the city. Viharamahadevi Park consists of large garden area shaded with huge trees, walking & bicycle trails, children's play area, open air theater, play-ground and a series of small ponds and mini-lakes and it also hosts many events such as out-door exhibitions, concerts, public meetings, carnivals, camping and many other public events.

International & National Stadiums

There are number of stadiums, sports grounds and sport complexes in Colombo which host both international and national level sports events such as cricket matches, tournaments and athletics competitions. Sugathadasa Stadium is one such international level multi-purpose stadiums which has the capacity to hold around 25,000 people.

R. Premadasa International Cricket Stadium which is located at Kettarama Road, Maligawatta is also one of the main venues popular for cricket matches which has hosted more than 100 one day international matches. It is the largest stadium in Sri Lanka having the capacity of 35,000 spectators. The stadium has hosted many remarkable matches and it is usually called as the 'Home of Sri Lankan Cricket'. Due to the existence of these international stadiums within Colombo Commercial City, it attracts large population to the city especially during cricket matches and other sports seasons.

Figure 58: *Sugathadasa Stadium*
Image Courtesy: Devaka Seneviratne Photography

Figure 59: *R. Premadasa International Cricket Stadium*
Image Courtesy: Indi Smarajiva, justgola.com

International Conference Halls

Bandaranaike Memorial International Conference Hall (BMICH) which was established in 1973 has been the official venue for most of the Sri Lanka's events. Replete with a magnificent conference & concert hall and function rooms, it was the first of its kind to accommodate a multitude of events both local and international. Over the years increasingly novel features were included to further enhance the facilities and accommodate guests looking to host splendid events. BMICH is an iconic venue of Colombo which acts as one of the highest points of attraction where most of the Sri Lankans have paid at least a onetime visit to attend the international book fair, exhibitions, conferences, graduation ceremonies, meetings, cultural events, weddings, concerts or trade fairs. The annual revenue of BMICH in year 2016 had been LKR 550 Mn.

In addition to BMICH, there are many number of international standard conference halls maintained by many private and public sector institutions and hotels within Colombo Financial City.

Figure 60: *Bandaranaike Memorial International Conference Hall, Colombo 07*
Image Courtesy: tripnino.com

Theaters & Cinemas

Colombo has number of popular theatres and cinemas of all time which host a large number of stage dramas, indoor concerts, movies and art exhibitions etc. The specialty of these theaters like Nelum Pokuna Mahinda Rajapaksa Theatre, Lionel Wendt Art Centre, Elphinston, Tower Hall and John de Silva Memorial Hall etc. is that these places have their own followers who visit from both local and distanced areas to enjoy different kinds of entertainment events.

Even though, there are number of cinema theatres around all over the places, the cinema theatres located in Colombo still attract many number of people outside

the Colombo Commercial City due to their premium cinema experiences with higher standards.

Figure 61: *Nelum Pokuna Mahinda Rajapaksa Theatre*
Image Courtesy: nelumpokuna.com

Figure 62: *Lionel Wendt Art Centre*
Image Courtesy: wikipedia.org

Figure 63: *National Museum of Colombo*
Image Courtesy: lanka.com

Educational Exhibition Centers

Colombo hosts number of educational exhibition places which have been visited by most of the Sri Lankans for at least once in their lifetime. Some of such major attraction centers are National Museum of Colombo, Sri Lanka Planetarium and Dehiwala Zoo.

National Museum of Colombo was established in 1877 and it is the largest museums of Sri Lanka at present. It contains collections of much importance to the country such as the regalia including the throne and crown of the Kandyan Monarchs as well as many other exhibits revealing the evolution of the country.

Sri Lanka Planetarium which was established 1965 by the State Engineering Corporation as a special feature for the Ceylon Industrial Exhibition held in Colombo the same year, is still the first and the only planetarium in the country. Due to its unique existence, it is considered to be a compulsory destination of most of the school trips in Sri Lanka. Thus, it it is being visited by many school children from all over the country every day.

Figure 64: *Sri Lanka Planetarium*
Image Courtesy: wikipedia.org

National Zoological Garden – Dehiwala, had been initially established as a private company by John Hagenbeck, brother of the famous animal trainer, Carl Hagenbeck. However, since the company went bankrupt in 1963, the zoo was purchased by the government at that time. In addition to its role as an educational exhibit, the Dehiwala Zoo also acts as a greenish calm environment within the hustle-bustle of city life. The Dehiwala Zoo is full of people every day. However, it becomes completely populated during school vacation times, due to increased amounts of vacation trips of kindergarten and primary school children. Its annual revenue of 2016 is reported to be LKR 160 Mn whereas one third of that is composed of foreign revenues.

Figure 65: *National Zoological Garden - Dehiwala*
Image Courtesy: mountlavinihotel.com

Chapter 03
Need of the Plan

3.1. Identification of 'Need of the Plan'

As it is the strategic planning process which was adopted in preparation of this plan, the first strategic question, "where are we now?" or in other words, "what is the current situation of the planning area?" was attempted to be answered with the intention of clarifying the actual need of a plan. It is essential to clarify the real need of a plan or the reasons why a plan should be prepared for the considered planning area to determine the focus of the plan and the direction towards which the city should be led in future.

The identification of the need of the plan was first started with identifying the existing problems of the planning area as perceived by different stakeholders of the city. In this stage, basically two types of stakeholders; the service providers and users (general public including citizens and commuters) were consulted to obtain their views on existing problems of the city. Above different stakeholders view city in different perspectives as they are attached with the city in different means thus the problems which were emphasized by them cover a wide spectrum of city issues. As the next stage, in-depth analysis of problems was carried out along with a root-cause analysis to acutely define the existing problems of the planning area; Colombo Commercial City.

The following main four issues which act as the causes for many problems initially identified through observations and stakeholder consultation are presented in this chapter in terms of their context, magnitude and significance.

(1) Problems due to Changing Development Trends

   a. Spontaneous Emergence of High Dense Developments within Colombo Commercial City Regardless the Availability of Supporting Infrastructure

   b. Current Development Trends Challenging the Existing Planning and Building Regulations based on Land use Zoning

(2) Emerging Social, Environmental and Economic Problems due to Distribution of Underserved Settlements

(3) Public Inconvenience and Economic Loss due to Traffic Congestion on Major Arterials at Peak-hours

(4) Lack of User-convenience within Colombo Commercial City due to Prevailing Environment Problems, Safety Issues and Deficiencies in Public Facilities

a. Lack of User-convenience due to Environmental Problems

    i. Inconvenience caused due to Urban Floods / Flash Floods
    ii. Inconvenience caused due to Polluted Water Bodies
    iii. Inconvenience caused due to Heat Island Effect

b. Inconvenience due to Safety Issues
    i. Safety Issues due to Crimes
    ii. Safety issues due to road accidents

c. Inconvenience due to Lack of Public Facilities

3.2. Problems due to Changing Development Trends

There are few development trends emerging within Colombo Commercial City which have caused problems of relatively high significance and which need to be addressed in the proposed development plan to minimize future possible negative consequences.

3.2.1. Spontaneous Emergence of High Dense Developments within Colombo Commercial City Regardless the Availability of Supporting Infrastructure

Context

High dense development usually represented in the form of vertical development is considered as a positive indicator of city development as it reflects the growing demand for space. Vertical development also indirectly contributes to control haphazard suburbanization while conserving environmentally sensitive lands and providing more open spaces. Also, vertical development makes investments in infrastructure development more efficient and viable.

3.2.1.1. The Origin of Vertical Development of Colombo

The origin of vertical development within City of Colombo was occurred during late 1950s' where medium rise buildings were constructed predominantly through public sector investments. With the introduction of open economic policies in 1977, government aimed at maximizing private sector investments in vertical developments of the city and consequently UDA undertook necessary planning and regulation measures and undertook regeneration projects for releasing more urban lands for private sector investments. Echelon Square Redevelopment Project is one such regeneration project undertook by UDA which changed the Skyline of Colombo's Central Business District.

3.2.1.2. Condominiums and Vertical Housing

Condominiums by definition characterizes the individuality and commonality where the owner of a condominium unit is granted the freehold right of it while he has to share in common with the other condominium dwellers of the building the ownership of elements of the building such as car park, landscaped gardens and circulation spaces. (Understanding the Concept of Condominiums by Ajitha Edirimane)

After 1977, majority of the medium to high rise buildings constructed with public sector investments were housing projects for low and middle-income households of City of Colombo whereas most of the profit oriented commercial and housing based high rise developments were carried out by private sector. The Apartment Ownership Law No. 11 of 1973 and its amendments and Common Amenities Board Law No. 10 of 1973 which was amended as Act No. 24 of 2003 commonly known as 'Condominium Management Authority Law' are the key laws which conduct the promotion and regulation of condominium developments of Colombo. Condominium Management Authority which was established in 2003 is the current legal body to grant approvals for condominium developments in Sri Lanka. Liberty Plaza, Unity Plaza Lucky Plaza are some of the commercial high rises constructed in 1980s while Kings Court and Queens Court built in 1990s are the first high rise condominiums developed by the private sector. However, a significant growth of high-rise condominium developments was observed after 1999 with the implementation of Colombo Development Plan – 1999 which included provisions to promote high rise developments.

Building classification based on height is as follows.

Definition	No. of Floors
Low-Rise	Up to 03
Intermediate-Rise	04 to 08
Middle-Rise	09 to 12
High-Rise	Over 13

Table 07: *Building Classification Based on Height*
Source: City of Colombo Development Plan (Amendment) – 2008, UDA

3.2.1.3. The Gradual Growth of High-rise Buildings and Condominiums

The temporal trend of high-rise developments within City of Colombo during the beginning of 21st century can be identified based on the following information on the number of approved high-rise buildings annually.

Year	No. of Buildings Approved under Different Height Categories					
	4-5 floors	6-7 floors	8-10 floors	11-20 floors	20 < floors	Total
1999	86	36	4	3	-	129
2000	86	30	5	4	-	125
2001	50	29	4	1	-	84
2002	16	10	-	3	-	29
2003	57	31	16	5	1	110
2004	51	35	17	2	2	107
2005	55	65	22	3	4	149
2006	65	61	35	5	5	171
Total	466	297	103	26	11	903

Table 08: *No. of Buildings Approved from 1999 - 2006*
Source: Colombo Living High; A City in Transition, N.P Herath & D. Jayasundara, 2007

It has been observed that out of total approved high-rise building applications in 1999, 67% of them were between 4 – 5 floors while 33% were of 6 floors or above whereas this situation was entirely changed in 2006 as 38% approved high-rise buildings were between 4 – 5 floors and 62% were of 6 floors or above. This shows the rapid growth of demand for high rise buildings after 1999.

Problems due to Changing Development Trends
Spontaneous Emergence of High-dense Developments within Colombo Commercial City.....

Out of total high-rise buildings approved within the period of 1999 to 2006, 70% consisted of residential floor space indicating the growing demand for housing within the city. One of the key records of Census & Statistics Department is that the growth of housing stock of City of Colombo which was 1.5% has outpaced the growth of population which was 0.5% during the period of 1981 to 2001. The growth of housing stock from 2001 to 2011 was 0.5% whereas the growth of population was -2.9% which means even though there has been a decrease in night time population of Colombo, housing stock of Colombo has increased. The main reasons for this rapid growth of housing demand in City of Colombo has been identified and explained in Colombo Living High; A City in Transition authored by Herath N.P and Jayasundara D. in 2007 as follows.

- Demand for apartments by the Tamil community due to the unsettled problems in the north and east
- Demand for apartments by Sri Lankans working abroad
- Demand for super luxury apartments from the high-income groups of local Sri Lankans and Foreigners as an investment
- Demand from expatriates working in Sri Lanka
- Speculation in the housing market by investors

As per the 2011 Census, the number of housing units coming under high rise category of flats and condominiums is 25,320 which accounts for 4.8% of total housing units within the planning area. As per the information gathered from Condominium Management Authority, 1115 condominiums have been approved within the period of 2005 to 2017. Out of them, 28% have more than 15 units while the rest of 72% have less than 15 units which are likely to be low-rise buildings (ground plus three floors or less).

Figure 66: *No. of Annually Approved Condominiums in Colombo & Suburbs (2005 – 2017)*
Source: Condominium Management Authority, 2017

It can be observed that the number of condominiums has been increased gradually from 2013 to 2015. However, since these records show only the condominiums which have been granted the CMA certificates, it does not show the actual picture as there are considerable number of condominiums within the planning area which have not been granted the CMA certificates.

3.2.1.4. The Present Trend of High Dense Developments in Colombo Commercial City

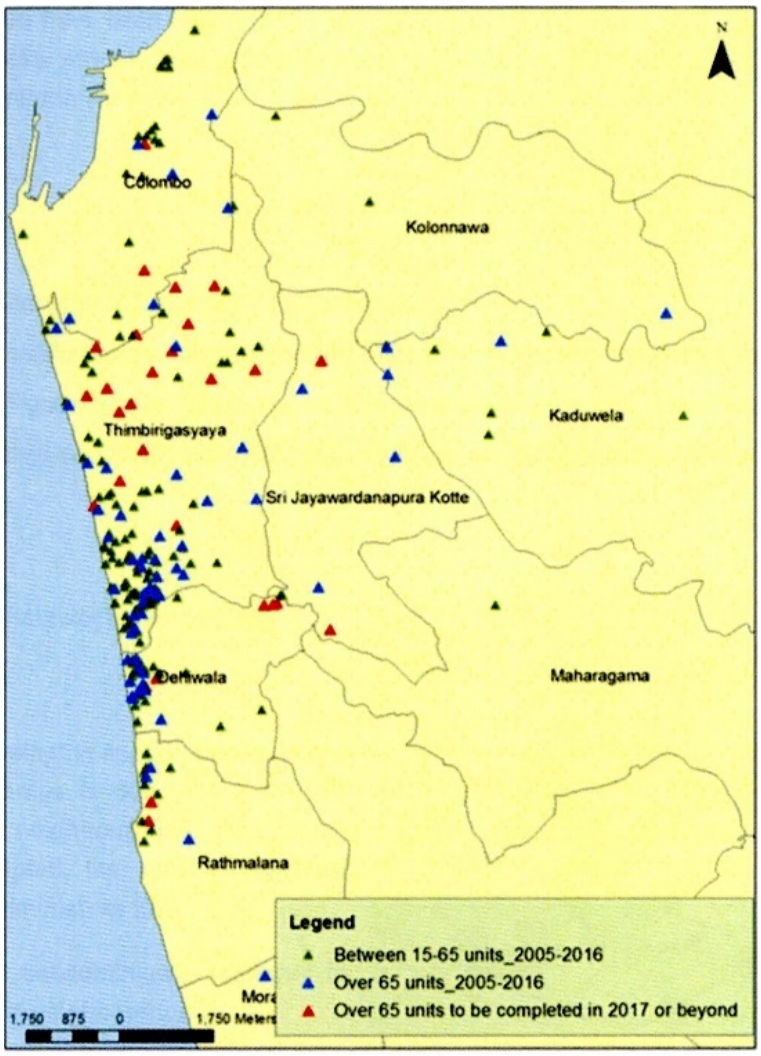


Figure 67: *Spatial Distribution of Certified Condominiums in Colombo & Suburbs*
Source: Condominium Management Authority, 2017

When considering the spatial distribution of certified condominiums, it can be observed that majority of them are concentrated in Colpity, Wellawatta, Dematagoda, Kotahena and Dehiwala areas and scattered distribution can be observed within central Colombo and towards Rajagiriya & Battaramulla areas.

Problems due to Changing Development Trends
Spontaneous Emergence of High-dense Developments within Colombo Commercial City.....

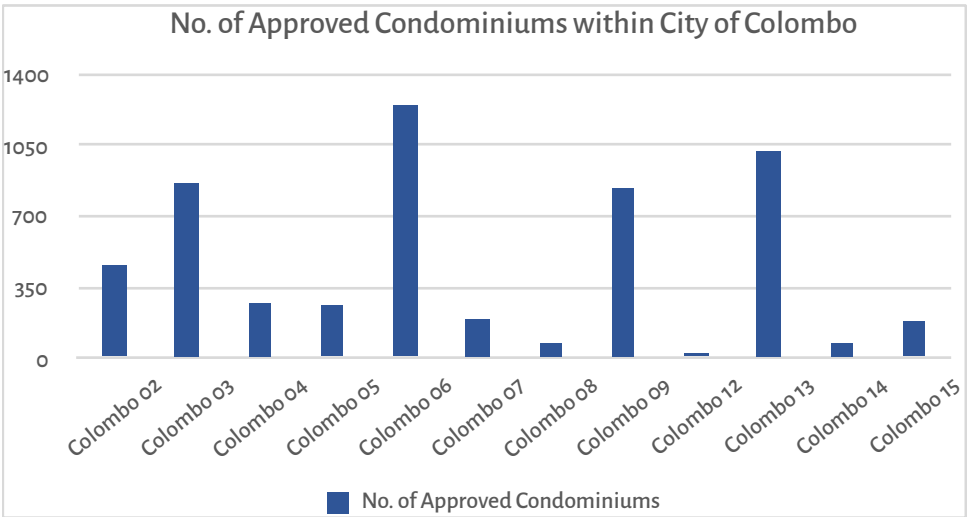


Figure 68: *No. of Approved Condominiums within different areas of City of Colombo*
Source: Condominium Management Authority, 2017

As per the Building Survey done by UDA in 2017, the distribution of high-rise buildings within planning area is as follows.

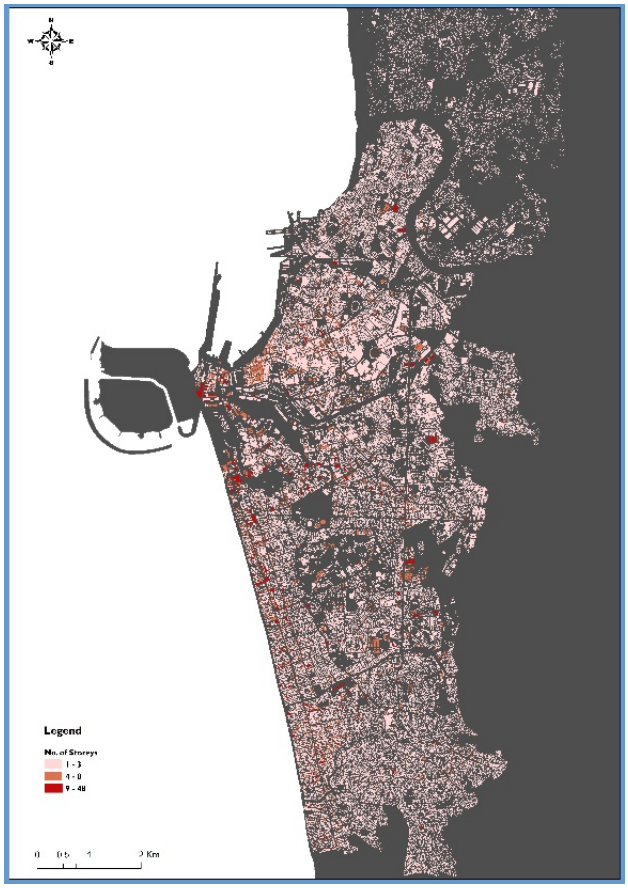


Figure 69: *Distribution of High-rise Buildings in Colombo*
Source: Building Survey – 2017, GIS Division, UDA

High-rise developments taking place in Colombo at present can be identified under three main purposes such as commercial & residential, hotel developments and high-rise condominiums for underserved settlement communities of Colombo. High-rise condominiums constr-ucted under the Urban Regeneration Project – (2010 – 2025) are mainly concentrated in Northern Colombo area while majority of private investments based residential, commercial and mixed used high rises are concentrated in Central and Southern Colombo areas.

Problems due to Changing Development Trends
Spontaneous Emergence of High-dense Developments within Colombo Commercial City.....

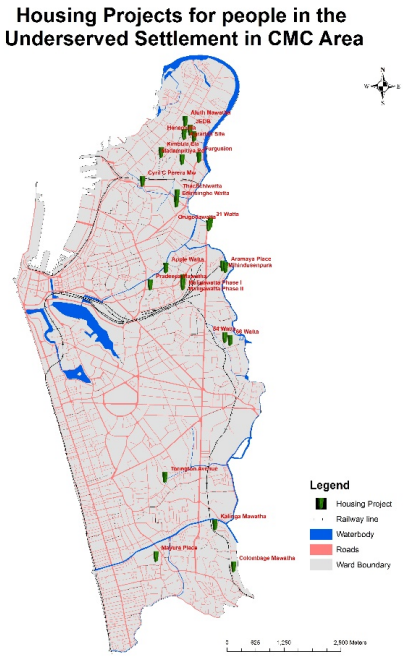


Figure 70: *Locations of High-rises built for Low-income*
Source: Building Approval Data - 2017, Enforcement Division, UDA

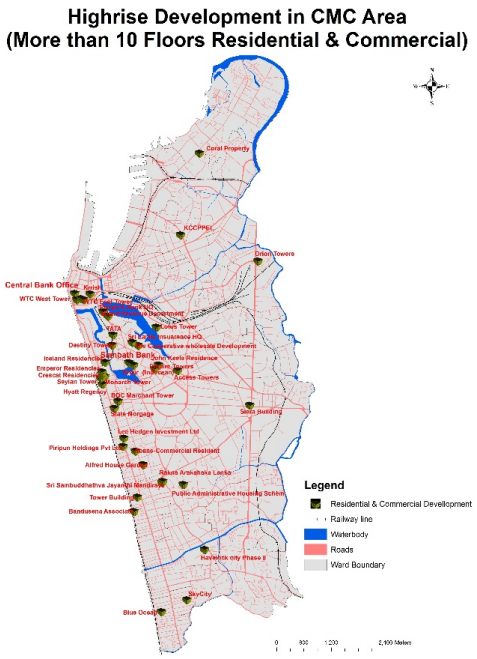


Figure 71: *Locations of Residential & Commercial High-rises above 10 floor*
Source: Building Approval Data - 2017, Enforcement Division, UDA

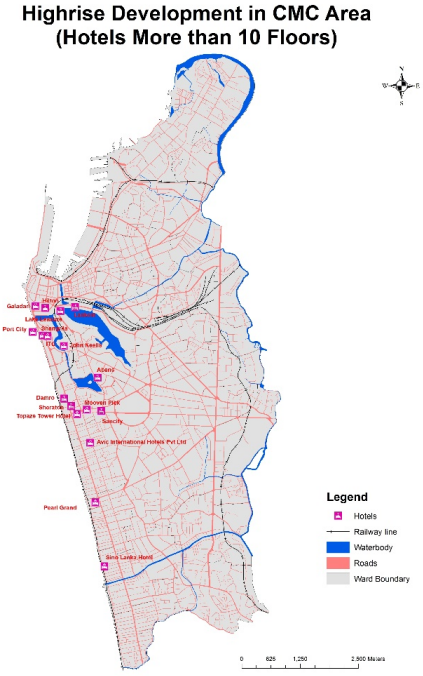


Figure 72: *Locations of Hotel Buildings above 10 floors in CMC Area*
Source: Building Approval Data - 2017, Enforcement Division, UDA

Significance & Magnitude

3.2.1.5. Issues Related to Increasing Trend of High-rise Developments

Even though it was mentioned in the beginning of this section that rapid growth of high-rise developments of a city can be seen as a positive indicator of city development, in preparation of the Colombo Commercial City Development Plan the above-mentioned increasing trend of high-rise developments in Colombo is identified as an evolving issue within the planning context with reference to the fact that the existing city infrastructure not having the capacity to cope up with the demand created by high-rise developments.

The market driven high-rise developments are carried out within the city mostly based on demand irrespective of availability of infrastructure facilities. On the other hand, where there are infrastructure facilities, there is no market demand for high-rise developments due to other influential factors.

1. Inadequacy of Sewerage and Waste Water Management Systems

Even though there is a sewerage system covering the entire CMC area which was built about 100 years ago during British period, its capacities have now exceeded with the increasing sewerage and waste water generation resulted due to increased residential and commuter population. Sewerage and waste water system is an essential part of city fabric especially a one which accommodates large high-rise developments. The existing practice is the laying of sewer lines at the cost of developers to accommodate high rise developments but most of the time these lines are laid in a haphazard way sometimes even blocking and damaging the main system.

(a) Ongoing and Proposed Waste Water and Sewerage Management Projects

- Proposed CMC Waste Water Management Project

CMC waste water project is designed with the intention of improving wastewater management services to cater the demand created by approximately 838,000 residents within the project area.
It proposes to construct a waste water treatment plant with installed capacity of 200 million liters per day (MLD).

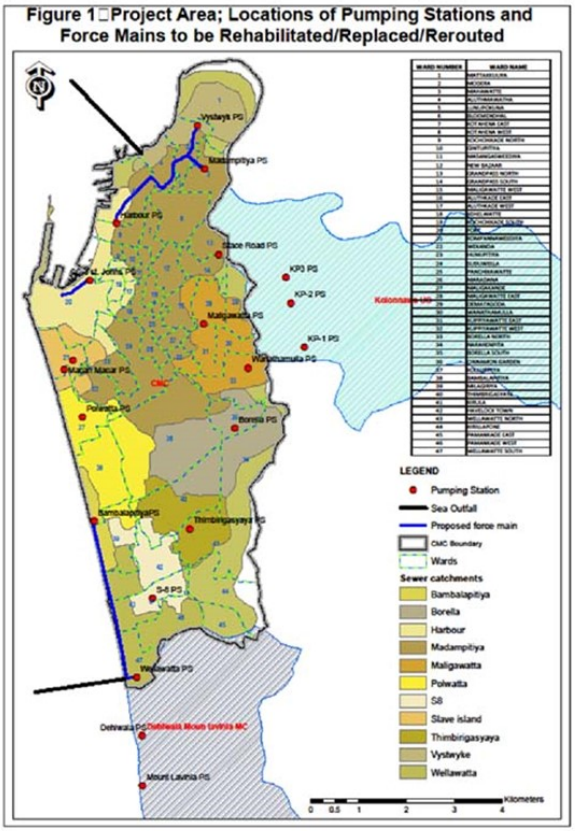


Figure 73: *Proposed Waste Water Management System in CMC Area*
Source: Greater Colombo Waste Water Management Project - colombo.mc.gov.lk, 2018

- Proposed Ratmalana – Boralesgamuwa Waste Water Management Project

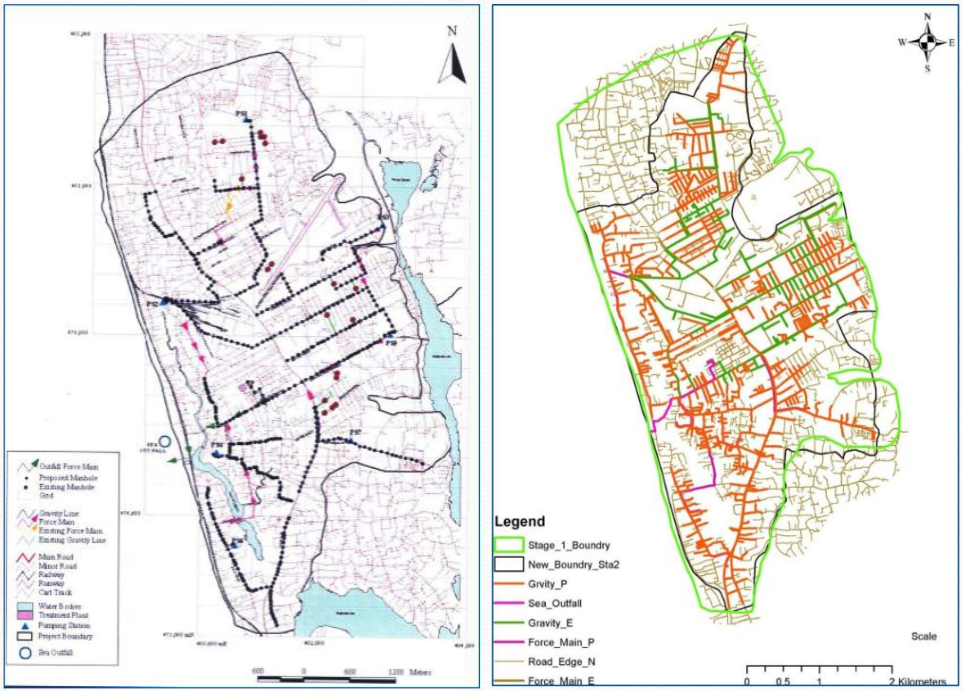


Figure 74: *Proposed Waste Water Management System in Ratmalana*
Source: National Water Supply & Drainage Board - 2018

The Ratmalana Waste Water Management Project is designed with the capacity of 17,000m3 per day covering parts of DMMC and Moratuwa MC Areas. However, the existing demand of the area is only 7000m3 per day thus this area has more potential for high dense developments it has more capacity in terms of waste water management. A part of total capacity of Ratmalana waste water management system will cover a part of Boralesgamuwa UC as well with a capacity of 6,670m3/day.

However, comparing with CMC area and Dehiwala, the area covered by this waste water project has comparatively low demand for high-rise and dense developments thus it can be identified as an underutilized area which should be given consideration in promoting future dense developments.

(b) Identified Areas with Gaps in Demand and Supply Capacities of Waste Water Management Systems

Considering above-mentioned proposed waste water management projects, it can be observed that the existing demand of CMC area can be met with proposed CMC Waste Water Project. However, there is a considerable gap in demand and supply capacity of waste water and sewerage management in Dehiwala, parts of Mount – Lavinia which have a significantly high demand for high-dense developments.

On the other hand, it is important to note that there are no any waste water and sewerage management systems in Peliyagoda, Wattala, Kolonnawa and Kelaniya areas which are also showing an increasing demand for high-dense developments.

Even though not having waste water management system is not considerably a burning issue where there are comparatively low dense developments with more low-rise buildings, it becomes a significant issue when the city starts to develop vertically resulting high-dense developments. The comparison of areas with high demand for high-rise developments and condominiums with waste water system coverage areas, it can be clearly identified the locations having issues due to deficiencies in waste water management.

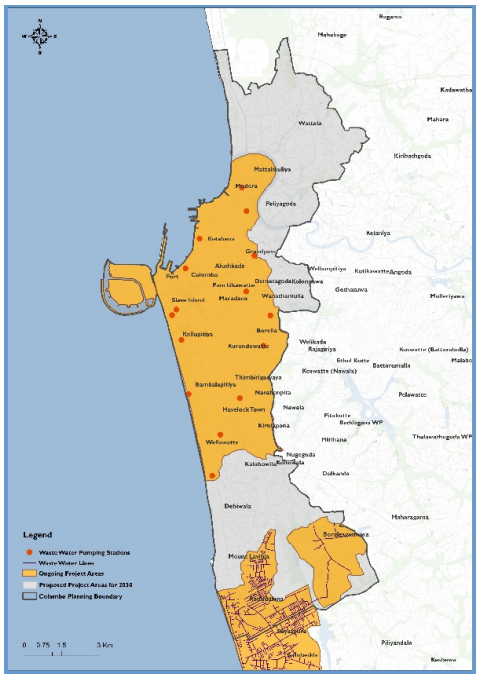


Figure 75: *Areas covered with existing & proposed Waste Water Management Systems | Source: Research & Development Unit, UDA - 2018*

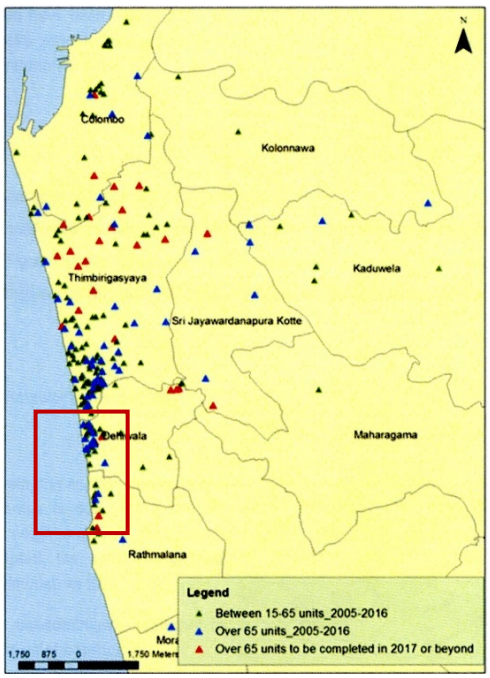


Figure 76: *Spatial Distribution of Certified Condominiums in Colombo & Suburbs Source: Condominium Management Authority, 2017*

2. Deficiencies in Local Area Supply of Pipe-borne Water and Electricity

Even though there is 100% coverage of both pipe-borne water and electricity to meet the growing demand within the planning area, the view of National Water Supply & Drainage Board and Ceylon Electricity Board is it is required to conduct local level capacity improvement projects to meet with the high demand created by growing high-dense developments. Hence, it is important to consider the possibilities of local level capacity improvements of both electricity and pipe-borne water supply to meet the demands of rapidly developing areas with high-rises and to direct the high-rise developments to areas which have the capacities to meet the demand.

3. The existing roads of the Colombo Commercial City not having adequate capacities to meet the requirements of high-rise developments

Basically, there are two aspects of this problem;

- The areas which have growing demand for high-rise developments have narrow roads with widths which are not adequate to achieve high FARs demanded by the market

Problems due to Changing Development Trends
Spontaneous Emergence of High-dense Developments within Colombo Commercial City……

- Medium/high-rise condominiums constructed within neighborhoods with narrow roads causing traffic congestion and inconvenience disturbing the peaceful neighborhood environments

As per the existing regulation requirements of CMC area (Colombo Development Plan (2008 – 2020), the minimum road widths required for particular FARs are as follows.

Row No.	Minimum Land Extent (Sq.m)	Minimum width between building lines of a public street/road (meters)	Minimum width of private street/road (meters)	Maximum Permissible FAR
1	150 less than 250	-	3.0	1:1.5
2	150 less than 250	-	4.5	1:1.75
3	150 less than 250	-	6.0	1:2.0
4	150 less than 250	-	9.0	1:2.5
5	150 less than 250	12.2	12.2	1:3.0
6	250 less than 400	12.2	6.0	1:3.5
7	400 less than 500	12.2	9.0	1:4.5
8	500 less than 700	12.2	9.0	1:5.0
9	500 less than 700	15.0	12.2	1:5.5
10	700 less than 900	15.0	12.2	1:6.0
11	900 less than 1000	15.0	12.2	1:7.0
12	900 less than 1000	22	12.2	1:7.5
13	1000 less than 1500	22	12.2	1:8.0
14	1500 less than 2000	22	12.2	1:9.0
15	1500 less than 2000	24	12.2	1:9.5
16	2000 less than 2500	24	12.2	1:10.0
17	2500 less than 3000	24	12.2	1:12.0
18	3000 and above	24	12.2	Unlimited

Table 09: *Specifications for Development – Form C 1 – CCDP - 2008*
Source: City of Colombo Development Plan (Amendment) – 2008, UDA

Even though, these requirements are considered mandatory, there are some cases where these regulations have been amended in order to facilitate the demands. One of such cases is the land strip between Colombo Plan Road (Marine Drive) and Galle Road which have very narrow cross roads about 12 ft widths, but having a significantly high demand for high-rise developments. The

existing regulations of minimum road widths applicable to this land strip have been amended allowing the high-rise buildings to be built with higher FAR considering the building line instead of street line.

The magnitude of this problem can be understood with the examples of Arethusa Lane and Chapel Lane at Wellawatta. At the beginning, these two lanes gave access to about 15 and 20 housing units respectively but later due to high-rise buildings constructed within the period of 1999 – 2006, these lanes gave access to 216 and 207 number of housing units respectively. It is important to ensure that required road widths are maintained within Colombo Commercial City, especially where there is considerably high demand for high-rise developments in order to facilitate the market demand while avoiding any negative consequences.

3.2.2. Current Development Trends Challenging the Existing Planning and Building Regulations based on Zoning

Existing planning and building regulations applicable to the CMC area are as per the Zoning Plan of Colombo Development Plan (2008 – 2020). As per the land use zoning plan of City of Colombo, there are 09 zones which are defined with permissible uses based on the anticipated character of the zone, maximum plot coverage, minimum allowable plot size and maximum Floor Area Ratio (FAR). However, the current development trends have been challenging these zoning regulations resulting amendments to the regulations at several times, actual land use being different from the proposed land use pattern and emergence of unauthorized developments.

3.2.2.1 Case I – Demand for Change of Use in Special Primary Residential Zone

Context

Special Primary Residential Zone which covers Colombo 07 (Kurunduwatta) area has been given special regulations with the intention of conserving its special garden based residential character. The maximum number of floors allowed within this zone is five storeys provided the access road is not less than 9.0m in width. It is also specified with the minimum plot size of 500 sq.m and maximum plot coverage is 65%. For the sites in extent of 2500 sq.m or more, it is specified to have maximum plot coverage of 50%. Also, the permissible uses for this zone are specified with the focus of promoting residential activities and its

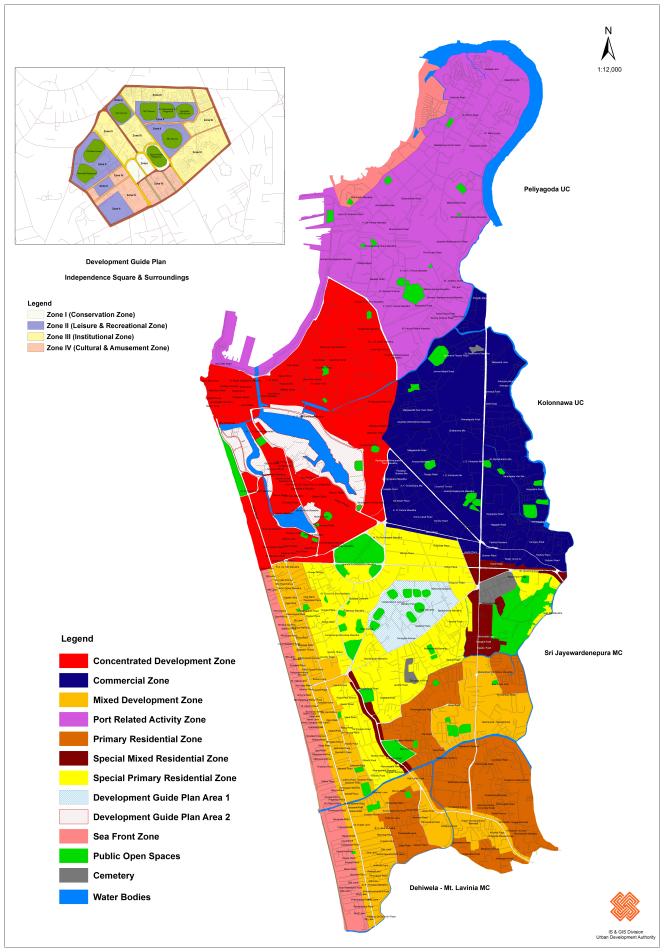


Figure 77: *Zoning Plan – CCDP - 2008*
Source: City of Colombo Development Plan (Amendment) – 2008, UDA

compatible uses thus even commercial activities are also allowed within the certain limits of site extents under specified conditions.

For example,

a) Hotels – each having not more than 10 bed rooms within a site exceeding 1000sq.m
b) Restaurants, banks – each within a site extent exceeding 1000sq.m
c) Professional offices – each having a net floor area not exceeding 500sq.m and each within sites of extent exceeding 500sq.m

The option available for those developers who wish to change the residential space for commercial purposes is the request for Change of Use Permit issued by UDA. However, this permit is only issued for a period of one year thus the developer needs to renew it annually.

Case I - Significant & Magnitude

Even though the above regulations are there to regulate the developments, the field observations reveal that the actual development is not in line with the regulations thus have gone against the anticipated zoning characters.

As per a survey conducted by the Urban Development Authority in 2012, it was revealed that there had been 394 unauthorized commercial entities within SPRZ by 2016. And majority of these unauthorized commercial entities had been emerged in Rosmead Place (27 constructions), Flower Road (27), Horton Place (24), Gregory Road (20) and Barnes Place (18). It was also revealed that majority of these unauthorized commercial entities were private offices whereas other main uses were food & lodging and retail establishments.

The main issue related with this demand for change of use is that the complaints by original residents of the residential zones against the upcoming commercial uses within the area which disturb the peaceful neighborhood environments. The main negative impacts of commercialization within SPRZ are higher traffic movement within neighborhood roads, noise pollution, air pollution, loss of aesthetic appeal and loss of garden character which is considered as a part of Colombo Heritage. There was a case in February 2012, where the residents of SPRZ submitted complaints to the President of Democratic Socialist Republic of Sri Lanka, against the emerging commercial entities within SPRZ to which the Secretary to the President instructed UDA to cease of issuing approvals from non-residential conversions. However, the UDA's recommendation was;

- to increase the service charges of change of use process
- to make necessary regulation changes regarding permissible uses and alteration of zoning boundaries appropriately to balance with on-going development demands and conservation needs
- to introduce strict legal provisions such as sealing of premises subject to court order in cases of non-compliance

The change of zoning boundaries has been carried-out at several times over the years to address the development demands.

Examples:

- change of area bounded by D.S. Senanayake Mw, Dudly Senanayake Mw and Bauddhaloka Mw from Special Mixed Residnetial Zone to Mixed Development Zone – March, 2014

- change of area Ananda Coomaraswami Mw, Col.T.G. Jayawardene Mw, Flower Terrace, Sir Earnest De Silva Mw and Marcus Fernando Mw from Special Primary Residnetial Zone to Mixed Development Zone – March, 2014

However, change of zoning boundaries and regulation amendments involves a serious process which includes several legal procedures, analytical and logical justifications and also which might lead to confusions and disputes among public and authorities. Thus, it is required to address this aspect in the proposed development plan to avoid the problems that might result due to activity-based zoning.

3.2.2.2 Case II – Demand for commercial use along either side of roads irrespective of allowable uses of zone

Context

It has been the conventional practice to demarcate zoning boundaries based on roads. As a result, the two sides of road fall under two different zones resulting two types of developments with different characters. In such cases, developers challenge the zoning regulations inquiring the reasons and justifications for not being able to develop their plots just as the plots at the opposite side.

Case II – Significance and Magnitude

Considering these challenges, several amendments to the regulations have been made as follows.

- Change of the zoning at **first lot facing D.S. Senanayake Mawatha** (from Dudley Senanayake Mw up to Kanatta Junction) and Bauddhaloka Mw (From Kanatta Junction up to Dudley Senanayake Mw) from Special Mixed Residential Zone to Mixed Development Zone – June, 2013

- Change of the zoning at **first lot of Eastern and Western side of the Leyards Road** from SPRZ to Mixed Development Zone – December, 2015

In addition to these, it has been identified that following regulation changes are required based on the current demand within City of Colombo.

- Change of the zoning at both side of Baseline Road from Primary Residential Zone to Mixed Development Zone
- Change of the zoning at both side of Thalakotuwa Garden Road from Primary Residential Zone to Mixed Development Zone
- Change of the zoning at first lot of Thimbirigasyaya Road from Primary Residential Zone & Special Primary Residential Zone to Commercial Zone
- Change of the zoning at both side of Havelock Road – Special Mixed Residential Zone to Commercial Zone or inclusion of commercial uses to the list of permissible uses of Special Mixed Residential Zone

However, due to these development restrictions, it makes a considerable level of negative impact to the city economy where the developers who are willing to make investments are discouraged by the existing zoning regulations. Thus, it is a mandatory requirement to review the existing zoning regulations and introduce innovative alternative solutions to tap investment opportunities while preserving the anticipated city characters.

3.3. Emerging Social, Environmental and Economic Problems due to Distribution of Underserved Settlements

Context

Underserved Settlements - Definitions

In Sri Lanka, the term of "underserved settlement" is used to identify shanties and slums since last few decades. Although there is no universal definition, the term of 'underserved settlement' is descriptive and domestic, defining community living in specific geographical area that lack one or more of the below conditions.

- Access to basic services such as safe water, sanitation facilities, transport / communication facilities
- Security of tenure

Emerging Social, Environmental and Economic Problems……

- Structural quality / durability of dwelling
- Sufficient living area

(UN-HABITAT, CEPA & Sevanatha, 2013)

The Policy Paper on Slum and Shanty Upgrading in Colombo prepared by the Slums and Shanty Division of Urban Development Authority of Ministry of Local Government, Housing and Construction in 1979, was the first ever attempt by the government to identify the slums for larger development program in the Colombo MC. The terms used there, are as follows:

Slums

"The term 'slum' refers to old tenement buildings built for influxes of migrant labor to the city mostly in the 1930s. In the local language this type of settlement arrangement is called mudukku. People who live these types of houses do not like to call their houses by the official name or popular local term. They usually call these houses 'row houses' (peli gewal)".

Shanties

"The collection of small, single-unit improvised structures constructed with non-durable materials on vacant land throughout the city are shanties. Shanties illegally occupy state or private lands, usually with no regular water, sanitation or electricity supply, the majorities are built on land subject to frequent flooding. In local language this type of settlement arrangement is called *pelpath.* This term reflects a group of people who live in more difficult conditions and greater poverty than "*mudukku*" or slums according the common usage.

Watta in the local language is the common term used for both slums and shanty settlements in Colombo by the general public. The English translation of Watta is Garden. Captain Garden, Ali Watta, Kadirana Watta are some examples of the names of Colombo slums and shanties.

In official documents, low-income settlements are mostly identified according to the different types of settlement arrangements as slums, shanties, upgraded settlement, relocated settlements or low-cost flats".

3.3.1. Case I – Underserved Settlements within City of Colombo

However, when it comes to developing world cities, Colombo is one example of a city that does not fit the usual text book models; no massive sprawling slums on the periphery of the city, no rampant in migration to the city and very few houses which could be classed as extremely poor. Therefore, terms like "squatter settlement" and "shanty" don't really apply to Colombo. In this case, Underserved Settlements is a better term to address all settlements identified as both slums and shanties in Colombo.

3.3.1.1. Origin of Underserved Settlements within Colombo

Figure 78: *Underserved Settlements along Railway Reservations in City of Colombo*
Image Courtesy: alamy stock photo

Slums including tenement garden came into existence in Colombo with the expansion of export trade associated with the rubber export industry after the Second World War in 1950s. The character of Colombo changed in keeping with the new economic demands for warehousing, workers accommodation and the road network improvement. The city core became more congested and the city elite moved out into more spacious residential areas in the suburbs. Back-to-back houses were built by city elites in the large estates which they owned in northern and central parts of Colombo and were lent out on a very low or no-rent basis to workers of Port, warehouses and related industries. Eventually, the extended families of these workers also started residing in these houses by adding unauthorized physical extensions to the houses resulting in creation of slums. Soon this trend became frequent and out of control creating huge problems in the city socially, environmentally and economically.

With the increased migrants to the city in 1950s, the supply of housing began to lag behind the demand and became unaffordable to the low-income communities. The expansion of shanties mainly took place based on vacant state

lands such as railway, canal and Kelani river reservations, where low income families who migrated to the city in search of employment opportunities and could not afford houses from standard residential areas built their shelters with temporary materials.

The central part of Colombo became a predominantly low-income residential area with many slums, and the northern and eastern parts of the city were occupied by shanties.

Magnitude & Significance

3.3.1.2. Existing Situation of Underserved Settlements in Colombo

The survey by Real Estate Exchange (Pvt) Ltd (REEL) in 1998/9 in the CMC area reported 1,506 USSs whilst Sevanatha's survey in 2001 (Sevanatha, 2002) estimated the USSs to number 1,615. The number of housing units in 1998/9 survey was 66,324, whilst the Sevanatha survey in 2001 found the number of housing units to be 53,659 (77,532 households) with a population of 336,000, which then accounted for approximately 50 percent of Colombo's population. The most recent survey by UDA in 2011 finds the household numbers to be 68,812 and the number of settlements to be 1499. As per the survey, the population living in these underserved settlements accounts for 53% of the total population of City of Colombo. The highest concentration of underserved settlements is within northern and central parts of CMC area. 900 acres accounting for 9% of the total land extent of CMC area are found to be covered with underserved settlements. The population of the settlements are often third or fourth generation residents, hence, a very low level of in-migration is prevalent. Issues faced by in-migrations such as constantly expanding of the slums are not faced in Colombo.

As per the survey conducted by Sevanatha Urban Resource Center in year 2012, the underserved settlements in Colombo can be categorized based on settlements size (in terms of number of houses) as follows.

Below 10 houses	-22%
Between 11 – 20 houses	- 32%
Between 21 – 60 houses	- 30%
Between 60 – 100 houses	- 11%
More than 100 houses	- 5%

Based on above classification, it is evident that majority of the underserved settlements within City of Colombo are small to medium size in terms of number of houses within them.

- 57% of USS occupants not having freehold rights to the land

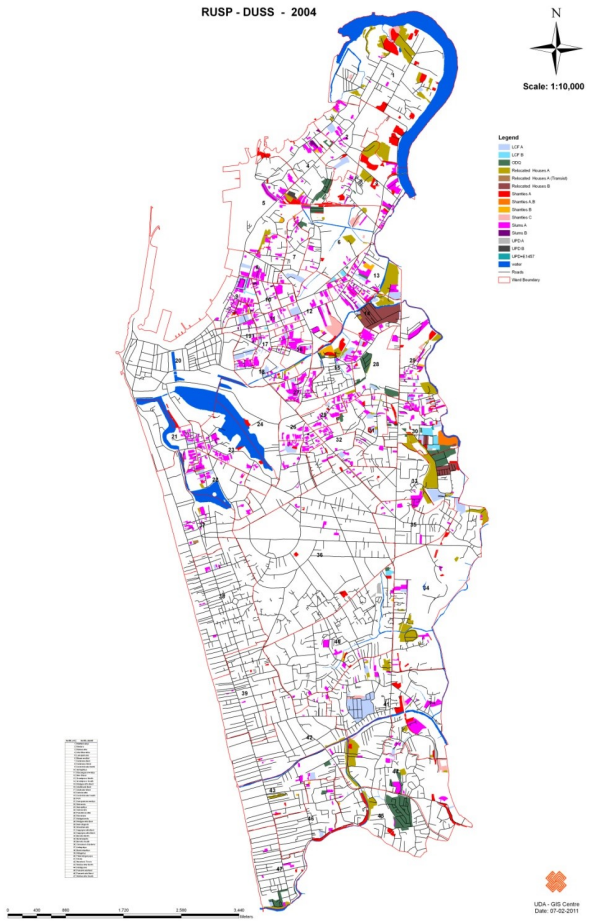


Figure 79: *Locations of Underserved Settlements of City of Colombo | Source: GIS Division, Urban Development Authority - 2011*

As most of these settlements were built up as unauthorized constructions mostly within state lands or privately-owned estates, they often do not have legal basis and are categorized as illegal housing that do not meet the housing regulations and/or do not have the right to the land they occupied.

As a result of the existence of these settlements for over two adult generations, a series of state interventions have now given most residents a right of residence, albeit not one sanctioned legally. Of the 1614 settlements counted by the Poverty Profile in 2002 only 6% were considered 'illegal'. Most of the settlements considered illegal are those occupying railway, canal, or other reservation land. As per the survey conducted by Sevanatha in 2012, it has been found that 43% of occupants living in underserved settlements own freehold rights of their properties while 57% do not possess security of tenure. However, 23% of the occupants are issued with user permits (enumerator cards) which grant temporary rights to the lands they occupy.

3.3.1.3. Problems due to Existence of Underserved Settlements

Problems caused due to existence of underserved settlements can be viewed in three aspects such as social, environment and economic.

1. Negative Social Impacts due to Existence of Underserved Settlements

Negative social impacts resulted due to existence of underserved settlements also can be viewed in two aspects such as impacts on dwellers of underserved settlements and overall impacts on society. The main negative impact on underserved settlement community is the problems caused due to poor living conditions.

(a) Poor Living Conditions of Underserved Settlement Community

It has been revealed by Sevanatha Survey in 2012 that 45% of houses in underserved settlements in City of Colombo are constructed with temporary materials and 55% are constructed with permanent materials. Even though, a majority of underserved settlement houses are considered to be constructed with permanent materials most of them do not have access to basic facilities such as pipe-borne water, electricity, sanitary facilities, proper drainage of sewerage, waste water and storm water, proper access roads and other public amenities such as public open spaces and community halls etc.
The survey on underserved settlements in City of Colombo conducted by Sevanatha in 2012 revealed following inadequacies in basic services.

Lack of Sanitary facilities

- Overall 41% of settlements have common toilets
- 8% have no toilet facilities
- 28% of settlements of underserved settlements have serious problems in respect of safe disposal of sewage; only 50% are connected to the city's sewage network

The dependence on public services is often higher amongst poorer settlements and the acute shortage leads to inappropriate and illegal construction of toilets. This creates problems such as pipe blockages and sewerage overflows, diversion of sewerage systems into canals, which in turn create health related problems especially for children. Drainage issues come to the forefront because many of these settlements are situated on marginal land, such as marshes and canal reservations that are prone to flooding.

Deficiencies in Pipe-borne water supply

- 33% of underserved settlements have no metered water connection
- 33% either use common facilities or rely on outside sources
- 5% of communities need safe drinking water and levels of service are rated as a serious problem in 8% of underserved settlements

Lack of street lighting

- Most USS (98%) have electricity connection BUT lack of street lighting is an issue for 34% of underserved settlement communities

Improper Solid-waste disposal

- 15% of underserved settlements report irregular or no collection

Poor conditioned Access roads

- 40 % have well maintained tarred roads/pavements with good width access
- 41% have poorly maintained tarred roads
- 19% do not have tarred roads

The condition of main access roads to, as well as by lanes (inner access roads) within the settlements are often poor in condition and this hinders access to and within the settlement.

Inadequate spaces

Figure 80: *A typical underserved house in Colombo*
Image Courtesy: dailynews.lk

Constrained space within the settlements, reflected by the size of housing units and lack of public space, is considered the critical negative feature of the underserved settlements. At the community level, the lack of space inhibits recreational activities and movement and intensifies the spread of disease, while at the household level there is lack of space for social occasions (i.e. funerals, weddings) and undertaking home-based income-generation, as well as limited privacy.

(b) Relatively High Probability of Spreading Diseases among Underserved Settlement Communities

Figure 81: *A solid waste dumping yard next to a slum area in Colombo*
Image Courtesy: Captured by Robin Hammond, Panos – scidev.net

Poor health conditions within the settlements are caused due to the proximity to stagnant canals, breeding grounds for mosquitoes which cause diseases such as filariasis. Furthermore, the congestion, high population density, and the close proximity of the housing structures, facilitate and accelerate the spread of the disease.

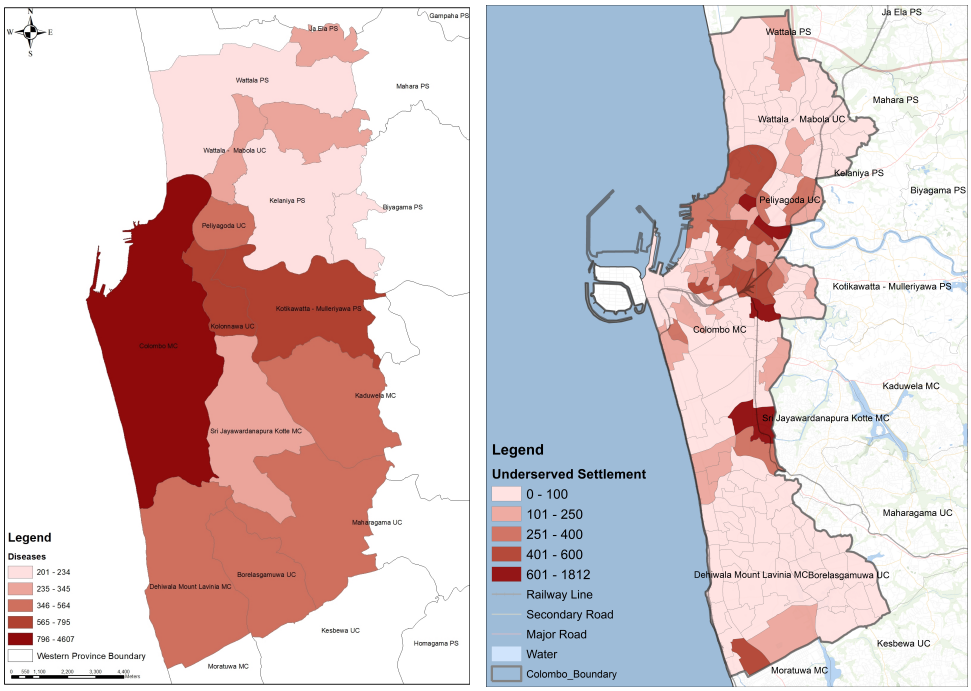


Figure 82: *Comparison of Diseases Spreading Areas with Distribution of Underserved Settlements | Source: (left) Diseases Records by Local Authorities & (right) Department of Census & Statistics, 2012*

The above comparison between the distribution pattern of underserved settlements and diseases spreading pattern shows some similarity where relatively high concen-tration of diseases can be observed in areas having high concen-tration of underserved settlements.

The dengue distribution pattern is also having a similar pattern just as distribution of underserved settlements, as there is a relatively high probability of existence of mosquito breeding sites within underserved settlement areas.

(c) Relatively high occurrence of illegal activities within underserved settlements associated areas

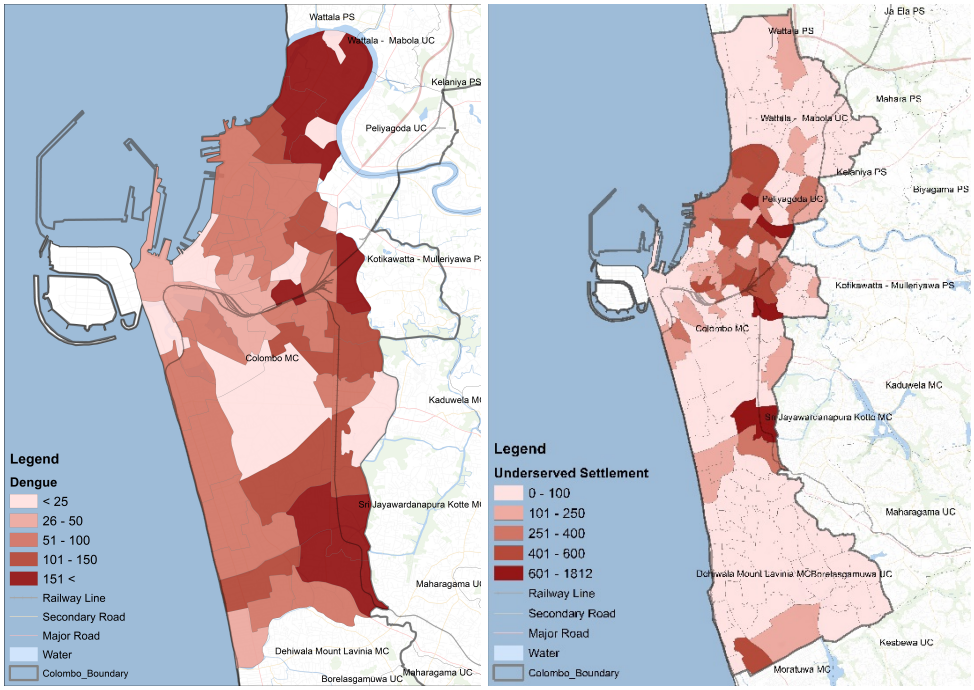


Figure 83: *Comparison of Dengue Spreading Areas with Distribution of Underserved Settlements | Source: (left) Public Health Department, Colombo Municipal Council – 2017 & (right) Department of Census & Statistics, 2012*

It has been found a spatial relationship between the crime incidences and locations of underserved settlements in Colombo.

The main reasons for this particular correspondence can be identified as the relatively high poverty and low education levels of underserved settlement communities, marginalization of undeserved settlement community as a lower social strata of Colombo society, higher prone for abuse of drugs and alcohol and especially spatial arrangement of underserved settlements having enclosed enclaves, narrow alleys which provide ideal conditions to carry out illegal deals.

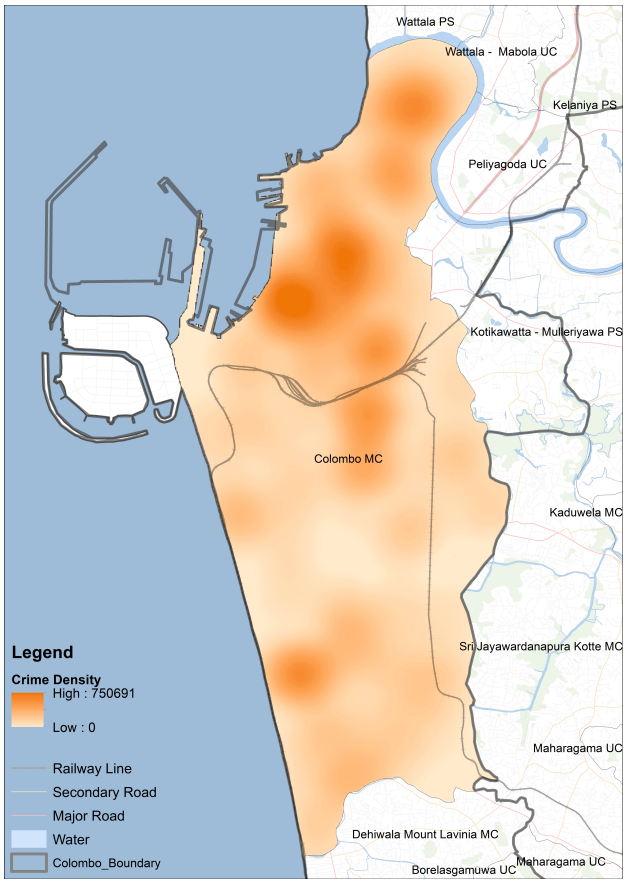


Figure 84: *Crime Density Distribution in City of Colombo*
Source: Based on Data by Sri Lanka Police - 2018

Abuse of drugs and alcohol can be considered as a factor that worsens the conditions of the urban poor. Addiction is often viewed as a main cause of low wellbeing for individuals and households. In addition, they are more prone towards marital instability, crime and domestic violence. A livelihood assessment conducted for World Bank in 2012 (UNHABITAT et al., 2012) in low income settlements in Colombo revealed that alcohol use by family members is a reason for insecurity within the household. The study also revealed that use of drugs and alcohol cause fear outside the house.

However, this higher tendency of occurrences of illegal activities in association with underserved settlements created a huge negative impact on the image of these areas, leading to gradual deterioration of these areas while discouraging future potential investments and developments.

2. Negative Environment Impacts due to Existence of Underserved Settlements

There are few negative impacts on environment caused due to existence of underserved settlements. These can be elaborated as follows.

(a) Pollution of water bodies linked with underserved settlements

As majority of the underserved settlements are located in canal, river and coast reservations, they significantly contribute to the pollution of water bodies. The main reasons for pollution of inland water bodies are direct disposal of sewerage

Figure 85: *A polluted canal located within an Underserved Settlement*
Image Courtesy: Captured By Peter Bennett – roar.media

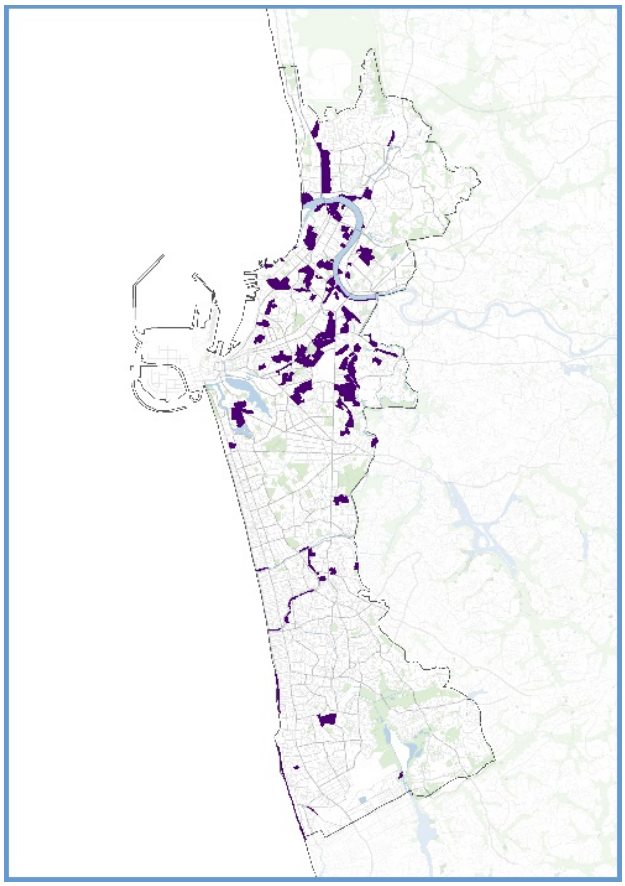


Figure 86: *Locations of Underserved Settlements within Colombo Commercial City*
Source: Urban Development Authority - 2018

and waste water through unauthorized connections and direct disposal of solid waste. There is a high tendency of the occurrence of above two when there is an underserved settlement attached to a particular water body. It has been found that 98% of the water bodies in Colombo are polluted and the pollution levels and its spatial connection with the underserved settle-ments can be identified by the following map.

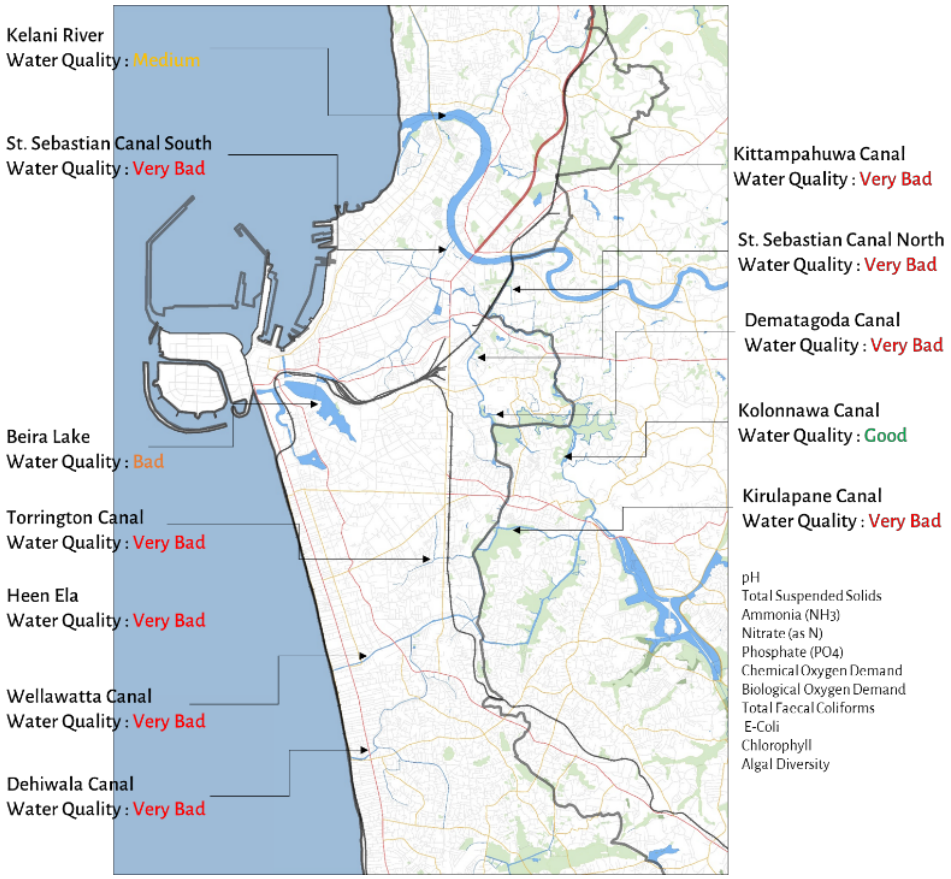


Figure 87: *Physic-chemical water quality of water bodies in City of Colombo*
Source: Technical report 4, Physical Features - Wetland Management Strategy, Metrocolombo Urban Development Project, 2016

(b) Flood Occurrences due to Blockage of Natural Drainages by Unauthorized Constructions

Underserved settlements are often located in low lying lands and flood plains thus become automatically exposed to floods. It had been found by the survey conducted by Sevanatha in 2012 that 31% of underserved settlements are being located in high flood risk areas especially in cases of flash floods. The reason has been identified as that 83% of internal roads within underserved settlements are not having proper storm water drainage leading to local flash flooding and waterlogging in internal access roads. At the same time, due to blockage of natural drainage paths and high vulnerability to floods, these communities often suffer from even sudden flash floods.

The occurrence of flash floods and urban floods in Colombo is more elaborated later as a separate issue of the planning area.

Figure 88: *An underserved settlement caught in flash floods*
Image Courtesy: Captured by Saman Sri Wedage – dailynews.lk

Figure 89: *Floods in Kelani River Banks*
Image Courtesy: blogspot.com

(c) Degradation of city visual quality due to existence of underserved settlements

Figure 90: *Underserved Settlements within the Colombo City Fabric -1 | Image Courtesy: Mirror Citizen, Daily Mirror*

Physical appearance of the underserved settlements, especially the ones which are constructed with temporary materials in a haphazard manner reflects a negative ambiance of the city which in return makes a significant negative impact on the image of the city as an international financial hub. The unpleasant environments associated with underserved settlements largely deteriorate the visual qualities of the area and at the same time decrease the land values as well as discourage potential investments and modern developments.

3. Negative Economic impacts due to existence of underserved settlements

Associated with the above discussed issue of deteriorating environmental visual quality due to underserved settlements, emerges another issue which is the reluctance of investors to invest in new developments in the areas in vicinity of

underserved settlements. Also, as most of these underserved settlements are located in prime locations of the city, these lands are of high value and have the potential to be developed with high economic returns. However, when considering the present land values of City of Colombo, it can be observed that there is a large disparity between values of lands located at a same radius from the city center.

Figure 91: *Underserved Settlements within the Colombo City Fabric - 2*
Image Courtesy: sundayobserver.lk

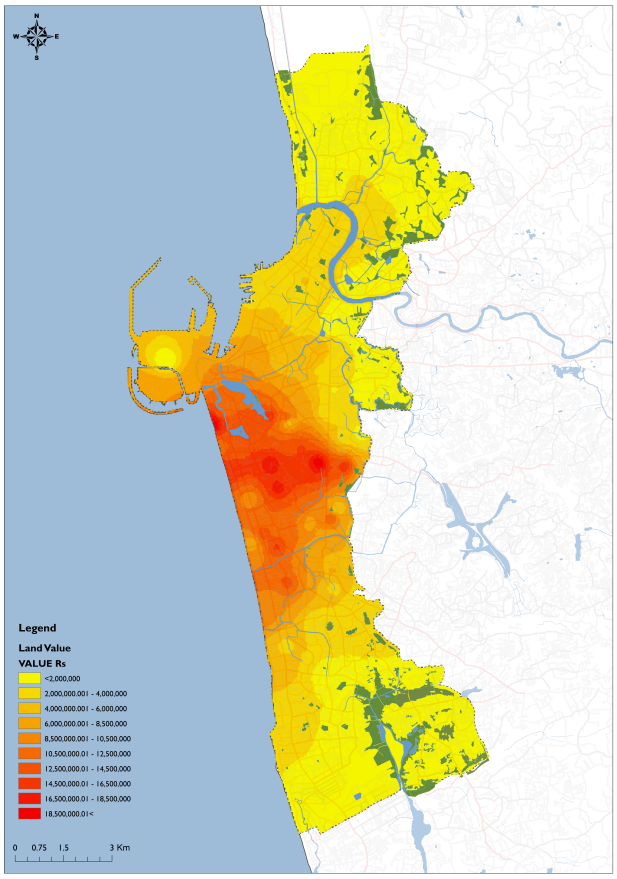


Figure 92: *Variation of Land Values in City of Colombo*
Source: Research & Development Unit, UDA - 2018

It has been found out that the land values of north Colombo, where relatively high concentration of underserved settlements can be observed is around LKR 3,000,000 per perch whereas the land values of areas towards south of Colombo located at a similar radius from CBD are above LKR 6,000,000 per perch. It shows the significant impacts of underserved settlements on city land values.

3.3.1.4 UDA's Current Intervention on Underserved Settlements in City of Colombo

Urban Regeneration Project is one of the current major interventions on underserved settlements by Urban Development Authority. The project was launched with the intention of relocating underserved settlement dwellers of City of Colombo into modern houses in new housing schemes (mainly high-rise apartments) with standard facilities while ensuring the transformation of Colombo into a world recognized city with a clean and pleasing environment.

The main concept of the project is to liberate 900 acres of lands covered with 1500 underserved settlements including around 68,000 households and to allocate 150 acres of lands for reservations, landscaping and open spaces for improvement of city environment, 300 acres of lands for rehousing (for resettlements) and 450 acres of lands for investment purposes.

As per the current status review of the project, around 4,900 housing units have been already completed and 13,200 housing units have been commenced with construction accounting for around 18,100 housing units in total.

Even though, this project attempts to relocate majority of underserved settlements, with practical limitations, it has been revealed that relocation is not the ultimate or the sole solution. Thus, a planning intervention is required to view the issue of underserved settlements with a different perspective and propose innovative solutions. At the same time, it is required to integrate the Urban Regeneration Project with the city development by incorporating the rehousing projects and proposing programs to get the optimum benefits of liberated lands.

Figure 93: *High-rise apartments built for low-income families of City of Colombo*
Image Courtesy: accessengsl.com

3.3.2 Case II - Underserved Settlements located outside of City of Colombo

Since the planning boundary of Colombo Commercial City expands beyond the limits of City of Colombo, there are other locations outside of Colombo city limits where small to large clusters of underserved settlements are located. Wattala, Peliyagoda, Kelaniya, Kolonnawa and coastal belt from Wellawatta to Ratmalana are some of the areas which have highest concentration of underserved settlements next to City of Colombo.

3.3.2.1. Underserved settlements in Wattala

Underserved settlements in Wattala are mainly based on southern outskirts of Muthurajawela Marsh, Hamilton Canal, Coastal Belt and other canal environs. When considering the character of these underserved settlements in Wattala area, it can be identified that they are in a comparatively high deteriorated status than most underserved settlements in City of Colombo.

3.3.2.2. Underserved Settlements in Coastal Belt

There are considerably large number of underserved settlements located in the coastal belt of Colombo Commercial City Area spreading beyond Colombo Municipal Council limits. A large concentration of underserved settlements is evident within coastal stretches within Wellawatta, Dehiwala, Mount-lavinia and Ratmalana areas. One of the main characteristics of the communities of these coastal underserved settlements is that their main livelihood is based on fishing related activities. Especially, the communities of underserved settlements located in Dehiwala and Ratmalana areas are largely engaged with fisheries activities. However, most of the underserved settlement houses within the coastal stretch are built with temporary materials and are in an improvised situation. On the other hand, there is a considerable level of crimes and involvements in illegal activities such as drug abuse, prostitution and vandalism reported in these areas which are proved to be having a relationship with the existence of coastal underserved settlements.

3.3.2.3. Underserved Settlements in Kelani River Banks in Peliyagoda, Kelaniya and Kolonnawa

There are considerably large clusters of underserved settlements located in the either sides of Kelani River especially in river and railway reservations. One of the major problems faced by the communities of these settlements is that the high vulnerability to floods as most of them are located in the flood plains of Kelani River. On the other hand, the existence of these underserved settlements in river & canal reservations, contribute to pollution, blockage of natural water ways and visual and physical access to waterfronts acting as a barrier to harness the true potential of Kelani River.

However, the problems due existence of underserved settlements within these areas outside of City of Colombo are also similar to the problems associated with underserved settlements in Colombo. Thus, it can be concluded that they also need special attention and sustainable solutions in order to ensure the development of all these areas as a whole as the Colombo Commercial City.

3.4. Public Inconvenience and Economic Loss due to Traffic Congestion on Major Arterials at Peak Hours

Figure 94: *Peak Hour Traffic Congestion on Baseline Road, Colombo*
Image Courtesy: daily-sun.com

As perceived by most residents and daily commuters of Colombo, the most burning issue of the city is the traffic congestion. During the last decade, increased traffic congestion on major roads in Colombo and suburbs during peak hours became one of the most tensed issues in the country.

Context

3.4.1. Heavy Traffic Flows Entering and Leaving Colombo Commercial City

Colombo Commercial City is connected regionally via seven major radial corridors namely Malabe, Galle, Kandy, Negombo, High-level, Low-level and Horana. As per the CoMTrans study undertaken in 2013 the traffic demand on seven corridors as follows.

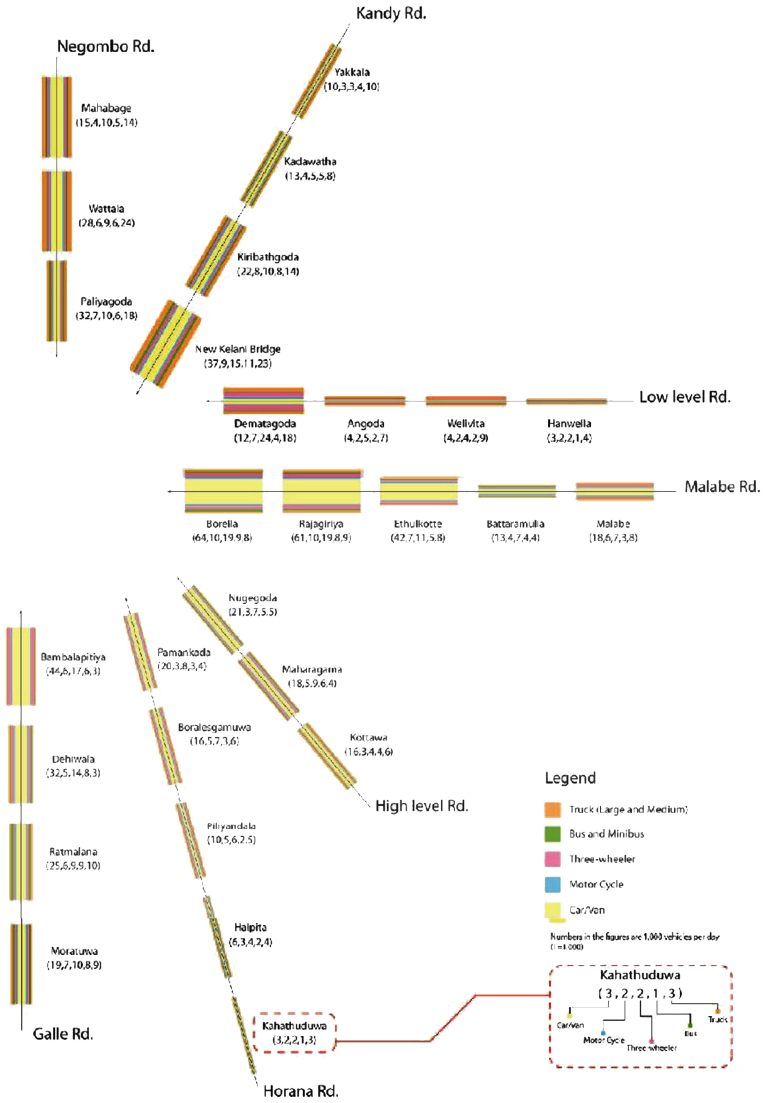


Figure 95: *Traffic Demand on Seven Corridors*
Source: CoMTrans Urban Transport Plan – 2014

As it is illustrated in the above map, the largest traffic flow entering to the city limits is observed at Borella, which is 110,000 vehicles per day.

The total count of per day vehicles entering to the City of Colombo from seven entering points namely Peliyagoda, New Kenai Bridge, Dematagoda, Borella, Nugegoda, Pamankada and Bambalapitiya is 498,000. Heavy flows are observed within CMC as well as surrounding areas such as Kaduwela, Sri Jayawardhane-pura Kotte, Dehiwala and Moratuwa.

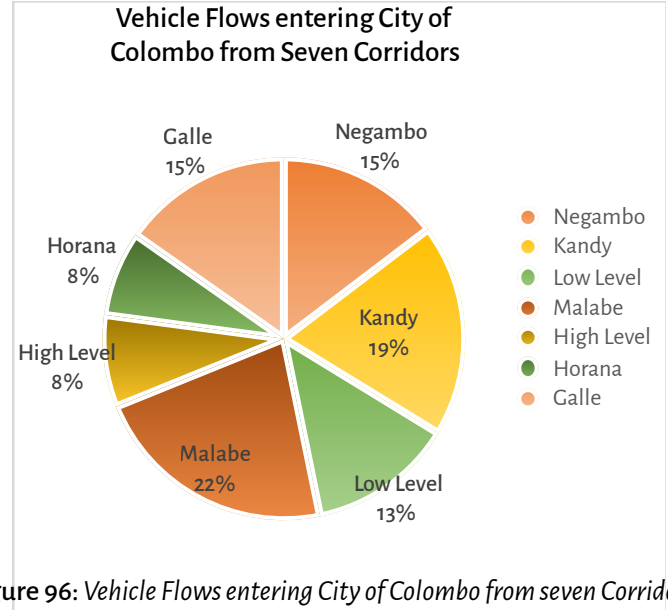


Figure 96: *Vehicle Flows entering City of Colombo from seven Corridors*
Source: CoMTrans Urban Transport Plan – 2014

Based on the OD matrix conducted by CoMTrans Study, it has been estimated that there are approximately 705,000 trips per day ending inside the City of Colombo. Also, it has been revealed that 20% of these trips accounting for around 140,000 trips are made within one hour of the busiest morning peak period (07:00-07:59).

Figure 97: *Home-based Work trips (>= 2000) | Source: CoMTrans Urban Transport Plan – 2014*

Items	Transport Mode			Total
	Private	Public	NMT	
Daily trip ('000 trips/day)	256	443	6	705
Peak hour trips (07:00-08:00) ('000 trips/hour)	61	81	2	145
Peak Hour Ratio	24%	18%	36%	20%

Table 10: *Trips by Transport Mode*
Source: CoMTrans Urban Transport Plan – 2014

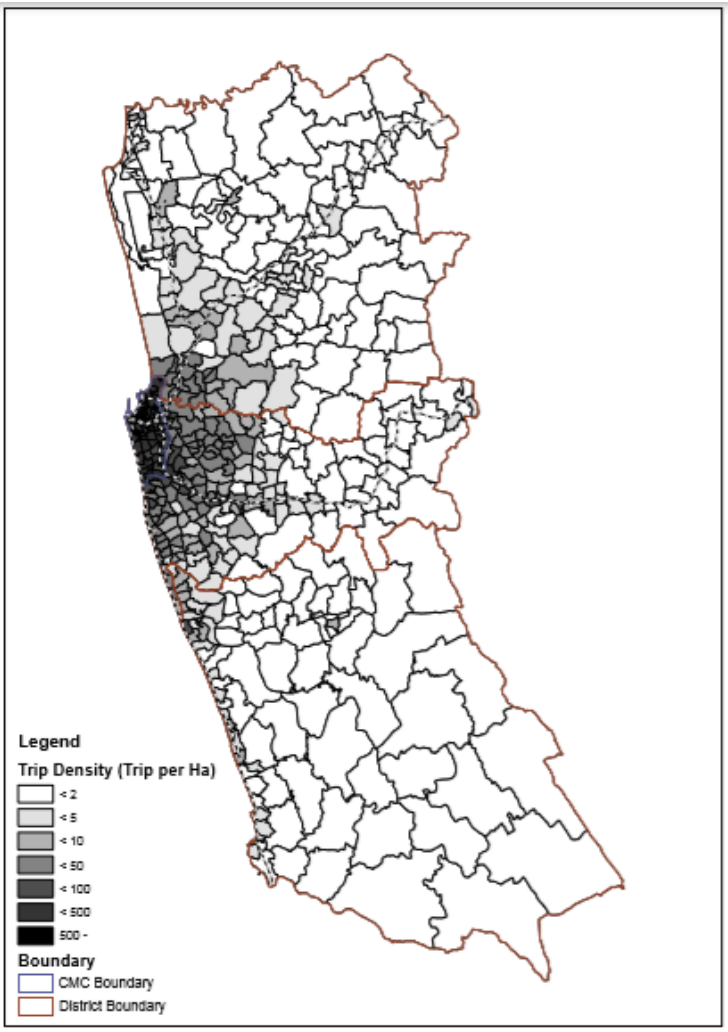


Figure 98: *Trip Generation Density of Trips attracted to Colombo Municipal Council Area*
Source: CoMTrans Urban Transport Plan – 2014

The above table which is prepared based on Home Visit Survey conducted by CoMTrans Study in 2013, shows 36% of trips are made using private modes of transport which 63% of trips are made using public modes of transport. However, it can be seen that peak hour ratio of private modes of transport is

higher than public mode of transport which conveys the relatively high contribution of private vehicles to the Colombo's traffic congestion during peak hours.

The above map shows the trip generation density of trips ending in Colombo MC area. The map also indicates the trips produced in CMC where the highest trip attraction density is observed indicating that a significant number of trips are made within the city boundary. For trips from outside CMC, their origins are mainly located in the area surrounding CMC and along the major corridors.

3.4.2. Hourly Fluctuation of Traffic Flows

There are three peaks within a day such as morning peak experienced between 7 am and 8 am, while the afternoon and evening peak periods extend about two hours from 1 pm to 3 pm and from 5 pm to 7 pm respectively. As per the CoMTrans Study, 2013, the shares of these peak hour trips to the daily trips are 24%, 19% and 12% respectively. The morning peak hour is dominated by home to work and home to school purposes whereas afternoon peak hour and evening peak hours are dominated by school to home and work to home respectively. Also, it had been revealed that the buses have the highest share during the three peak periods.

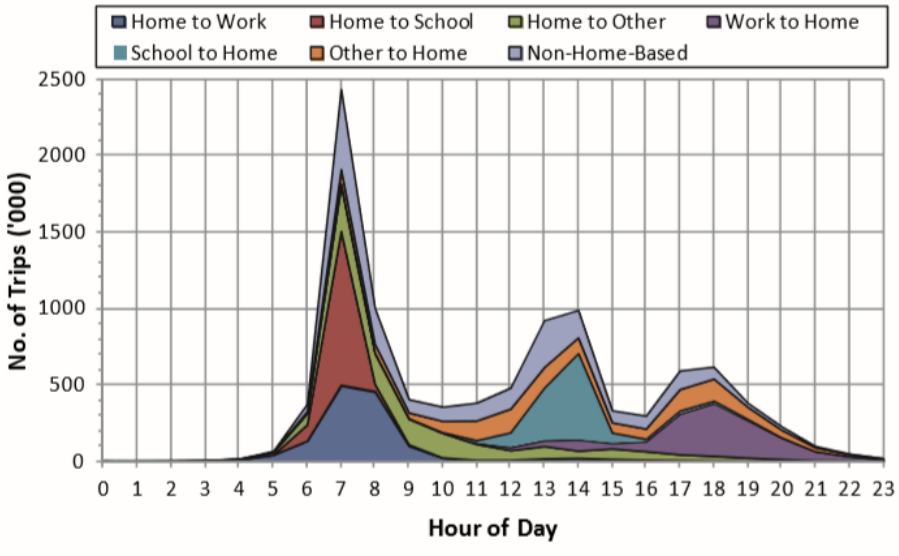


Figure 99: *Hourly Fluctuation by Purpose at Trip Destination in the Western Province*
Source: CoMTrans Urban Transport Plan – 2014

Bus frequency operating within Colombo Commercial City during the morning peak hour between 7 am to 8 am is shown in Figure 101. It shows that the highest frequency of buses is experienced within Pettah area, Kandy corridor and Galle corridor in sequence.

Figure 100: *Bus Frequency within Colombo Commercial City during the Morning Peak Hour*
Source: CoMTrans Urban Transport Plan – 2014

3.4.3. Major Reasons behind the Severe Traffic Congestion at Peak Hours

The major reasons causing the severe traffic congestion within Colombo Commercial City can be identified in terms of increase in number of vehicles, issues with existing intercity and intra-city public transport systems, problems related to existing configuration of road network and the problems with existing traffic management systems.

3.4.3.1. Rapid Increase in Number of Vehicles; Especially the Private Vehicles

Parallel to the relatively high growth of household income within the last decade and past years of this decade, a rapid increase of ownership of private passenger cars, motor cycles and three wheelers has been experienced. The increase of private modes of transport has directly caused the increase in traffic demand on the roads and result in serious traffic congestion.

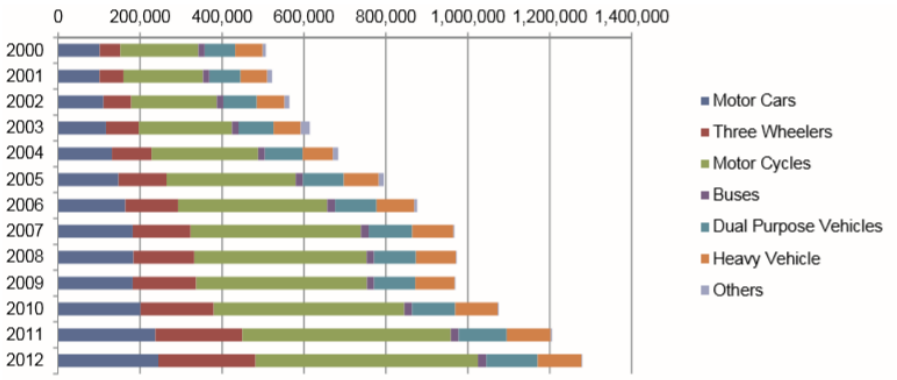


Figure 101: *Vehicle Population of Western Province by Mode in 2013*
Source: CoMTrans Urban Transport Plan – 2014

The above graph compiled by the CoMTrans Study in 2013 shows the rapid increase in vehicle population in western province during the last decade. The annual average growth of vehicle population of western province is 8.5% which is significantly higher compared to the annual population growth of 0.7%. Also, the number of motor cars has been doubled during the last decade from 110,799 in 2002 to 244,636 in 2012. In terms of number of motor cars for 100 people, it has been doubled from 2.0 in 2002 to 4.2 in 2012. The number of three-wheelers has increased at a very high space, almost 3.5 times in the past ten years.

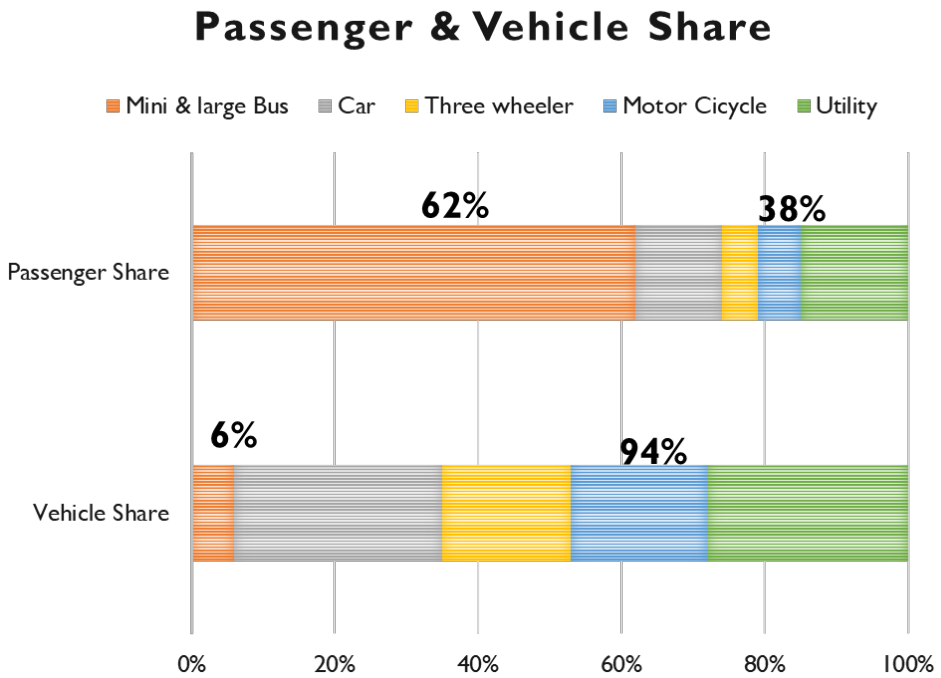


Figure 102: *Passenger – Vehicle Share*
Source: Reduction of Traffic Congestion in Colombo; Weerawardhana W.J., 2011

The above graph shows the disparity between the passenger and vehicle share in Colombo Commercial City, which indicates that 62% of passengers use 6% of vehicles (Mini & large buses) based on public modes of transport whereas 38% of passengers use 94% of vehicle share based on private modes of transport.

3.4.3.2. Problems in Existing Intercity and Intra-city Public Transport Systems

The existing problems of intercity and intra city public transport systems can be seen as a major reason for the rapid increase in private modes of transport. As per the CoMTrans Study in 2013, following issues related to public transport system have been identified.

(a) Problems in Railway Transport System

- All railway lines converging on the Fort Area without having mass transport systems connecting laterally force the passengers to travel a long way to get to the destinations
- The lack of integration between railway transport and other transport systems in terms of accessibility between railway stations and bus stands, park & ride systems enabling easy transfer between modes and adjustments of operational hours as suit with other public transport
- Operational speed of trains which is around 30km/h being relatively slow compared to commuter railways in other countries
- Most trains not being air-conditioned except for the upper-class cars of express trains and being highly crowded distract passengers leading them to choose other modes of transport

Figure 103: *Crowded trains transporting daily commuters of City of Colombo*
Image Courtesy: (left) roar.media & (right) ft.lk

(b) Problems in Bus Transport and other Road-based Public Transport

- Low bus operation speed caused due to sharing the road space with private motorized modes of transport thus the travel speed of bus transport is dependent on other modes. Moreover, travel speeds of buses are usually even slower than passenger cars as they need to stop at bus stops and passenger cars can take the shortest paths regardless routes

- The existing Pettah-centered bus network resulting around 8,000 round-trips from/to Pettah and Fort areas of Colombo. The radial patterned route system creates a significant load on the road system in the city center. It creates a situation where passengers cannot avoid Pettah or Fort area when travelling to a city in another corridor

- Buses being overcrowded during peak hours and lack of passenger convenience is also one of the major reasons why passengers are reluctant to take buses but tend to use private vehicles instead

3.4.3.3. Problems with the Configuration of Existing Road Network

When analyzing the configuration of the existing road network, it can be observed that most road segments within which severe traffic congestion is experienced are having highest betweenness values. It means that the road network is configured in a such a way that these road segments have high frequencies of falling in between when making trips via various routes. The lines in red in the above betweenness analysis map, indicate the roads with higher betweenness values. The comparison of the above two maps indicate the resemblance of roads with higher betweenness values having higher tendency for high traffic congestion.

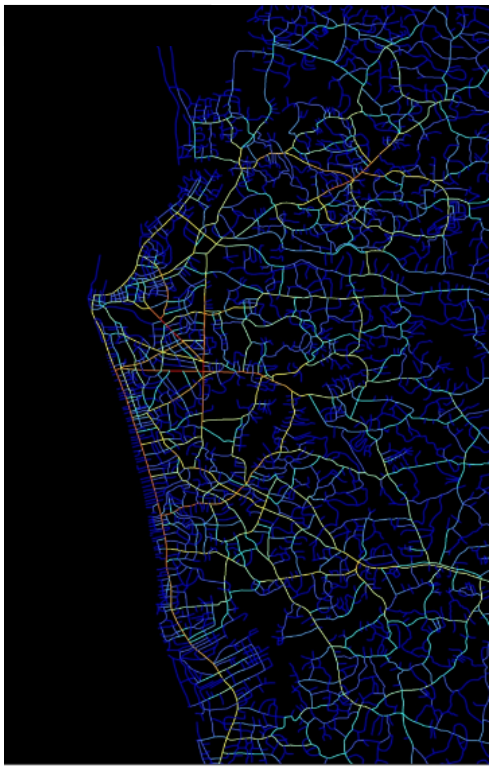


Figure 104: *Betweenness Values of Road Segments in Colombo Commercial City*
Source: Research & Development Unit, UDA - 2018

Figure 105: *Traffic Congestion at Morning Peak Hour on Weekdays*
Source: Google Traffic Maps

The road density of CMC is 10.7% of total administrative area whereas those of surrounding areas are in the range of 4% to 6%. However, road densities of Inner Shanhgai, Seoul City and Greater London also have similar road densities such as 12%, 13% and 12% respectively. Hence, it can be concluded that the road density with Colombo City is at a comparatively satisfactory level.

When comparing the above-mentioned hourly capacities and peak hour road traffic capacities in terms of passenger car units, it can be identified that there are significant capacity gaps in Kandy, Malabe, Galle and Low-level corridors which highly contribute to the severe traffic congestions.

Corridors	Peak-hour Road Traffic (pcu)	Hourly Capacity (pcu)	Gap
Malabe Corridor	5100	4400	-700
Kandy Corridor	4400	3300	-1100
Negombo Corridor	4000	4400	+400
Galle Corridor	2900	2300	-600
Low Level Corridor	2900	2200	-700
Horana Corridor	2200	2300	+100
High Level Corridor	2000	2300	+300

Table 11: *Capacities of Seven Corridors in terms of Passenger Care Units (pcu)*
Source: CoMTrans Urban Transport Plan – 2014

It has been proved by scholars that a road network designed based on a well-formed hierarchy helps to reduce the overall traffic impact. Usually it is recommended to have around four road categories such as local streets, collector streets, sub-arterial roads and arterial roads. When considering the national road network, it can be argued that the road hierarchy is maintained in the national and regional scale at a satisfactory level. However, when considering the road network within the Colombo Commercial City, it can be identified that there are many places where local streets are directly linked with arterial or sub arterial roads resulting many intersections and interruptions for major transport flows.

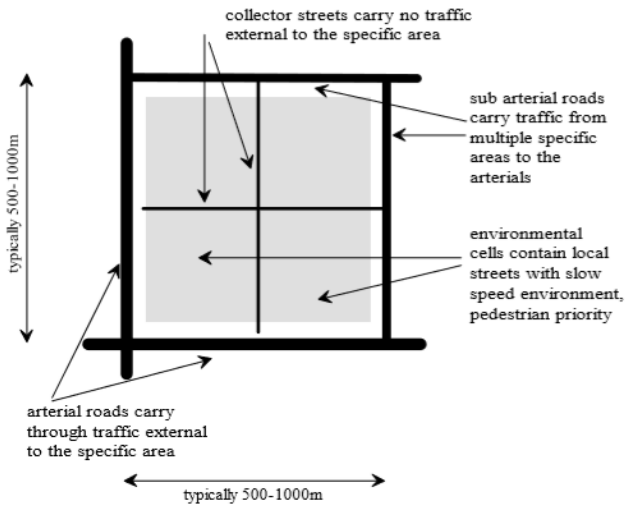


Figure 106: *Standard Hierarchy of Roads*
Source: planning tank.com

3.4.3.4. Problems with Existing Traffic Control and Management Systems

Problems associated with existing traffic control and management system also contribute to the severe traffic congestions during peak hours. Traffic control and management can be regarded as an essential countermeasure to tackle traffic congestion. CoMTrans study undertaken in 2013, revealed that traffic demand exceeds traffic capacity of the intersections in peak hours at many intersections in CMC. The study has pointed out following issues with traffic signal system and parking management.

- Majority of traffic signals at intersections are standing alone without coordinating with each other
- Existing traffic signals not providing efficient traffic control as they apply day and time specific pattern control units
- Signals for pedestrian crossings have been installed only at limited locations on Galle Road and Baseline Road but do not cover some hot spots within Colombo Commercial City
- There are some roundabouts within Colombo Commercial City where traffic volume exceeds capacity at peak hours but yet do not have enough space to accommodate enlargement of roundabout layout and circulating lanes thus required to be converted to signal controlled intersections
- Inadequacy of parking spaces especially within trade and recreational areas along either side of major arterials, result in onsite parking by the sides of roads reducing traffic capacities

Significance & Magnitude

3.4.4. Severity of the Traffic Congestion in Colombo

A key indicator of magnitude of the traffic congestion in Colombo is the average travel speed. The average travel speed during the morning peak between 7 am to 8 am, afternoon peak between 1 pm to 2 pm and evening peak between 5 pm to 6 pm is as follows.

As per the CoMTrans Study, the sections with 20km/hour or less travel speed are defined as congested. The observations of CoMTrans study team on heavily congested road sections during three peak hours is as follows.

3.4.4.1. Travel speed during morning peak hour (Inflow to City Center)

During the morning peak hour from 7 am to 8 am, the travel speeds within CMC and its surrounding area are mostly less than 20km per hour and some sections are observed with speeds less than 10km per hour as well.

a) Maradana roundabout and Town Hall intersections are the most remarkable congested points in the city center

b) Traffic congestion is observed at many intersections on baseline road intersecting with radial roads since major traffic flows go from suburbs to the city center and road traffic capacity is limited at the intersections

c) Traffic congestion is observed at flyover sections such as Dehiwala flyover. Despite the construction of flyover, it is still congested due to straight traffic volume is more than the one lane traffic capacity on the flyover section.

Figure 107: *Average Speed during Morning Peak-hour (0700 h – 0800 h)*
Source: CoMTrans Urban Transport Plan – 2014

3.4.4.2. Travel speed during afternoon peak hour (School traffic hour)

Figure 108: *Average Speed during Afternoon Peak-hour (1300 h – 1400 h)*
Source: CoMTrans Urban Transport Plan – 2014

Traffic congestion during this hour (1 pm to 2 pm) is severe especially within city center where a number of schools are located. This is also stimulated by business activities in the city center.

a) Kularatne Mawatha between Maradana and Borella are heavily congested where there are many large schools such as Ananda College and Zahira College

The southern part of Duplication Road (R.A. De. Mel Mawatha), High level road and Armour street are also congested where there are many schools

3.4.4.3. Travel speed during evening peak hour (Outflow from City Center)

The traffic congestion during this hour (5 pm to 6 pm) is more severe than the morning or afternoon peak. The area to the west of baseline road, many intersections and roundabouts are congested within the city center.

a) Maradana roundabout and the Town Hall intersections are congested in this hour as well. At these intersections, traffic flows come to this point from various directions and traffic volume often exceeds traffic capacity at the intersections

b) Compared to the traffic congestion in the morning peak, outbound directions are congested at many major intersections on Baseline Road.

Figure 109: *Average Speed during Evening Peak-hour (1700 h – 1800 h)*
Source: CoMTrans Urban Transport Plan – 2014

However, it is important to note that the significance of the issue of traffic congestion is limited to only the peak hours on week days. The following illustration on google traffic map on a week day and weekend day represents that the significance of this issue is mainly based on weekdays.

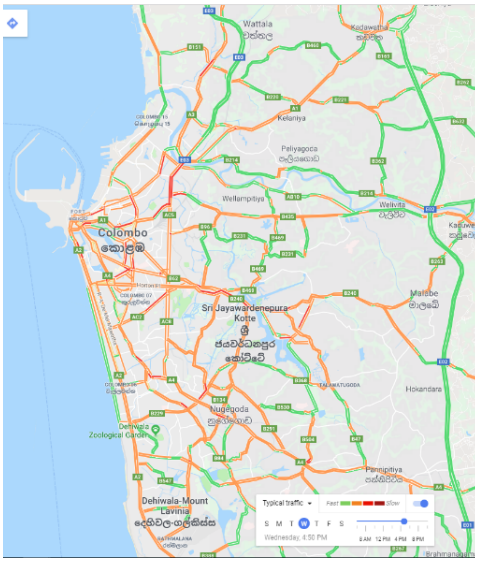


Figure 110: *Traffic Congestion within Colombo Commercial City at 1600 h on Monday (weekday)*
Source: Google Traffic Maps

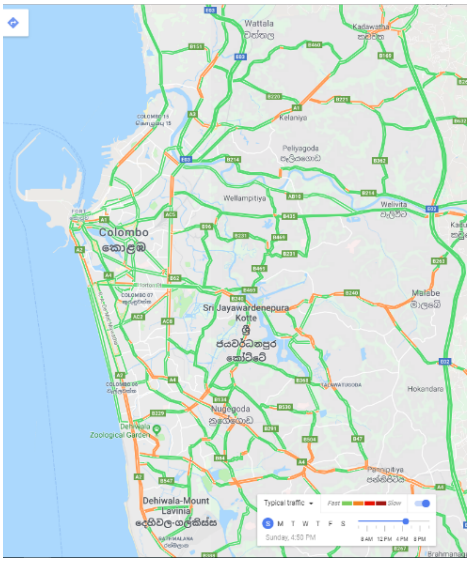


Figure 111: *Traffic Congestion within Colombo Commercial City at 1600 h on Sunday (weekend day)*
Source: Google Traffic Maps

3.4.5. Major Impacts of Severe Traffic Congestion during Peak Hours

Even though, severity of traffic congestion is experienced only during peak hours on weekdays, it cannot be ignored because it causes significant negative impacts on economy and environment. Above all, it makes a huge impact on individual lives of both residents and commuters of Colombo Commercial City, causing inconvenience, time loss and psychological impacts.

3.4.5.1. Economic Impacts due to Traffic Congestion during Peak Hours

As per the scholarly arguments, comparatively low average travel speed is a positive characteristic of an economically active city, as it indicates high functionality of the city with large population flows associated with agglomeration of economies. However, when comparing the average travel speeds of other developed and developing cities which have comparatively higher vehicle volume than Colombo, they still seem to have higher average travel speeds as indicated in the following table.

City	Average Travel Sped (km/h)
Cape Town – South Africa	49
Las Vegas - USA	43
Abudhabi – UAE	42
Dubai - UAE	41
London - UK	40
Los Angeles - USA	36
Paris - France	30
Kuala Lampur - Malaysia	27
Bangkok - Thailand	26
Singapore	26
New York - USA	24
Jakarta - Indonesia	21
Banglore - India	17
Colombo – Sri Lanka	10

Table 12: *Average travel speeds of different cities in the world*
Source: Tomtom Traffic Index – 23-08-2018 (based on real time data)

Even though, the severity of traffic congestion is especially experienced during peak hours, its economic impact is significantly higher because the time loss it causes has a comparatively higher value because it is the collective time of economically active population including professionals, businessmen, local and foreign investment associates which has a considerably high time value. The economic loss due to traffic congestion is a combination of financial loss due to operational costs including wastage of fuel and productive cost including the time loss. It has been estimated that the cost of congestion in Western Province of Sri Lanka was 20 Billion per year accounting for 2% loss of annual regional GDP during the last decade. (Prof. Amal Kumarage, 2004)

However, the recent studies conducted by Colombo Municipal Council has revealed that the present economic loss due to traffic congestion and air pollution within Colombo MC area is approximately 40 Billion annually accounting for 1.5% of annual GDP loss. (Traffic & Road Design Division - CMC, 2014)

The severe traffic congestion resulting an average speed of 10km/h within City of Colombo and suburbs along with associated huge economic costs makes Colombo more distanced and difficult to reach from surrounding areas diminishing its attractiveness as a Commercial City.

3.4.5.2. Environmental Impacts due to Traffic Congestion during Peak Hours

(a) Air Pollution

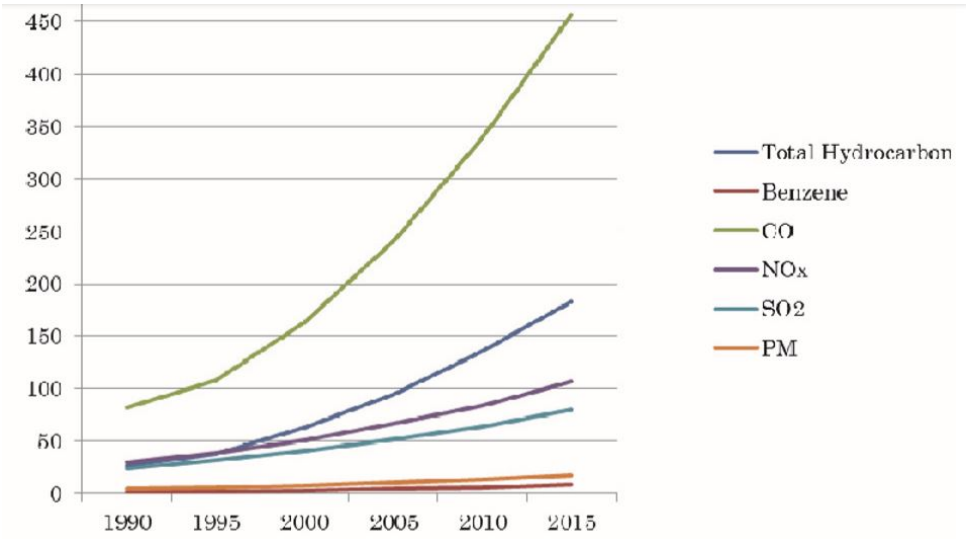


Figure 112: *Estimated emissions from transport sector in 'Do Nothing Scenario' for 1990 to 2015 | Source: CoMTrans Urban Transport Plan – 2014 - (Initial Source: Urban Air Quality Management in Sri Lanka, Air Resource Management Centre)*

Public Inconvenience and Economic Loss due to Traffic Congestion on Major.....
Major Impacts of Severe Traffic Congestion during Peak Hours

Congested road conditions can have a detrimental effect on the environment, in particular air quality and noise pollution. The emissions from motor vehicles is one of the most air polluting sources in Sri Lanka which contributes to over 60% of total emissions in Colombo. Investigations have revealed that density of pollutants such as NO_2, SO_2 and CO is in an increasing trend during peak period, thus it is inferred that the atmospheric conditions along the roads are even worse. The Air Resource Management Center (AirMac) has calculated the emissions from the transport sector, the "Do Nothing Scenario" for the period between 1990 and 2015 as follows.

The breakdown of each pollutant by vehicle type as calculated in 2000 is as follows and it reveals that gasoline engines are bigger emitters of CO and Hydrocarbon while NOx and PM are mostly emitted from diesel engines.

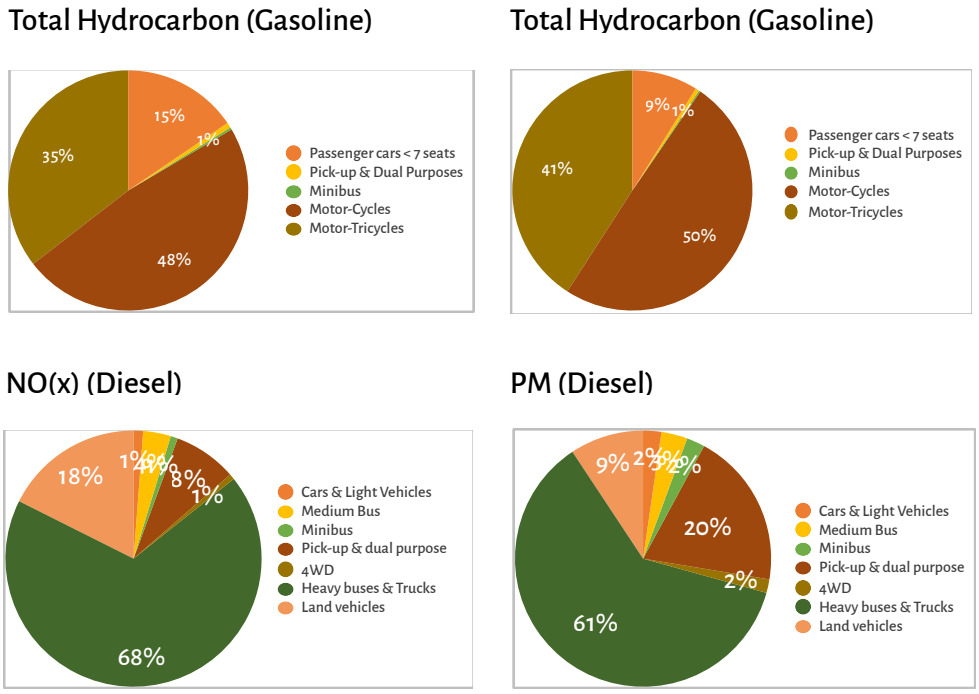


Figure 113: *Breakdown of each pollutant by vehicle type*
Source: CoMTrans Urban Transport Plan – 2014 - (Initial Source: Urban Air Quality Management in Sri Lanka, Air Resource Management Centre)

The above study has shown that motorcycles and three-wheelers together contribute about 90% of the HC of gasoline engine vehicles and heavy buses and trucks together contribute to 60% - 70% of the NOx and PM emissions of the diesel engine vehicles.

The below table shows the maximum concentration of air pollutants within Colombo as measured in 2008. When comparing the measured values with CEA standards, it can be observed that SO2 and PM10 were occasionally exceeded the standards.

Emission Factors	Maximum Concentration	CEA Standards	Measured Date
CO	2.86 ppm	26.0	January 4th 2008
SO_2	0.104 ppm	0.08	January 2nd 2008
NO_2	0.10295 ppm	0.13	November 20th 2008
PM_{10}	146 microg/m^3	100	November 7th 2008

Table 13: *Maximum Concentration of Air Pollutants within Colombo - 2008*
Source: CoMTrans Urban Transport Plan – 2014

It has been found that PM2.5 accounts for about 50% - 60% of total PM10 in typical cities. The average PM2.5 level (measurement of very small particles in air that are 2.5 micrometers or less in diameter) is measured by Colombo Air Quality Monitor – US Embassy and converted to US EPA AQI for weekdays is as follows.

Day	Average PM2.5 level (US EPA AQI)
Monday	69 - 123
Tuesday	67 - 84
Wednesday	69 - 87
Thursday	69 - 89
Friday	87 - 87
Saturday	67 - 83
Sunday	69 - 88

Table 14: *The Average $PM_{2.5}$ level in Colombo measured by Colombo Air Quality Monitor - US Embassy | Source: aqicn.org – Real-time Air Quality Index - 23-08-2018*

As per the standard range of Air Quality Index (AQI) developed by United States Environment Protection Agency (US EPA), it can be observed that Colombo is having a moderate level of air quality. However, it is important to note that the average air quality on Monday is relatively higher and reaches the category of 'unhealthy for sensitive groups'. It also reflects the relatively high vehicle volume flowing into the city on Mondays.

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Figure 114: *Air Quality Index – United States Environment Protection Agency*
Source: Wikipedia

However, when comparing the AQI level of Colombo with other countries, it can be observed that it comparatively lower than developed cities such as Melbourne, London, Paris and Singapore. However, the AQI level of Colombo is higher when compared with other neighboring cities such as Mumbai and Chennai which have unhealthy level of AQI. The reasons for this can be identified as modern state interventions such as initiation of vehicular emission testing program in 2008, banning the importation of Two Stroke Three-wheelers in 2008 and introduction of low suppler diesel in 2003.Since, exposure to air pollutants leads

City	Average PM2.5 level (US EPA AQI)	Level of Health Concern
Colombo	81	Moderate
Melbourne	27	Good
London	41	Good
Paris	53	Moderate
Singapore	46	Good
Bangkok	74	Moderate
Mumbai	160	Unhealthy
Chennai	186	Unhealthy

Table 15: *The Average $PM_{2.5}$ level of different cities in the world*
Source: aqicn.org – Real-time Air Quality Index - 23-08-2018

to a variety of health effects in a broad range of acute and chronic health effects varying form sub-clinical effects to pre-mature mortality, it is important to control this issue by limiting vehicular emissions by providing sustainable solutions to reduce the severe traffic congestion in Greater Colombo.

(b) Green House Gas (GHG) Effect

GHG are the main contributors to Global Warming. Emissions from transport represented 22% of global CO_2 emissions in 2010 and almost three-quarters of the emissions from transport is from the road sector. According to the International Energy Agency (IEA) Report, total CO_2 emission from fuel combustion in Sri Lanka in 2010 was 13.2 million tons and more than half of total CO_2 emission (6.9 million tons) was from the transport system, of which the road sector contributes the most (approximately 94%) of CO_2 emission of 6.5 million. Although, Sri Lanka's contribution of GHG is very minor at the global level, the portion of CO_2 emission from road sector in the western part is significantly high. However, when considering the rapidly increasing vehicle volume in Greater Colombo since 2019, it can be assumed that these emission levels have significantly raised making a considerable effect on global GHG phenomenon.

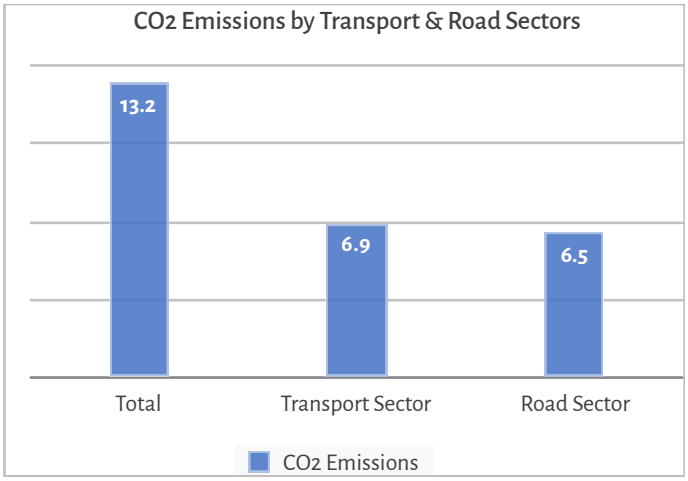


Figure 115: *CO_2 Emissions by Transport & Road Sectors*
Source: CoMTrans Urban Transport Plan – 2014

3.4.5.3. Social Impacts due to Traffic Congestion during Peak Hours

Health impacts are the most significant negative effect of traffic congestion imposed on the society. To some people, congested highways are a symptom of deteriorating quality-of life-in a community. The amount of time that is spent on commuting to and from work is also in reality, time that is taken away from social interactions or pursuit of activities that have a personal value and satisfaction. (Prof. Amal Kumarage, 2004)

One of the major health impact of traffic congestion is the risk of diseases due to air pollution. It has been found that tendency of many more people becoming vulnerable to respiratory diseases such as asthma has increased with the existing

level of pollutant concentrations in air, especially along major traffic corridors. Stress, anxiety and frustration caused due to slow moving traffic and inconvenient traffic environments within Colombo, is also one of the major impacts which has serious short- and long-term health implications on Colombo community including both residents and commuters.

3.5. Lack of User-convenience within Colombo Commercial City due to prevailing Environmental Problems, Social Issues and Deficiencies of Public Facilities

Colombo City Users

Residents, Commuters and Tourists can be identified as the main users or the associated community of Colombo Commercial City.

Residents

There are approximately 650,000 of population within Colombo Municipal Council Area (City of Colombo) and 1,132,514 population within Colombo Commercial City. Since, Colombo is an international city and a business magnet in South Asian Region booming with enhanced living standards, there is a tendency of international population migrating to high-rise condominiums in the city.

Colombo community is composed of different social strata based on income, ethnicity, nationality, religion, education level and employment type etc. thus it is required to accommodate the various needs of these communities when preparing the Colombo Commercial City Development Plan.

Commuters

Approximately 2.2 million commuters circulate within and via Colombo Commercial City. Among them are the daily commuters who travel for work and education purposes, those who travel frequently or occasionally to obtain administration, health and other services and for shopping and entertainment purposes. Commuters who visit Colombo is composed of a variety of social strata of different income groups, nationalities, ethnicities, education levels and

cultural groups etc. thus need to accommodate their needs within the Colombo Commercial Development Plan as to match with their different interests and affordability levels.

Tourists

Sri Lanka has experienced a continuous growth in tourist arrivals since the end of civil war in 2009. The annual tourist arrival has increased from 855,905 in 2011 to 2,052,832 in 2016. It has been revealed that tourists who visit Sri Lanka for more than 10 days, tend to spend at least 02 days in Colombo expending around USD 100 per day. However, it has been reported that the highest hotel room occupancy rate is observed within Colombo City which had been 78.3% in 2010 and 75.18% in 2016. These facts suggest the relatively high tourist attraction within Colombo Commercial City. This trend can be verified further with the experienced rapid development of high-end tourist star hotels of international hotel chains such as Shangri-la, ITC hotels, etc. within City of Colombo.

The tourists visiting Colombo can be broadly categorized as international and local tourists, whereas international tourists can be reclassified as tourists who travel for business, heath facilities, education purposes, pleasure and personal relationship affairs. It is important to consider tourists and their needs as one of the major aspects to be addressed within Colombo Commercial City Development Plan, to ensure the overall user convenience within the city.

3.5.1. Lack of user-convenience due to environmental problems

The major environmental problems prevailing within Colombo such as urban floods/ flash floods, polluted canals, heat island effect and visual pollution lead the city to be an inconvenient city ultimately causing a negative impact on its image as an international financial city.

3.5.1.1. Inconvenience caused due to Urban Floods/ Flash Floods

Context

I. Rainfall

Colombo Commercial City which is located in the wet zone of the country, is predominantly fed by the South-Western monsoon season from May to

September, and during the inter monsoon seasons between October to November. The mean annual rainfall of this region is over 2500 mm, and the monsoonal rainfall is responsible for nearly 55% of the annual precipitation.

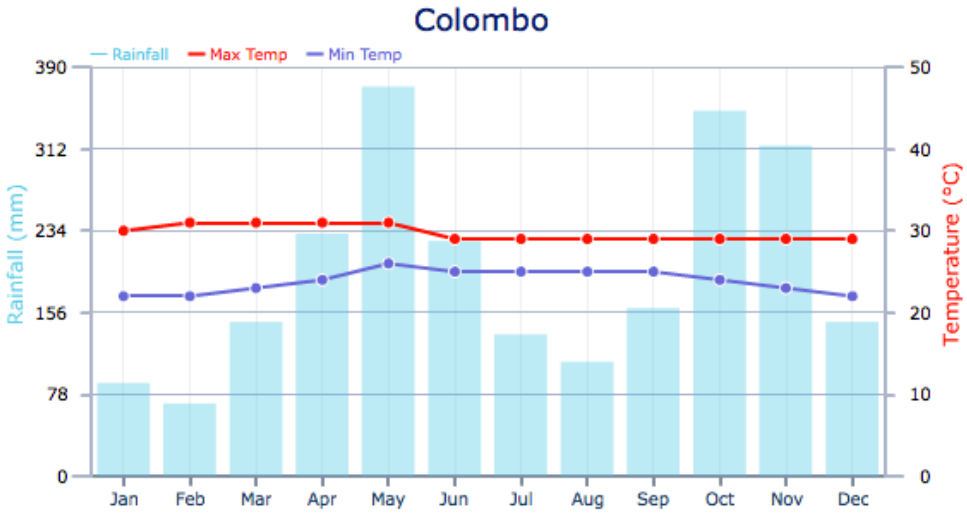


Figure 116: *Rainfall and Temperature variation throughout the year*
Source: climateand weather.com

II. Main Water Flows; Kelani River & Diyawanna Oya

CMR entails two drainage basins: Greater Colombo basin in the south and the Kolonnawa basin in the north. The main water sources of the Colombo region are Diyawannawa Oya and the Kelani River. Diyawannawa Oya flows within Colombo city areas and then connects to the Kelani River. Kelani River is the second longest river of Sri Lanka and flows through the wet zone meeting the sea at the North boundary of the City of Colombo. It covers 80 percent of the water supply to Colombo and its flow varies between 800-1500 m^3/s during the monsoon and some 20-25 m^3/s in the dry season, depending on the operation of 3 reservoirs in the catchment. Diyawanna Oya is connected by a canal and tunnel system to drain the storm water retained in there to either the ocean or to the Kelani River. According to the bathymetric studies carried out by SLLRDC, about 80% of the canals coming under this drainage system, have beds about 1 m below the mean sea level, and the water flow is hence mainly governed by the hydraulic gradient. (Deltares, ADPC & CECB, 2016)

III. Canal Network

The history of the canal system stems from the Portuguese Era, with improvements undertaken during the Dutch Period and the British Period. Thereafter, part of the canal system has been maintained by the Irrigation Department and the rest by Colombo Municipal Council. Lately, the part which was maintained by the Irrigation Department was undertaken by SLLRDC except

Figure 117: *Canal Network Colombo*
Source: Sri Lanka Land Reclamation & Development Corporation

for the Kelani River and its appurtenant flood protection works which are still under the jurisdiction of Irrigation Department.

The system has five main outlets to the sea and many small outlets of storm water drains. Four of the main outlets directly discharge into sea: Dehiwala Outfall, Wellawatte Outfalls, Mutwal Tunnel and the spill of the Beira Lake. The St. North Lock which is one of the outlets of St. Sebastian Canal discharges in to the Kelani River and the river discharges to sea through its Modera Outfall. The spill waters of the Beira Lake, takes place via a man-made circular weir near the old Parliament.

When the Kelani River water level is high, the gate at the North Lock outlet to Kelani River is closed, so that reverse flow (from the river into the system) cannot take place. This operation is now carried out by the Department of Irrigation. Mutwal Tunnel of diameter 1.8 meters, functions as the outlet of the Main Drain. The head of the canal system could be considered as Parliament Lake, to the East of Kotte Lake. Under dry weather conditions the North Lock, Wellawatte and Dehiwala outfalls are the major outflow points. In a flood situation, with the North Lock closed due to high water level in the Kelani River, the system has to rely on mainly Wellawatte and Dehiwala sea outlets. Also, the Mutwal Tunnel helps ease the drainage problems of North Colombo to a great deal at times when the North Lock is closed.

IV. Flooding in Colombo

The area around Colombo the commercial epicenter of Sri Lanka, is naturally prone to riverine flood risks as it is located along the plains of the Kelani River (Niroshinie et al., 2011). Colombo is frequently affected by floods as a result of high monsoon rainfall, flash floods due to intense rainfall in the upper catchments, and cyclonic floods (due to development of low-pressure systems in the Bay of Bengal).

Lack of User-convenience within Colombo Commercial City due to prevailing.....
Lack of user-convenience due to environmental problems

Water levels of the Kelani River, as recorded at the Nagalagam Street river gauge, are shown in Figure 118. When the water level of Kelani River (as recorded at the Nagalagam Street river gauge) is between 5.0 – 7.0 ft, a minor flood situation occurs, whereas when the level exceeds 7.0 ft a major flood situation takes place. Water level exceeding 9.0 ft, at this location is considered as a dangerous flood.

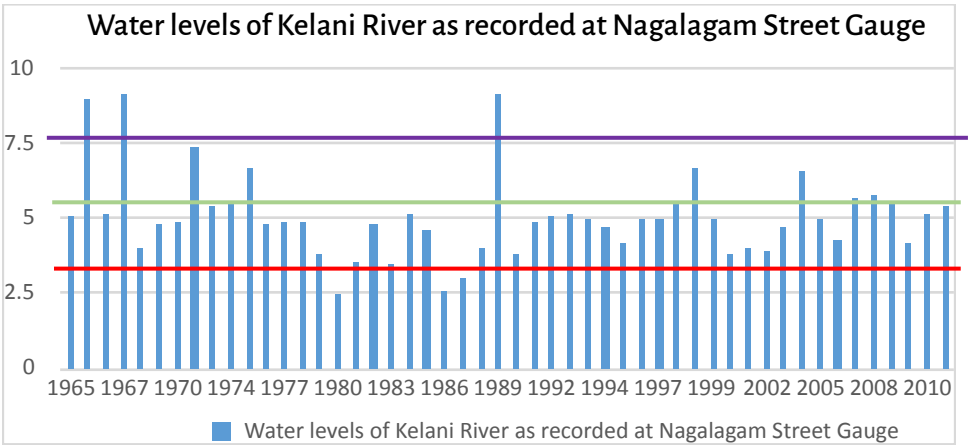


Figure 118: *Water levels of Kelani River as recorded at Nagalagam Street Gauge (1965 – 2010) | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

Severe flooding has been recorded in the Greater Colombo basin in the last few decades on several occasions, particularly on the following days:

- 4-5 Juvne 1992, when a rainfall amount of 494 mm in 19 hrs. was recorded, with maximum clock hour intensities up to 90 mm/hrs. (< 10-year return period)
- 13-21 May 2010, when in 9 days 616 mm was recorded, though the daily value never exceeded 155 mm/day nor did the hourly rainfall exceed 56 mm/hrs. (the latter two are average annual maxima)
- 10-11 November 2010, when 440 mm was recorded in 16 hrs. with hourly values up to 123 mm/hrs. (50-year return period)
- 15 May 2016, when 329.5mm (which is equal to 10-year rainfall) was recorded from 0000h on 15th to 1400h on 17th. The water level of Kelani River recorded to be 3.9m on 15th and 5.6m on 16th and water level of Parliament lake was recorded to be 2.1m on 16th.

Significance & Magnitude

The magnitude of floods in Colombo Commercial City area is such that 50mm – 100mm above rainfall per day creates flash floods and holds it about 1 - 2 hours.

V. Damages due to past severe rainfall events

- 10-11, November 2010

One of the most significant and devastating flood events in the recent history was the flood event that took place during the evening of 10 November to approximately noon on 11 November, 2010. As a low-pressure area developed over the city, up to 490 mm (19.3 in) of rain fell during the short period of 15 hours overnight, causing widespread damage and flooding in the area. This was the highest amount of rainfall recorded in 18 years. According to the Disaster Management Centre (DMC) the heavy rains displaced over 260,000 people in Colombo and suburbs. Heavy rains also submerged the National Parliament (by about 122 cm of water) and damaged 257 houses, while completely destroying 111. Most of the schools were closed during the period and many of the government offices could not report for work and Government was compelled to grant paid leave for them. Multiple grid sub-stations had to be shut down in various locations in Colombo due to the risk of being submerged, leading to power outages in multiple areas. The May 2010 flooding, with losses as high as $100 million, also demonstrated the realities of high flood risk in Colombo Metropolitan Area.

- 15-16, May 2016

According to the Disaster Management Centre, 301,602 people have been affected by the floods and landslides. An estimated 21,484 people were displaced as a result of the disaster and estimated 623 houses have been destroyed and 4,414 have been damaged. These are reportedly the worst floods in 25 years. On 25 May the Government of Sri Lanka estimated that a total of 128,000 families could have been impacted by the disaster, with 30,000 in need of financial assistance for reconstruction or rehabilitation. Colombo is the worst affected district in the country with 190,349 people affected by the floods; this is mostly as a result of large numbers of people living on reclaimed marshy land that is highly susceptible to flooding. According to Government estimates, 25,000 to 30,000 businesses may have been impacted by the disaster. These are primarily small enterprises such as stores, three-wheeler drivers and petty traders.
Most of the people in the Kolonnawa basin have become refugees. Some upstream cities along the Kelani River were fully inundated and at some locations the water rose up to the roof level of houses, as per the information released by the department of Irrigation.

Further, since the quality of water at a number of locations in the canal system is in an extremely bad level, it aggravates the flood impacts by spreading diseases in inundated areas. Flood depth map of May 2016 and November 2010 flood incidents are as follows.

Chapter 03
Need of the Plan

Lack of User-convenience within Colombo Commercial City due to prevailing.....
Lack of user-convenience due to environmental problems

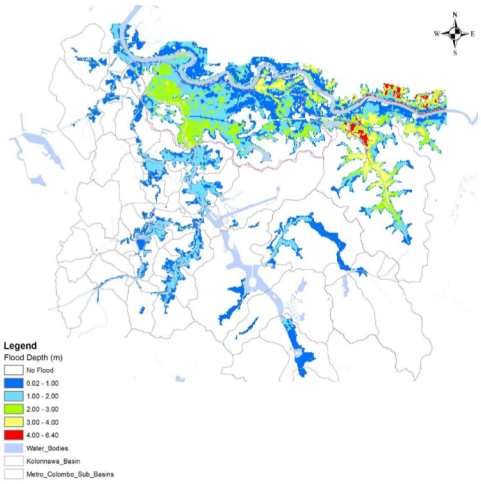


Figure 119: *Flood depth Map of May 2016 Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

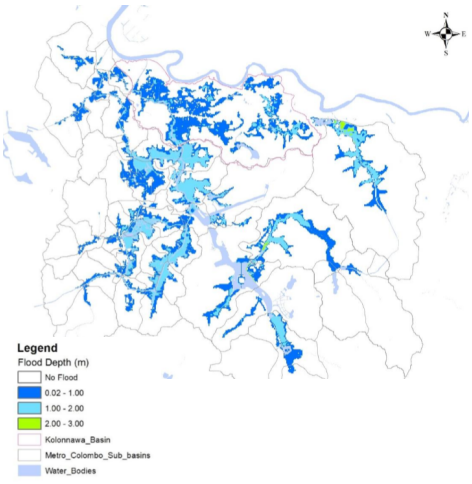


Figure 120: *Flood depth Map of November 2010 | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

Figure 121: *Partially inundated houses on left bank of Kelani River on 20th May 2016 (approx. 2.2m flood water level) | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

Figure 122: *Inundated Colombo – Hanwella Low Level Road near New Kelani Bridge Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

Figure 123: *Partially inundated improvised buildings on the left bank of the Kelani River – Closure Look | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

Figure 124: *Partially inundated improvised buildings on the left bank of the Kelani River | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

VI. Flood Risk Assessments – Forecasts

Several flood risk assessments have been carried out by various public and private academic and professional organizations for Greater Colombo catchment and other sub catchments in response to the increased flood risks during the last decade. The flood risk (Risk = Product of Hazard, Exposure & Vulnerability) has increased with the increase of severity of flood hazard which has been reflected by relatively high precipitation intensities and increase in exposure due to relatively high population densities, intensified agglomerations of international, national and local economic activities and high valued properties. Relatively high vulnerability levels are observed especially in the cases where underserved settlements are located within flood prone areas.

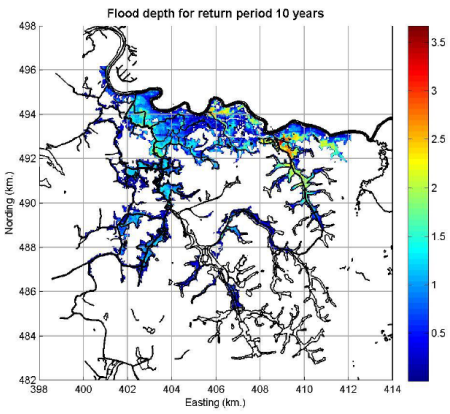


Figure 125: *Flood depth for return period of 10 years | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

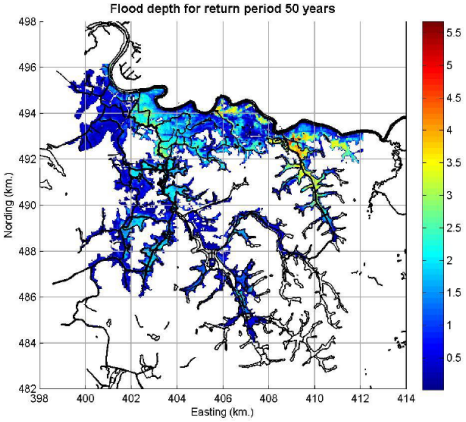


Figure 126: *Flood depth for return period of 50 years | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

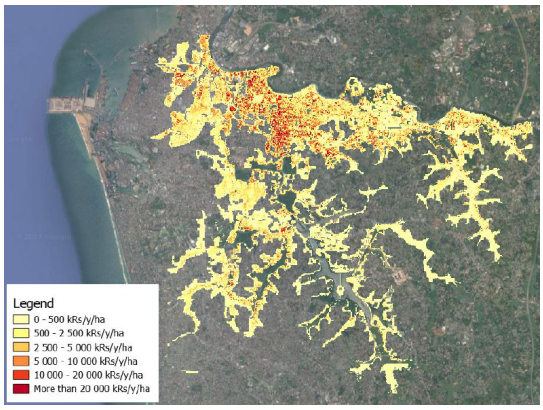


Figure 127: *Existing Flood Risk in Metro Colombo Area Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

The above maps show 10 Yr and 50 Yr flood depth maps developed by Deltares, ADPC & CECB in 2016 under Detailed Flood Risk Assessment for Metro Colombo Region. As per the detailed flood risk assessment conducted by Deltares, ADPC & CECB in 2016 the existing flood risk of Metro Colombo area is as follows.

Lack of User-convenience within Colombo Commercial City due to prevailing……
Lack of user-convenience due to environmental problems

As per the above Flood Risk Map, the highest flood risk within Colombo Commercial City can be experienced in the southern valley of Kelani River, either sides of St. Sebestian Canal, Dematagoda and Kinda Canals. The existence of a large number of underserved settlements within these areas cause blocking of natural water ways, encroachments of reservations, narrowing of canals, discharging of solid and sewer waste which act as main reasons for overflowing and flooding in these areas. In addition, the existence of underserved settlements increases the exposure and vulnerability to flood hazard, directly causing a significant increase in flood risks.

VII. Major Reasons for Flooding in Colombo

The following observations have been made by Sri Lanka Land Reclamation & Development Corporation as referenced in 'Detailed Flood Risk Assessment for Colombo Metropolitan Region' by Deltares, ADPC and CECB in June, 2016.

- Storage capacity in the basin has reduced considerably in the last decade due to uncontrolled landfill and flood plain encroachments by illegal settlements.

- Conveyance capacities of the canals are limited by solid waste, floating debris and bottlenecks in the canals. The sewers are discharged to the canals creating floating waste and depositing waste on the river bed. A number of hydraulic bottlenecks have been identified in the canals, like encroaching structures, unguided bridge piers and rock outcrops limiting the conveyance of the flow.

- The outflow capacity of the drainage system being too small, particularly in the north.

    - The existing Mutwal tunnel outfall has a limited capacity, which was earlier further reduced by rock at the outlet.

    - The capacity of the North Lock sluice at the outlet of St. Sebastian North Canal to Kelani Ganga is inadequate, which was particularly felt during the November 2010 flood.

    - The capacity of the pumping station at South Lock in St. Sebastian South Canal, which drains to Beira Lake, is reduced to 30% of its original value as only one of the three pumps is operational.

- The outflow from the basin being further limited during monsoon and inter-monsoon season floods when high rainfall amounts in the city coincide with high levels in Kelani Ganga. When this occurs discharge

via North Lock is not possible.

- Localized floods often taking place in the micro-drainage system, operated by the municipalities of Colombo (CMC), Kotte and Mt Lavinia due to unauthorized constructions and waste dumps obstructing free flows. It has been revealed by CMC that only 60% of the micro-drainage system functions well where 40% remains problematic.

- The drastic increase in rainfall intensities of short period rainfalls during past decade.
- Encroachments of River & Canal Reservations and Wetlands as a Major Reason for Flooding in Colombo

Wetlands

Approximately 15.4% of the CMR is covered by different types of natural and heavily modified wetlands, including paddy land and marshes. These wetlands provide a valuable service in mitigating flooding in the downstream area. Ecological changes in the wetlands are driven by population growth, and caused these wetlands to reduce their water storage capacity. Furthermore, increasing water velocities due to channelization and urbanization of the watershed have also decreased their flood mitigation potential.

Wetlands are a promising green investment because they act as natural water storage, serving as a retention area for flood waters (Hettiarachchi et al., 2014b; World Bank, 2013c). However, the Greater Colombo Basin lost about 30 percent of its water storage capacity over the last decade due to city growth. Hydrological scenario analyses conclude that, if the CMA's urban wetlands were lost, the flooding observed in 2010, once considered a 50-year event, may now occur every 25 years (World Bank, 2015). The rapid and partly ad hoc urbanization in the past decades, for example, has caused degradation of wetlands and their traditional ecosystem services (World Bank, 2013c).

Historically, the city of Colombo has developed around wetlands. However, over time these wetlands have been degraded and lost (Signes, 2016b). Degradation dramatically affects their hydrological cycle and the services they provide (Hettiarachi et al., 2014b). Nowadays rapid urbanization, illegal waste disposal and filling are between the major causes of ecosystem degradation and disappearance (Ibid.; CEA et al., 2006).

The storage available in the wetlands of Metro Colombo system is an essential part of the flood prevention mechanisms. The Metro Colombo basin area consisting of Metro Colombo basin and Kollonnawa basin consists of several wetlands and waterbodies to an extent of 16.64 km2. This is approx. 13.07 km2 of wetland area and 3.57 km2 of water body area. In the projection on wetland

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degradation and encroachment the flood risk will increase eventually by approx. 90%. It has been predicted that projected that 90% of these wetlands (about 12.41 Km2) will be encroached in future and may be urbanized.

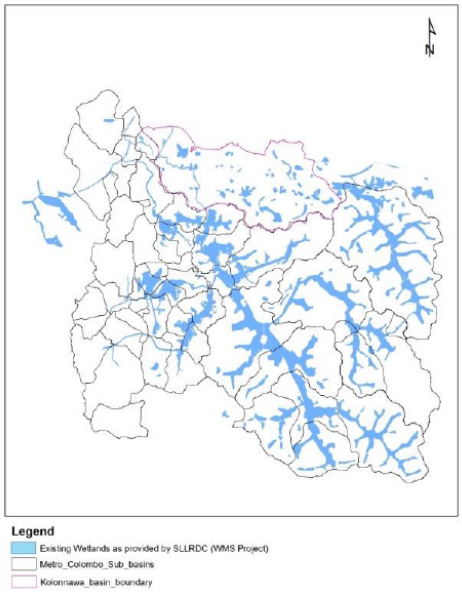

Figure 128: *Existing wetlands as provided by SLLRDC | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

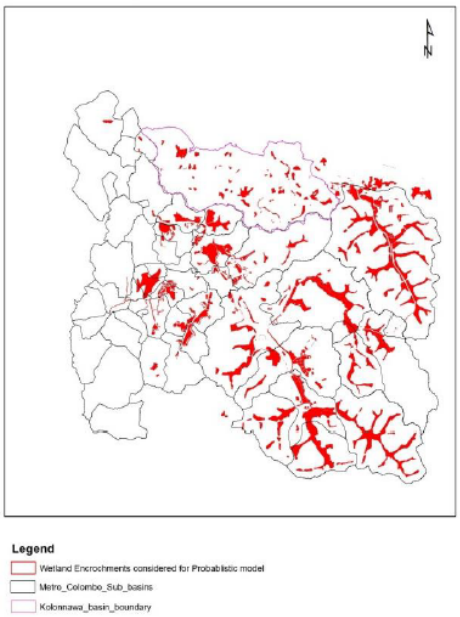

Figure 129: *Wetland Encroachments considered for Probabilistic Model | Source: Flood Hazard Assessment & Hydraulic Modelling; deltares, adpc & cecb, 2017*

The areas shown in red in above map show the possible future encroachments that have been predicted by Detailed Flood Risk Analysis conducted by Deltares, ADPC and CECB in 2016. Even though, future risk of encroachments is comparatively lower in Colombo Financial City area than the Capital City, infill of wetlands in Capital City has a direct impact on floods in Colombo. In addition, the encroachments in river and canal reservations due to illegal constructions especially underserved settlements make a severe impact on increased flood risks in floods plains of Colombo.

It has been found out that total wetlands and paddy in the planning area, which was 1026.87 ha in 2010 has reduced to 627.59 ha in 2018 resulting a decrease of 399.28 ha accounting for 38 .9% of total decrease.

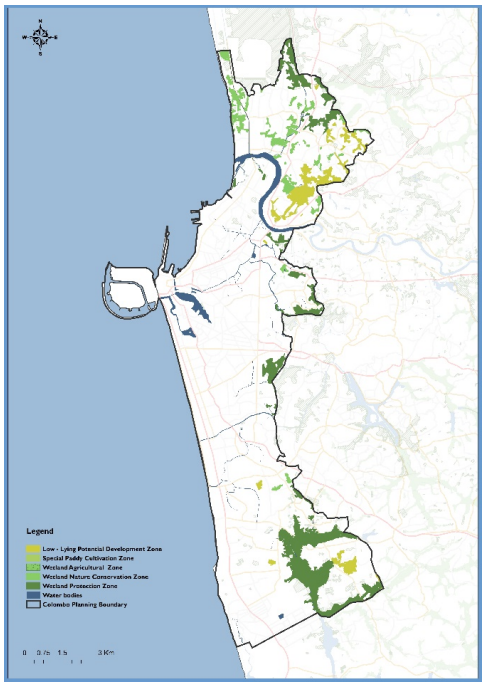

Figure 130: *Wetlands within Colombo Commercial City in 2010*
Source: Research & Development Unit, UDA

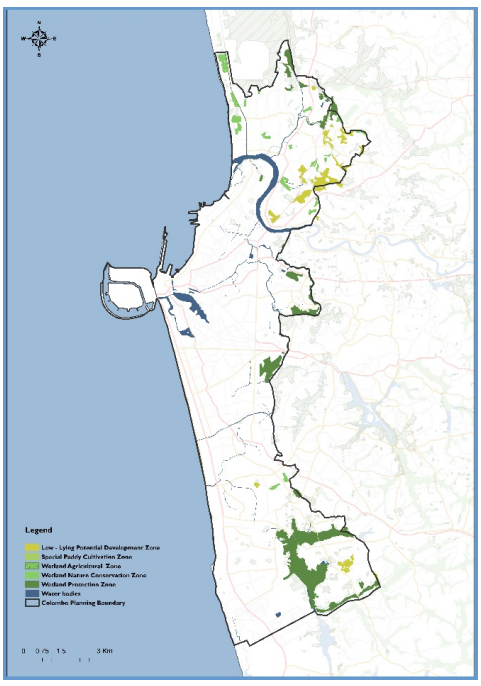

Figure 131: *Wetlands within Colombo Commercial City in 2018*
Source: Research & Development Unit, UDA

Wetland Category	Extent (ha) in 2010	Extent (ha) in 2018
Low Lying Potential Development Zone	214.79	122.97
Special Paddy Cultivation Zone	1.21	1.21
Wetland Agriculture Zone	0.95	0.95
Wetland Nature Conservation Zone	187.65	77.26
Wetland Protection Zone	622.27	425.20
TOTAL	**1026.87**	**627.59**

Table 16: *The reduction of wetland extent from 2010 to 2018 within Colombo Commercial City*
Source: Sri Lanka Land Reclamation & Development Corporation - 2018

The above statistics show the significant decrease of wetlands within Colombo Commercial City from 2010 to 2018. It is important to note that the larger portion of wetlands within Colombo Commercial City fall under the categories of Wetland Protection and Wetland Nature Conservation Zones. These encroachments have already caused the increase in flood risk, thus it is mandatory to manage this issue, by discouraging encroachments and introducing active and passive conservation of wetlands, canal and river reservations.

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3.5.1.2. Inconvenience caused due to Polluted Water Bodies

Context

The water network of Colombo Commercial City includes, 19Km length of Kelani River 1.67km perimeter length of Beira Lake, 89Km length of canals and 34km stretch of coast. There are 16 number of canals within the Colombo Commercial City canal network.

Figure 132: *Inland Water Bodies within Colombo Commercial City*
Source: Research & Development Unit, UDA

	Water Body	Length (km)	Avg. Width (m)	Water Level	
				Dry	Wet
1	Kelani River	7	100		
2	St. Sebestian Canal South	5	20	1.37	1.6
3	Wellawatta Canal	3.1	20	1.09	1.19
4	Dehiwala Canal	6.8	25	1.3	1.29
5	Bolgoda Canal	10	12	1.3	2.35
6	Kirulapana Canal	1.3	25	1.7	1.79
7	Kotte Canal	6.4	35	1.89	1.99
8	Heen Ela	2.2	20	1.19	1.83
9	Torrington Canal	1.6	12	1.4	2
10	Dematagoda Canal	2.7	20	1.9	1.83
11	Kolonnawa Canal	1.6	30	1.91	2.01
12	Dematagoda Diversion	4.7	30	1.3	1.61
13	St. Sebestian North Canal	1.3	20	1.14	1.6
14	Madiwela East Diversion	3.8	1.5 (drain)		
15	Hamilton Canal	4.1	20		

Table 17: *Physical Dimensions of Inland Water Bodies in Colombo Commercial City*
Source: Sri Lanka Land Reclamation & Development Corporation

I. The Pollution of Surface Water Bodies of Colombo

Considering the origin and important uses of past and present (which will be elaborated under environmental potentials), the present status of majority of the surface water bodies is not satisfactory in terms of water quality due to high pollution levels.

Significance & magnitude

a) Surface Water Pollution of Canal network

One of the recent studies on water quality of Colombo water bodies is the 'Assessment of Water Quality in the Inland Waterways and Lakes within Metro C olombo Area' conducted under Metro Colombo Urban Development Project in

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2015 to 2016. According to the study, following observations have been made with reference to the UE Water Framework Directives (WFD) scores for the Canal Network in Metro Colombo Area.

- Very bad quality found in 50% of the network
- Bad water quality found in 15% of the network
- Medium quality found in 15% of the network
- Good quality found in 20% of the network

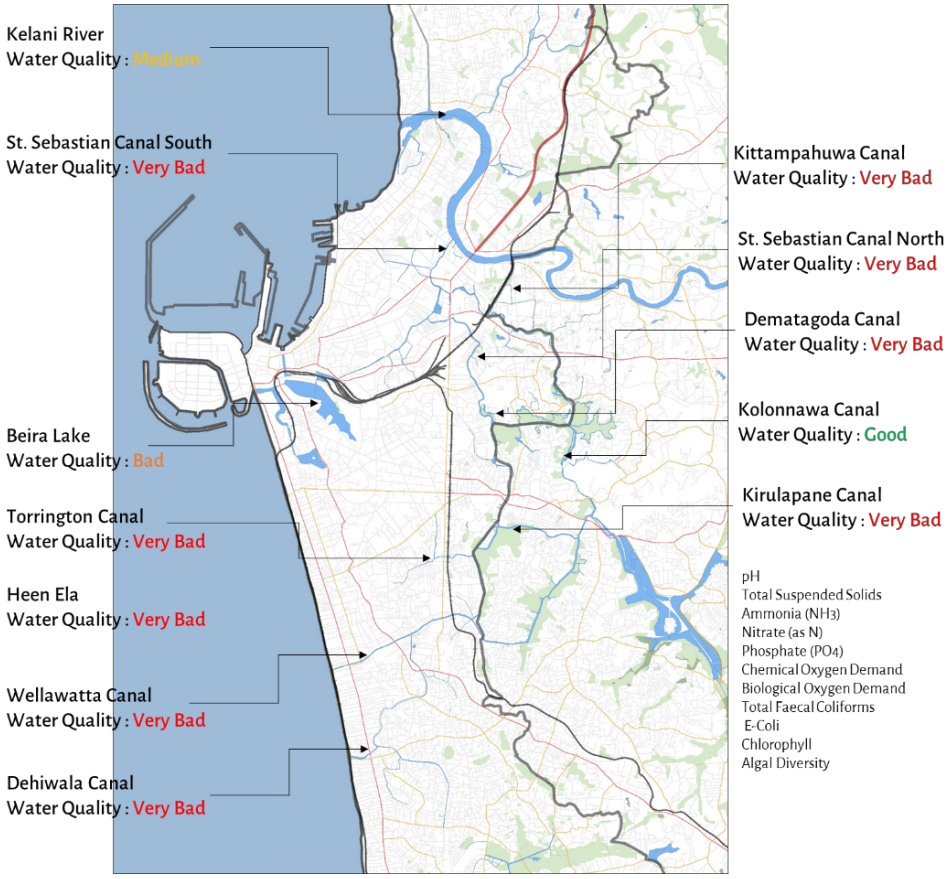

Figure 133: *Physic-chemical water quality of water bodies in Colombo Commercial City*
Source: Technical report 4, Physical Features - Wetland Management Strategy, Metrocolombo Urban Development Project, 2016

It has been found out that the reduction in quality is mostly due to the discharge of domestic waste water. However, the water quality is seemed to have been increased since 2014 due to interventions made by Metro Colombo Urban Development Project and other relevant state agencies to rehabilitate the canal network of Metro Colombo Area.

The above map shows the synthesis of physico-chemical water quality combining the water quality indicators such as Total Suspended Solids (TDS), Ammonia (NH3), Nitrate (as N), Phosphate (PO4), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Total faecal coliforms, Coliforms and E.coli.

As per the results of the above study, Kittampahuwa, Dematagoda, Kirulapana, Dehiwala, Heen Ela and St. Sebestian Canals indicate a very bad level of water quality whereas Kinda Canal indicates a bad level of water quality. The water quality of Kolonnawa Canal is comparatively better as it indicates medium to good level of water quality.

As per the above study, TDS is at a very bad level in Kittampahuwa, Dematagoda and Norris Canal and Free Ammonia as N is at a very bad level in Kittampahuwa, Dematagoda, Kirulapana, HeenEla, Dehiwala and St. Sebestian Canal. Also, it is important to note that Phosphate concentration is at a very bad level in Dematagoda Canal.

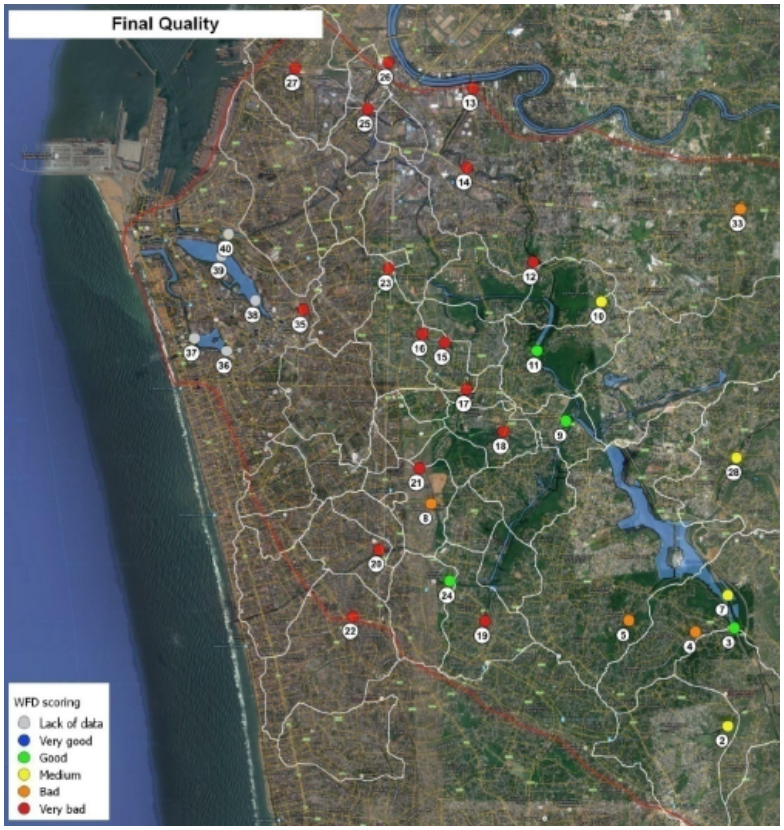

Figure 134: *The final result of Water Quality Assessment – May 2015*
Source: Technical report 4, Physical Features - Wetland Management Strategy, Metrocolombo Urban Development Project, 2016

However, as per the Water Quality Assessment undertaken in 2015, the recommendations are given such that even though, the actual water quality of over 90% water bodies within Metro Colombo are in a poor level, the anthropogenic pollution sources can be easily identified and reduced with an efficient management plan. It further states that a larger time-scale, 5 years can even be considered as a short-time pollution, with a natural ecological potential still remaining on the watershed.

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b) Surface water pollution of Beira Lake

As per the 'Assessment of Water Quality in the Inland Waterways and Lakes within Metro Colombo Area', the physic-chemical water quality of Beira Lake is at a bad level as it indicates relatively high COD level and Chlorophyll level. However, the total Phosphate level of South West Beira Lake is relatively high. When considering the physic-chemical parameters of sediment water of Beira Lake, it can be identified that Nitrite and total Nitrogen as N is at a relatively high level in all parts of Beira Lake including Floating market, South West Beira and East Beira. The most important factor is that Iron (as Fe) is significantly high in Floating Market area and Manganese (as Mn) is also considerably high. Also, Zinc (Zn) and Lead (as Pb) is also very high in all parts of Beira Lake. Thus, it is important to note that sediment level of heavy metals is considerably high in Beira Lake and it needs appropriate attention and controlling mechanism in order to ensure a standard water quality in the lake.

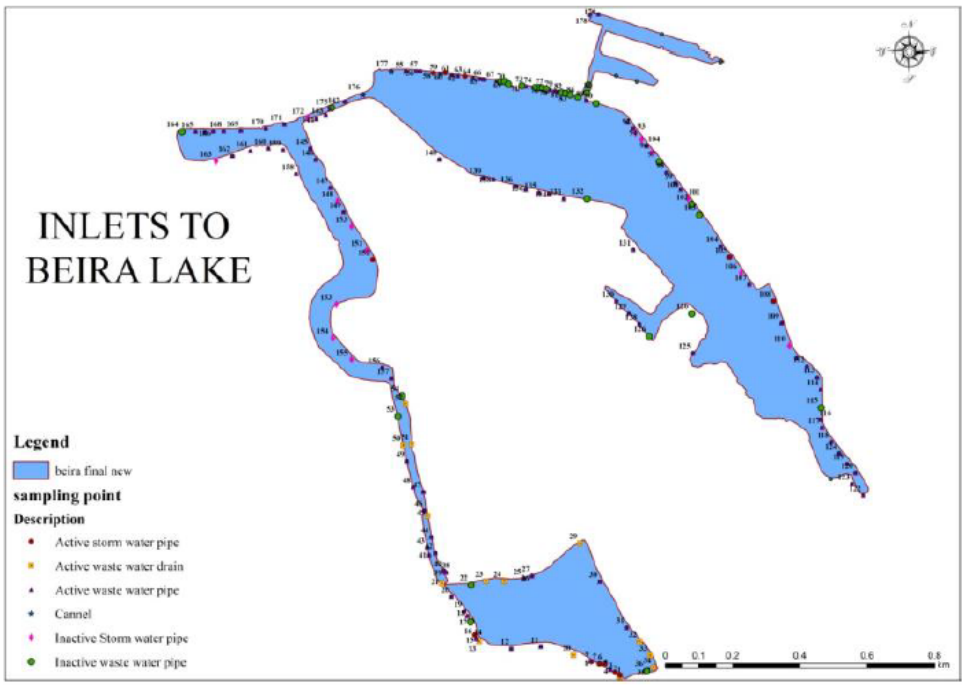

Figure 135: *Inlets to Beira Lake*
Source: Technical report 4, Physical Features - Wetland Management Strategy, Metrocolombo Urban Development Project. 2016

The main source of pollution of Beira Lake is the direct connections of storm water and waste water inlets to the lake. The map produced as a part of the above-mentioned water quality assessment, of such storm water and sewer outlet connections is as follows.

As per the study, the sediment of Beira Lake does not show major micro-pollutant contamination. However, the sediment contains medium to bad heavy metal contamination (in particular lead and zinc). Hence, it is recommended to regulate dredging activities and prohibit fishing strictly during such works.

II. Impacts of Polluted Water Bodies

The impacts of polluted water bodies can be broadly identified as impacts on respective ecological systems and impacts on society meaning the possibilities of spreading diseases, odor, degrading visual quality and imageability of the surrounding area, increase of flood risk, reduction of land values and demotion of developments in surrounding areas.

a) Impacts on ecological system

The polluted canals and water bodies are contaminated and bear lower water quality levels which is highly harmful for the inhabitant flora and fauna species. Especially lower level of BOD and COD levels and relatively high metal concentrations are not favorable for the inhabitant species.

b) Possibilities of spreading diseases

The polluted water canals which contain flowing debris cause blocking and reducing the speed of natural flows creating environments for mosquito breeding and create habitats for harmful animal species. In addition, the fishing of these polluted canals is also considered to be harmful where the contaminated or infected fish species can cause serious illnesses in people who consume it. Another negative effect is the consumption of water from polluted water bodies, especially Kelani River can result in serious diseases and even bathing and other activities associated with polluted water can harm people who consume them in numerous ways.

c) Inconvenience due to odor and unpleasant environments associated with polluted water bodies and impacts on city image and economic value

Figure 136: *Polluted Canal in Colombo*
Image Courtesy: roar.media

Figure 137: *Beira Lake - 2016*
Image Courtesy: archives.sundayobserver.lk

One of the strongly felt impact of polluted water bodies in the bad odor associated with them which significantly affect the city image. Bad odor is common experience associated with most of the polluted water bodies in

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Colombo. However, the worsened situation which prevailed during last decade has somewhat lessened due to interventions made by MCUDP project and other relevant agencies on cleaning and rehabilitation of certain parts of Beira Lake and other canals. However, at present it can be observed that bad odor is a problem even in water bodies which were cleaned few years back due to lack of continuous monitoring, maintenance and management. However, the bad odor and unpleasant environments associated with polluted water bodies create a negative image of the city making it unattractive. This can be identified as one of the reasons which cause drastic reductions in land values and discouraging investors for future developments in the area. Therefore, polluted water bodies which are treated as backyards of the city can be identified as one of the root causes which exclude some important parts of city from developments and lead them to be left out as deteriorated areas.

d) Increase in flood risks

As explained in the previous section on flood risk in Colombo, polluted water canals which contain large amount of debris and solid waste is one of the major reasons for blockage and slowing of natural discharge of canal network.

3.5.1.3. Inconvenience caused due to Heat Island Effect

I. Heat Island Effect

Impervious surfaces and built structures in urban areas alter local climate through the urban heat island (UHI) (Oke, 1987). The UHI refers to the relatively higher surface and air temperatures that occur in urban areas as a result of land cover changes and waste energy arising from urbanization (Oke, 1995). Conversion of vegetation cover (Pervious surfaces) into concrete or asphalt surfaces (Impervious surfaces) increases surface heat storage and decreases nocturnal urban cooling. The resulting warmer temperatures likely results in greater air-conditioning demand, thus increasing energy use and latent mechanical heat output.

As urban areas develop, changes occur in the landscape. Buildings, roads, and other infrastructure replace open land, water catchment areas and vegetation. Surfaces that were once permeable and moist generally become impermeable and dry, where infiltration reduces and runoff increase. This development leads to the formation of urban heat islands - the phenomenon whereby urban regions experience warmer temperatures than their rural surroundings (EPA, n.d.).

Figure 138: *Conceptual representation of UHI Profile in Colombo*
Source: Dissanayake W.M.P.L., 2017 (Original source: Syrios, K. and Hunt, G.R., 2008)

Context

II. Reasons for Heat Island Effect in Colombo

Heat Island Effect is a sub-result of rapid urbanization taken place in Colombo which is attributed with factors such as considerable conversion of green cover into built-up area, use of construction materials which have less heat absorption and high heat reflection capacities and disturbances to airflow and blocking of urban ventilation due to Street Canyon Effect. (Street Canyon Effect: A street canyon is a place where the street is flanked by buildings on both sides creating a canyon-like environment. Street canyons effect temperature, wind speed, wind direction and consequently the air quality within the canyon

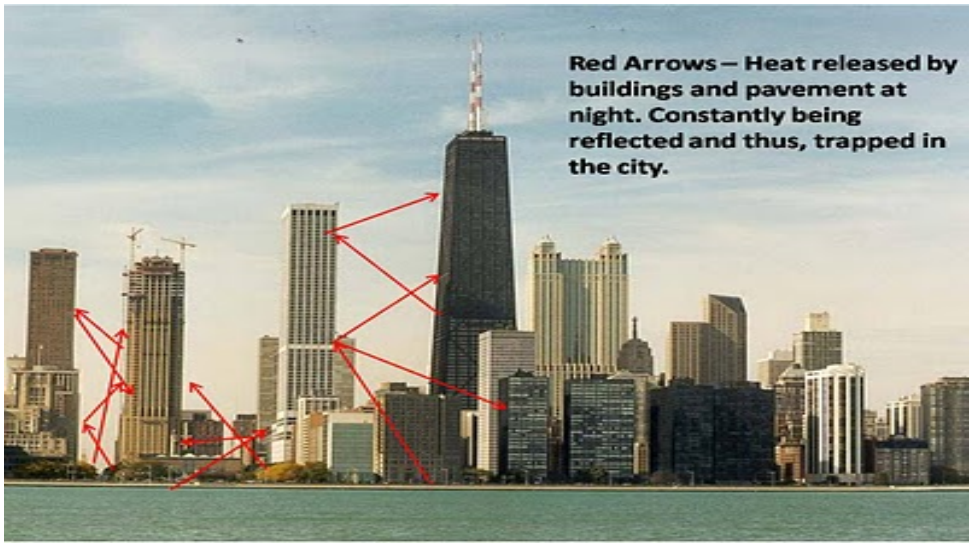

Figure 139: *Heat Canyon Effect*
Source: Dissanayake W.M.P.L., 2017 (Original source: Syrios, K. and Hunt, G.R., 2008)

III.Reduction of Vegetation Cover due to Rapid Urbanization

As a result of the waves of Colombo urbanization moving towards east of City of Colombo, the vegetation cover has been reduced gradually over the years as shown in following maps.

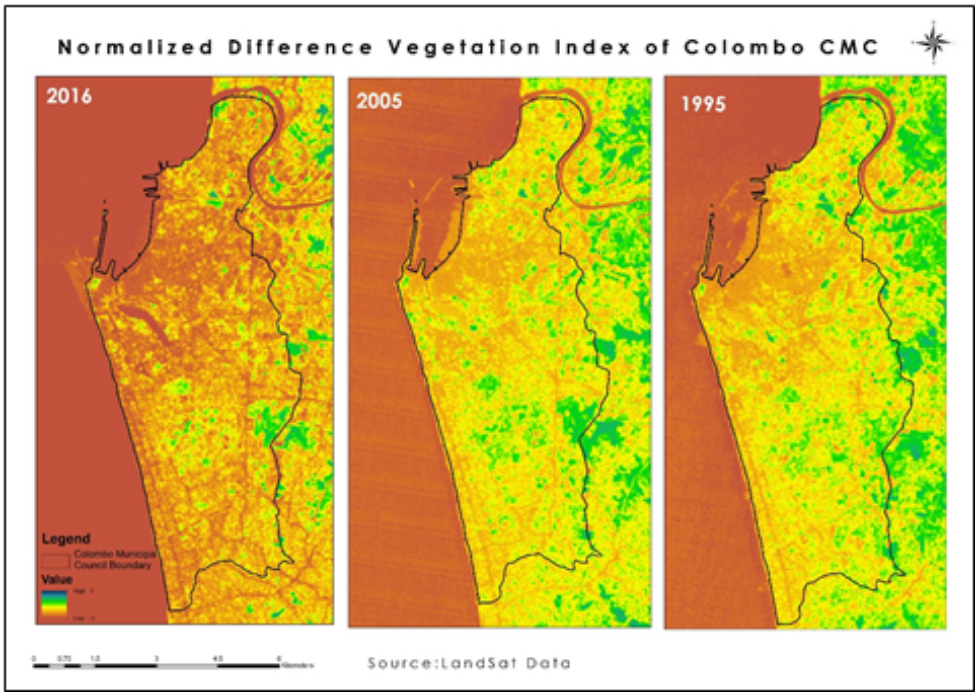

Figure 140: *Reduction of Vegetation Cover from 1995 to 2016 (NDVI Analysis Based on Landsat Data of 1995, 2005 and 2016)*
Source: Dissanayake W.M.P.L., 2017

IV. The Status of Heat Island Effect in Colombo

Significance & magnitude

As per a study conducted by Department of GIS & Remote Sensing of University of Sri Jayawardanepura, the Land Surface Temperature Distribution and Heat Island Effect of Colombo District is as follows. *(Figure 141)*

When analyzing the variation of land surface temperature within Colombo District over last two decades, it can be identified that the temperature levels have been comparatively increased in 2015 compared to 1995. Also, it can be identified that the area indicating high temperature levels also have been increased drastically especially towards the east and south of Colombo.

As per the above study, the heat island effect of Colombo analyzed based on Landsat Data of 2016 is shown in the above map. According to the above analysis, it can be understood that the highest heat effects are recorded in north Colombo, including areas such as Bloemandhal, Dematagoda, Kotahena and Peliyagoda etc. and Ratmalana area where large warehouses and industries are located. The map clearly shows that the heat island effect is relatively lower in coastal stretch and Colombo 07 area which is currently designated as Special Primary Residential Zone. The present planning intervention on this area is such that to

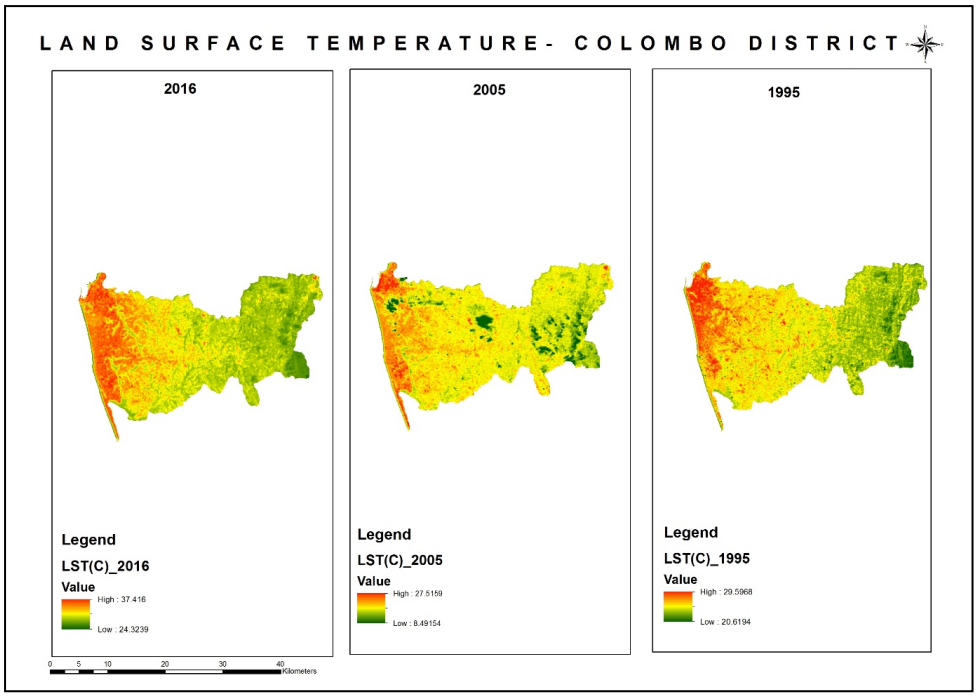

Figure 141: *Variation of Land Surface Temperature- Colombo District*
Source: Dissanayake W.M.P.L., 2017

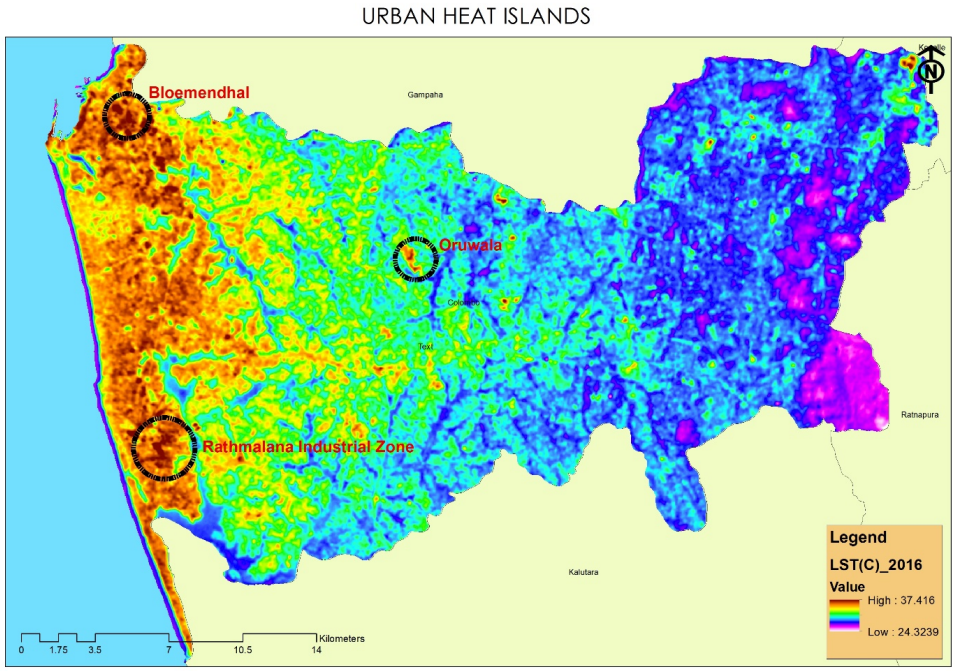

Figure 142: *Urban Heat Islands in Colombo District based on Landsat Data - 2016*
Source: Dissanayake W.M.P.L., 2017

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conserve its original garden character which has been created as a result of Garden City Concept of Patrick Geddes in 1921. Therefore, this area contains more green cover and less high-rise buildings, which has been clearly implicated with relatively low heat island effects.

From the above example, it can be identified that the heat island effects of City of Colombo can be managed by increasing the green cover of Colombo and allowing wind corridors as to facilitate the required air circulation and urban ventilation. It is a mandatory to give due attention to this issue in order to ensure convenience for the city users as increased temperatures generated by higher heats within a city make a huge impact on psychology of the city dwellers and commuters. Continuous exposure to high heat levels may cause depression, anxiety, aggressiveness and serious events such as heatstroke, heat exhaustion and heat cramps especially in elderly and children.

3.5.2. Lack of User-convenience due to Safety Issues

3.5.2.1. Safety Issues due to Crimes

Context

As an international city of business and tourism and as the commercial capital of Sri Lanka, safety is a prime requirement which should be ensured in order to attract more people to the city. As a country, Sri Lanka has been designated as a free and safe country since the end of civil war in 2009.
As stated by the international website on travel guide; Rough Guide (https://www.roughguides.com/destinations/asia/sri-lanka/crime-safety/), “Sri Lanka is a remarkably safe place to travel in, and violent crime against foreigners is virtually unheard of. The only bad news is that scams and aggressive touting are widespread in a few places.”

Significance & Magnitude

I. Crime levels of Colombo

As per the Numbeo indicators, which is an online information analyst based on global visitor perceptions, the level of crime in Colombo is 40.37 which is at moderate level. Also, crime increasing trend in past three years as at September 2018 is 42.74 which is also in a moderate level. The other crime related statistics are as follows, based on Numbeo indicators.

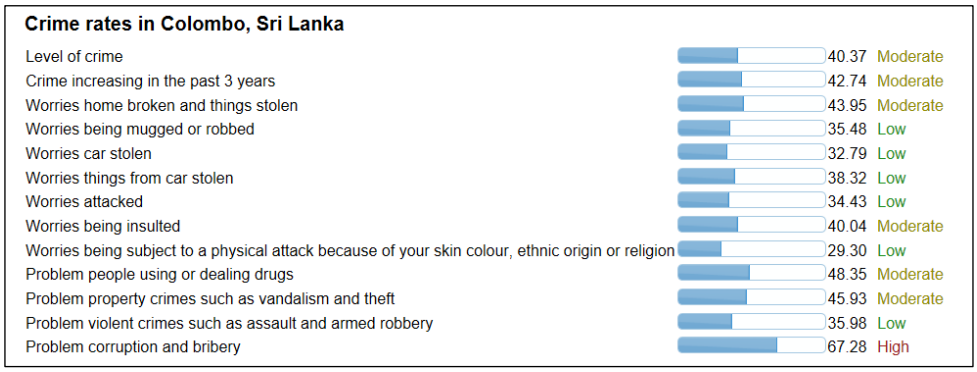

Figure 143: *Crime Rates in Colombo as at September 2018*
Source: Numbeo Indicators (https://www.numbeo.com/crime/in/Colombo

As per the above statistics, it can be identified that the indicators such as worries of being mugged or robbed, worries of being insulted, problems due to using or dealing drugs and property crimes such as vandalism and theft are at a moderate level ranging from 40% to 50% while problems due to corruption and bribery being high accounting for 67.28%.

However, as per the above indicators, the safety in walking alone during daylight is at a high-level accounting for 78.66% and safety in walking alone during night is at a moderate level accounting for 57.26%. This information conveys that night safety in Colombo is at a relatively low level.

As per the grave crime abstract for the year 2017 by police divisions from 1st January to 31st December 2017, the total number of crimes in separate police divisions of Greater Colombo Area is as follows.

Police Division	Total Number of Crimes
North Colombo	1105
South Colombo	905
Central Colombo	678
Mount-lavinia	2026
Kelaniya	1895
Anuradhapura	1798
Gampaha	1170
Negombo	1275
Total – Sri Lanka	35,978

Table 18: *Crime Records of Police Divisions within Colombo Commercial City*
Source: Respective Police Divisions, Sri Lanka Police

As per the above statistics, it can be identified that there is a significantly high level of crimes is reported in Mount-lavinia and Kalaniya police divisions. However, there is a comparatively higher level of crimes reported in North Colombo than South and Central Colombo. Central Colombo which is consisted of Colombo 07 area including special primary residential zone conserved with garden character seems to indicate low level of crimes. The reason for higher level of crimes in North Colombo is attributed to existence of Underserved Settlements which has been elaborated in the previous section on issues related to USS. Comparatively higher level of crimes in Mount-lavinia has some correlation with the co-existence of tourism activities and underserved settlements in coastal belt and inner clusters of USS such as Bodowita, Attidiya and Angulana etc.

Issues related to city spatial configuration such as enclosed areas or less exposed areas with less accessibility, deserted areas due to deteriorated built-environments and lack of activities and human interactions and dark narrow streets/ alleys make ideal environments for occurrence of crimes and other illegal activities. It is a responsibility of city planners to manipulate the city configuration in a such a way to avoid the existence of such environments in order to ensure the safety of Colombo.

II. Impacts of Crimes

a) Downgrading city image as an international city

The major impact of crimes in Colombo Commercial City is that it creates a negative image of city and it affects the economic activities of Colombo as an international city. Higher level of crimes automatically distracts international and local tourists entering Colombo. Since Colombo is the commercial capital of the country, the higher level of crimes conveys a negative image on not only Colombo but also the whole country. Higher level of crimes also downgrades the city in international standards of livability and disgraces its image as an international business hub. The investors, who look forward for business opportunities in Colombo get discouraged when hearing about higher crime levels in Colombo.

b) Threatening the safety of Colombo City Users; residents, commuters and tourists

A safe city is a dream of all city dwellers and visitors. A city corrupted with higher crime levels can harm its people and properties in numerous ways resulting in serious effects such as injuries, psychological disorders and even fatalities to people and large economic loss due to property damages.

3.5.2.2. Safety issues due to Road Accidents

Context

Road safety and pedestrian safety is again one of the standard requirements of any city. When it comes to capital cities, road accidents can be resulted due to large vehicle flows circulating within the city if due attention is not given take necessary technical and planning mitigatory measures.

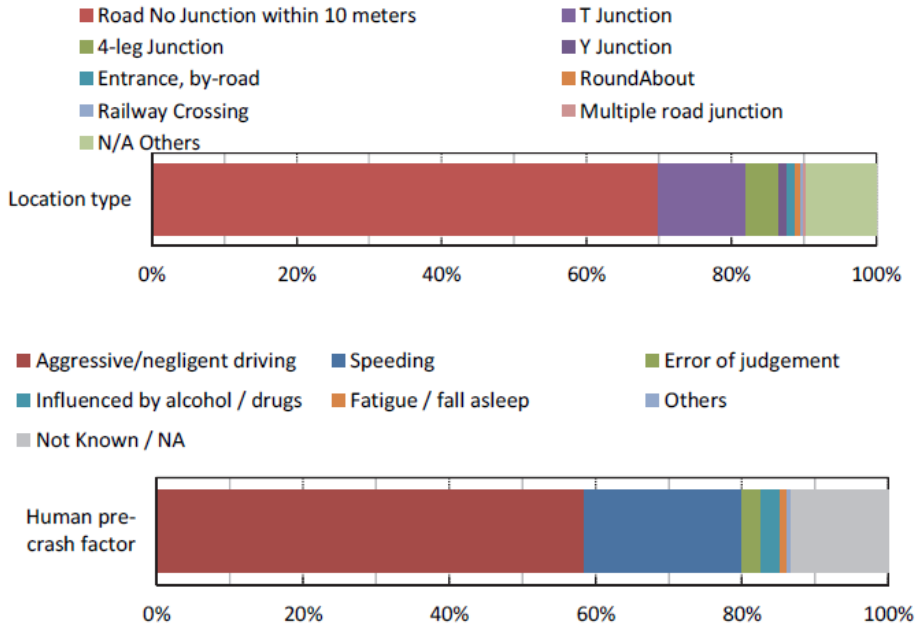

Figure 144: *Location type and crash type of fatal accidents in Colombo*
Source: CoMTrans Urban Transport Plan – 2014

Significance & Magnitude

The number of people injured in traffic accidents has continuously increased in last five years, in the western province. Especially, the number of pedestrians injured and killed in traffic accidents is significant compared to other areas in Sri Lanka.

As per the above graph, it can be identified that the number of accidents has increased gradually during the period of 2009 to 2012 within Western Province. A large amount of total accidents of western province occur within Metro Colombo Area as large vehicle flows circulate within the area.

As per the CoMTrans Study, 2013, around 70% of accidents occur on road with no junctions located within 10 meters and the major reason is aggressive/ negligent driving. However, around 10% of road accidents occur at T-Junctions.

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Lack of User-convenience due to Safety Issues
Inconvenience due to Lack of Public Facilities

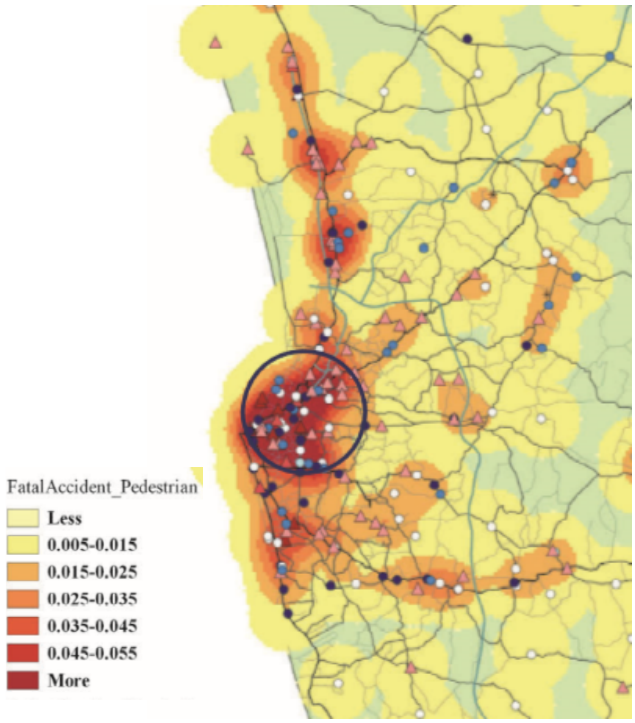

Figure 145: *Location and heat map of pedestrian fatal accidents in Western Province*
Source: CoMTrans Urban Transport Plan – 2014

The heat map of pedestrian fatal accidents in the Metro Colombo area is shown by the above map. According to the map, it can be observed that the occurrence of fatal-accidents is significantly high throughout Greater Colombo area and especially in North Colombo.

As per the recommendations of CoMTrans Study – 2013, improvements of pedestrian crossings, sidewalks, traffic lights, centre medians, development of fast lane and no-passing zone, setting-up of speed traps and enhancing awareness are some of the mitigatory measures recommended to reduce pedestrian and motor accidents.

3.5.3. Inconvenience due to Lack of Public Facilities

One of the most felt problems faced by Community of Colombo Commercial City is the lack of public facilities such as public toilets, restrooms, seating areas, street lights, information centers and shady areas and parking places etc. This issue is mostly felt especially in highly congested nodes such as Pettah, Maradana, Dematagoda, Kollupitiya, Bambalapitiya within Central Colombo and many other nodal centers within Colombo Commercial City. Since, Colombo is a place where around 2 Mn commuters daily circulate within and as it as place

of both foreign and local tourists given its role as a popular tourism destination and a booming financial hub, it is important to ensure that above basic public facilities are provided sufficiently within the city.

3.6. Perceiving City Potentials as Solutions for Issues of Colombo Commercial City

As elaborated in the previous sections, existing issues of Colombo Commercial City are as follows.

1. Problems due to changing development trends

    a. Spontaneous emerge of high rises within Colombo Commercial City regardless the availability of supporting infrastructure

    b. Current development trends challenging the existing planning and building regulations based on zoning

2. Emerging social, environmental and economic problems due to distribution of Underserved Settlements

3. Public inconvenience and economic loss due to traffic congestion on major arterials at peak hours

4. Lack of user-convenience within Colombo Commercial City due to prevailing environment problems, safety issues and deficiencies in public facilities

    a. Lack of user-convenience due to environmental problems

        I. Inconvenience caused due to Urban Floods/ Flash Floods
        II. Inconvenience caused due to polluted water bodies
        III. Inconvenience caused due to Heat Island Effect

    b. Inconvenience due to Safety Issues

        I. Safety Issues due to Crimes
        II. Safety issues due to road accidents

    c. Inconvenience due to lack of facilities

City Potentials

The main potentials of Colombo Commercial City can be viewed in terms of economic potentials, environmental potentials and on-going and proposed projects.

3.6.1. Economic Potentials

As per the Central Bank Report – 2016, the growing economic sectors of Colombo are tourism, wholesale & retail, financial services, transport & logistics, construction and real estate & housing.

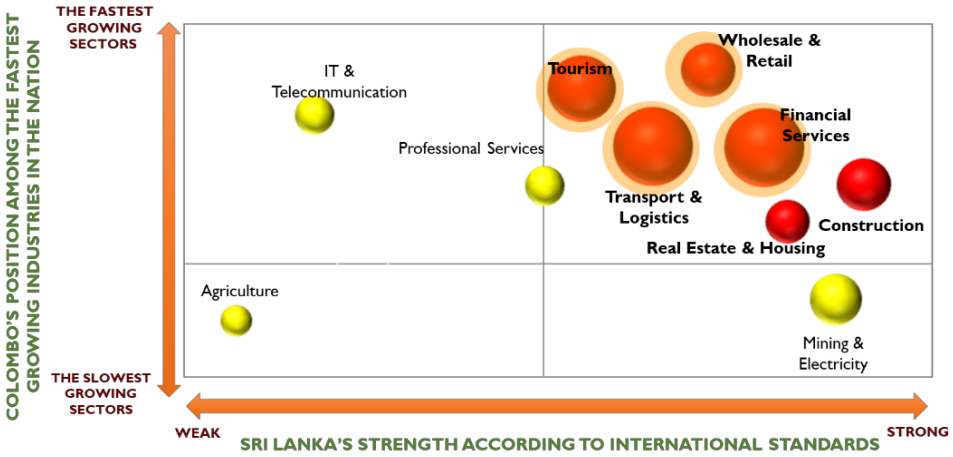

Figure 146: *Comparison of Colombo's Position among the Fastest Growing Industries in Sri Lanka*
Source: Central Bank Report - 2016

3.6.1.1 Real Estate Market in Colombo

As per the report, 'Real Estate in Sri Lanka – Prospects & Potential' by Jones Lang LaSalle in 2014, during the last few years, due to increased service sector activities in Colombo, the city's real estate market has witnessed heightened activity and has drawn interest from both national and international investors. As explained in the section 'Colombo as an International Business Hub', Colombo is having considerably high demand for real estate in international market especially for office space. The high demand is due to relatively high affordability due to less costs compared to other outsourcing destinations. According to the Asian Development Bank, Colombo ranked first in the City Competitiveness Rankings among the top cities of Sri Lanka, India and Bangladesh, and above the Indian cities of Mumbai, Bangalore and New Delhi.

City	Country	Rank	Level of Competitiveness
Colombo	Sri Lanka	1	International
Mumbai	India	2	International
Bangalore	India	3	International
New Delhi	India	4	International
Chennai	India	5	International
Dhaka	Bangladesh	6	International
Hyderabad	India	7	International
Kolkata	India	8	National
Gampaha	Sri Lanka	9	National
Ahmedabad	India	10	National
Pune	India	11	National
Surat	India	12	National
Kalutara	Sri Lanka	13	National
Chittagong	Bangladesh	14	National
Kanpur	India	15	National

Table 19: *City Competitiveness Ranking (39 South Asian Cities), Competitive Cities in the 21st Century, Asian Development Bank (2011)*
Source: On Point – Real Estate in Sri Lanka - Prospects and Potential, Jones Land Lasalle - 2012

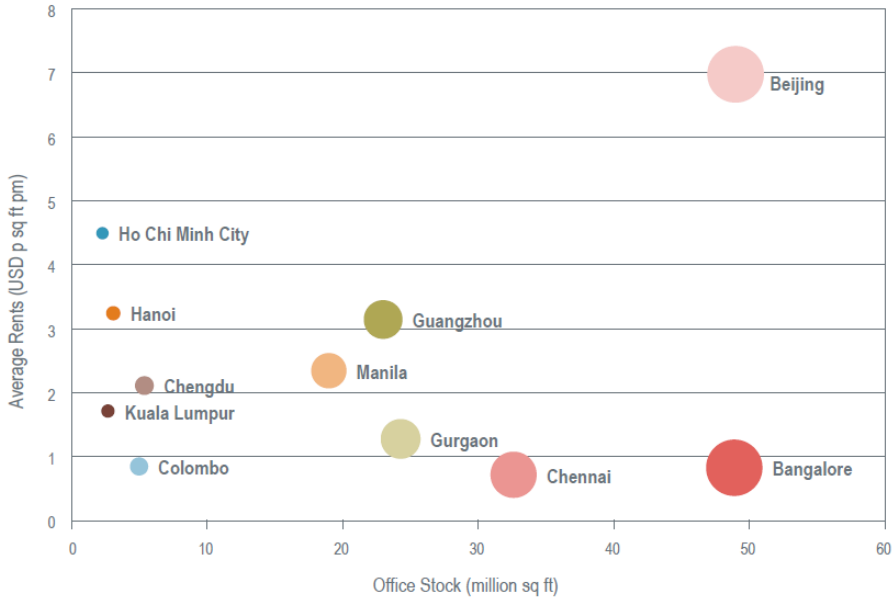

Figure 147: *Availability and Affordability of Office Space in Outsourcing Locations*
Source: On Point – Real Estate in Sri Lanka - Prospects and Potential, Jones Land Lasalle - 2012

3.6.1.2. Increasing Office Space

The future demand for commercial office space in Colombo will be closely correlated with the industries that have the prospects of maximum growth. Growth in finance, insurance and information and communication technology sectors would lead directly to demand generation for quality office space. As of 2011, there were 22 banks (including 11 foreign) operating in the Colombo Metropolitan Region (CMR), with over 632 branches and 897 banking outlets. As per the Lang LaSalle's report on real estate, by 2015, the central and secondary business districts of Colombo (CBD and SBD) have nearly 2.5 million sq ft of Grade A multitenant leasable office space. The total stock, including the stand-alone self-owned office space and Grade B office space, is estimated to be around 5 million sq ft.

Figure 148: *Office Space at Trace Expert City, Maradana*
Image Courtesy: Echelon Magazine

3.6.1.3. The Boost in Retail Market of Colombo

Retail establishments in Colombo are largely located along the high streets, either in traditional retail areas like Pettah, Dematagoda (Northern Colombo) or in upmarket established retail areas like Kolupittiya, Bambalapittiya and Wellawatte (Southern Colombo). Given Sri Lanka's prominence in textiles, tea, spices, gems and jewellery, the traditional wholesale areas in Northern Colombo are busy throughout the year with continuous patronage from domestic as well as export-oriented business units. Up-market and branded shopping destinations are found towards the south of the city centre along the Galle and Duplication Roads. Majestic City, Liberty Plaza, Crescat Malls and ODEL and

recently established Colombo City Centre are popular with the locals as well as tourists. Prime high street activity in Colombo is largely concentrated to Galle Road, Duplication Road and Sri Jayewardene Mawatha along with mostly un-organized wholesale markets in North Colombo like Pettah (Lang LaSalle, 2015)

Figure 149: *Crescat Boulevard Shopping Mall*
Image Courtesy: cinnamonheotels.com

3.6.1.4. High-rise Residential Apartments

The recent upswings in the service sector including from the finance, tourism and the IT/ITES industry in Colombo have triggered a healthy demand for residential space in the Colombo Commercial City. The development of premium condominium projects is most prominent in the CBD, whereas sub-divided developments, row houses and villas in the peripheral suburbs have emerged as preferred assets for investment amongst the middle-income group. As per the residential market analysis conducted by Lang LaSalle in 2015, it has identified 05 segments of residential markets in Colombo.

Lower Mid-Level Segment: The lower mid-level segment has the largest supply as well as absorption share in the apartment market. Projects are predominantly concentrated in the peripheral and old city areas. Many of them fall into the un-organized real estate sector with an average of 5 - 20 units each. The average unit cost is approximately LKR 10 million with minimum specifications and unit sizes and a clear focus on affordable pricing.

Mid-Level Segment: The mid-level segment has specifications and product mix similar to premium segment apartments, but is located in the suburbs. Most of the projects in this category are located in the upcoming suburbs of Rajagiriya and Sri Jayawardenepura Kotte. Units are available from LKR 10-25 million and the segment has a share of 26% in the supply of condominiums.

Premium Segment: This is the most popular segment within the city limits of Colombo and is primarily in close vicinity to the CBD area, with pricing in the range of LKR 25-45 million per unit. Specifications are superior with large unit sizes ranging 1,250-1,800 sq ft.

Luxury Segment: The luxury segment consists primarily of already establi-shed projects with resale values of more than LKR 45 million per unit. The Emp-eror at Galle Road and a few units from premium segment projects qualify for this categorization based primarily on their larger floor area (above 1,800 sq ft).

Ultra-Luxury Segment: Colombo doesn't have any projects with average unit value above LKR 60 million, although every project in the premium and luxury segments has a few units of the ultra-luxury segment with considerably higher specifications, furnishings and larger floor area. In most projects, these units are either penthouses or higher floor duplex units with private terraces etc.
In Colombo, residential real estate offers an ideal investment option. Over 70% of the 4,100 condominiums sold during 2007–2011 in Colombo were for the purpose of investment.

Figure 150: *Altair Building (Mixed Development) located at Gangaramaya, Colombo in Construction Image Courtesy: skyscrapercity.co*

Possibility of directing Real-Estate Demands to wider areas of Colombo Commercial City

The growing demand for real estates in Colombo in terms of office space, retail space, tourism space and residential space can be seen as a significant economic potential which can be enhanced to increase Colombo's GDP contribution to the national economy. However, the issue is that the growing real estate demands are limited to certain areas which have high land values. And in some cases, the areas with high demand are not having required infrastructure facilities to cater the demand as explained in the previous section. Thus, it is required to propose strategic actions to distribute the growing demands equally into a wider area of Colombo Commercial City based on carrying capacities of each areas.

3.6.1.5. Tourism as a Growing Economic Sector in Colombo

Tourism is also one of the main economic potential of Colombo. During the last decade, the tourism sector had indicated a rapid growth which has been reflected by recent establishments of international hotel brands, star restaurants, pubs, cafeterias, casinos, night clubs, spas and other entertainment and recreational centres.

As per the recent records, the tourism industry of Sri Lanka has reached a new limit of over 2 million (2,050,832) arrivals in 2016, which is an increase of 14.0 per cent over last year's 1,798,380 arrivals.

Resort Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Colombo City	2,209	3,209	3,188	2,190	3,141	3,086	3,054	3,170	3,633	3,966	4,319
Greater Colombo	2,520	2,555	2,651	2,494	2,640	2,573	2,856	2,913	2,883	3,041	3,184
South Coast	5,112	5,505	5,370	4,940	5,099	5,037	5,660	5,868	6,717	6,787	8,437
East Coast	184	184	230	230	23	238	296	628	842	895	1,121
High Country	726	734	772	928	847	940	743	838	889	1,035	1,178
Ancient Cities	2,467	2,417	2,582	2,679	2,749	2,779	2,901	3,217	3,595	3,601	3,990
North Region	0	0	0	0	0	0	0	21	51	51	107
All Regions	**14,218**	**14,604**	**14,793**	**14,641**	**14,714**	**14,653**	**15,510**	**15,655**	**18,510**	**19,376**	**22,336**

Table 20: *Accommodation Capacity (Rooms) in Tourist Hotels and their Regional Distribution within the Country 2006 to 2016 | Source: Annual Report – Sri Lanka Tourism Development Authority - 2016*

As per the above table, it can be observed that City of Colombo and Greater Colombo altogether stand second only to south coast in terms of Accommodation Capacity (Rooms) in Tourist Hotels. Also, a significant growth of accommodation capacity within City of Colombo can be observed from 2010 onwards. Occupancy Rate of tourist hotel rooms in City of Colombo and Greater Colombo are 76.75% and 75.18% respectively in 2016.

A clue on how Growth in Tourism Sector can be incorporated for Overall City Development

Growth in tourism sector is also one of the major economic potentials of Colombo, where it attracts a large number of international and local tourists to the city resulting a large flow of income to the city. In Colombo, tourists have variety of means to spend their money for activities such as shopping, dining, entertainment and pleasure activities etc. Thus, this trend and potential can be further enhanced to distribute its benefits to a wider area of Colombo. Currently, the coastal stretch, Colombo CBD and Beira Lake area acts as the main tourist focal points due to existence of star hotels and other tourist attractions. However, it is important to note that there are many other natural landscapes such as river, canal eco-systems and wetlands which can be transformed into attractive tourist points. This, natural potentials of Colombo will be further elaborated in a following section.

Figure 151: *Shangri-la Hotel – Colombo Fort*
Image Courtesy: shangri-la.hotelsincolombo.net

3.6.2. Environmental Potentials

The main environmental potential of Colombo is the availability of 160 km length of variety of water fronts including 7 km length of Kelani River, 7.7 km perimeter length and 0.78 km² area of Beira Lake, 53 Km length of canals and 31 km stretch of coast. Colombo Commercial City canal network consists of 16 number of canals.

3.6.2.1. Kelani River

Figure 152: *Kelani River*
Image Courtesy: picture.lk

Kelani River is one of the main rivers in Sri Lanka. Although it is not the largest in the country, the river is considered highly important for the water requirements of Colombo. Kelani River supplies approximately 80% of the water used in Colombo. The starting point of the Kelani River is the Sri Pada mountain range whereby its travels through the hill country and ultimately flows in to the ocean at Colombo.

3.6.2.2. Colombo Canal Network

I. Origin & early use

The system of canals of Colombo dates back to the time of King Vira Parakrama Bahu VIII of Kotte, the country's capital for some time in the 15th century. The canals led to Negombo on the Western Coast of Sri Lanka, then a busy seaport and there is evidence that countries such as China, Burma, Rome and Greece traded with the rulers of Lanka at that time. The purpose of the original waterways was to transport the export produce to seafaring ships leaving from the port of Negombo.

During the Colonial Period, Dutch seized "the opportunity to establish lines of waterways which provided both easy and cheap transport of goods from outlying areas to their ports. (Links between Sri Lanka and The Netherlands, R L Brohier) The canals which meander through the City of Colombo and its suburbs, connect the Kelani River to Puttalam in the North, through the Negombo and Chilaw lagoons, with a cut across to Kalpitiya. The connection to Kalutara and Beruwela in the South is through the Kotte Lake, Kirillapone, Dehiwela and Nedimale canals to Bolgoda Lake and then to the Kalu Ganga.

Grandpass, as the name denotes, was the centre for all canal traffic in Dutch and, later, British times where, there was a ferry on the Kelani River. It was often congested with the flat-bottomed "padda" boats used for the transport of goods such as copra, pepper, cinnamon and arrack from the distilleries. A branch flowed past Lake House to join the harbour while another section, now blocked up, joined the sea at Galle Face, beside the beautiful old parliament building now used as a Secretariat. One of the main canals was the San Sebastian Canal which began at Grandpass and flowed through the Bloemendhal marshes, past the bottom of Hulftsdorp Hill to flow into the Beira Lake. It is interesting to note here that Hulftsdorp Hill, named after the Dutch Governor Hulft, is now the centre of the judicial system housing the splendid colonnaded old buildings of the Dutch Courts as well as the magnificent new Superior Courts.

South of Colombo city, the Dehiwela and Wellawatte bridges are built across further extensions of the canal network in those two suburbs and the British had added a cut later for flood control. The Hamilton Canal was originally constructed by the Dutch and later improved and strengthened by the British, hence its Anglicized name. *(Main source:* http://lankalibrary.com/geo/dutch/dutch4.htm*)*

II. The present use of Canal Network of Colombo

(a) For flood management

At present, the main use of canal network is its role as a part of the drainage network of Colombo. The canal system plays a significant role in mitigating the flood risk of Colombo. The Colombo drainage network is a combination of rivers, canals, small tributaries and large and small open drainages.

(b) Habitat for special flora & fauna species

Another main role of canal network is that these canals and surrounding eco-systems act as habitat for special species of different flora and fauna. The canal banks are also home to 16 species of snakes, such as the python, cobra and water snakes, the latter too being near extinction. The Ibis, Purple Coot, Kingfisher,

Grebes and Cormorants have been seen feeding along the Kolonnawa Canal as well as in the Dutch Canal by the Muthurajawela Wetlands Centre. The Common Sandpiper is often seen along edges of canals. The Heen Marsh is popular with the Pond Heron and Red Wattled Lapwing.

(c) For shallow water fishing

Inland fishing also takes place in several canals in Colombo. Hamilton Canal is one of the main canals which is used for shallow water fishing and anchoring of boats. Fleets of fishing boats, painted in bright colour and bearing unusual names are berthed along this section of the canal in Hendala. Hamilton Canal which stretches from Colombo to Puttlam provides water for about 900 shrimp farms which are major foreign exchange earners as well as generating employment for about 40,000 persons. Shallow water fishing is carried out even now in Wellawatte, Dehiwala, Kolonnawa Canals and tributaries of Bolgoda Lake.

(d) For pleasure activities

During the past years, especially under the Metro Colombo Urban Development Project, undertook under the Ministry of Megapolis & Western Development several canals of Colombo were rehabilitated and opened up for recreational activities with the development of wide service roads, landscaped footpaths, linear parks, cycle paths and walking trails etc. This rehabilitation process has

Figure 153: *Weras Ganga Park - Bellanwila*
Image Courtesy: timeout.com

enabled water sports such as rowing, boating, sailing, water-skiing and paddle boating.

3.6.2.3. Beira Lake

I. Origin & early use

The Beira Lake was initially built by the Portuguese by digging the marshy land which was around the fort in all direction other than west and connecting it with the stream (today known as St. Sebestian Canal) that was flowing between the mount of Dematagoda and Mount of St. Sebastian. Then the purpose of the Beira Lake was to act as a moat providing protection to Colombo Fort from local kings. The lake was built in such as way that it is connected with the sea from both sides, separating the Colombo Fort from the mainland. During that time, all means of transportation between the mainland and the fort have been done using boats. Original area of the lake had been 1.61km^2 The primary outflows of the lake had been the kayman gates to the east and St. John's Canal to the west. During the Dutch period, they, expanded the lake was expanded by reducing the fort by 1/3 of the previous and created several islands such as Slave Island. The British, during their governance removed the crocodiles of the lake and developed the area surrounding the lake for recreational activities such as rowing and yachting. The area around the lake had been a popular destination

Figure 154: *Beira Lake in 1915 (The Norris Cana, the lake & Pettah by Slinn & Co. – 1915)*
Image Courtesy: exploresrilanka.lk

for functions and recreation purposes including the Grand Ball which was held to celebrate the news of British Victory in Waterloo.

II. The present role of Beira Lake

By the 19th century, land reclamation for development began and the area of the lake gradually reduced. At the same time, pollution of Beira Lake began as a result of treating it as a backyard and direct discharging of solid waste and sewer into the lake. Lined with many large warehouses, reminiscent of its past when tea used to be transported to the port of Colombo on barges via the port access canal, the lake now is very quiet with many of the warehouses been abandoned. However, in ecological terms, Beira Lake is still home to flora and fauna species such as storks, pelicans, monitor lizards and various species of fish. The present extent of Beira Lake is 0.78 km^2 where originally it was 1.61km^2 before 100 years back.

(a) Beira Lake as a popular recreational destination

Figure 155: *Swan Boat Rides at Beira Lake, Gangaramaya*
Image Courtesy: archives.dailynews.lk

As a result of the Beira Lake Restoration Project, the Beira Lake was cleaned and rehabilitated. The periphery of the Beira Lake bounded by Perahera Mawatha, Nawam Mawatha and Sir James Pieris Mawatha has been landscaped and paved making it a beautiful space to walk through, with the giant trees and the view of the sparkling lake. The small island located within the above boundaries of Beira Lake has been designed as a recreational resting area and is famous as 'lovers' island'. The place offers swan boat rides and is famous recreational destination especially during holidays and festive seasons.

The Beira Lake becomes a vibrant public open space during festive seasons such as Vesak Festival and Perahera of Gangarama Temple. The Seema Malikaya on the lake is also a popular destination of tourists and also a famous photo and film location.

(b) Beira Lake as a High-end Investments Attraction Centre

As a result of the rehabilitation of Beira Lake a significant change of surrounding land use was occurred resulting in rapid growth of surrounding land values and attar action of high-end investments. This can be understood as one of the major turning points of Colombo, from where it started the trend of high-end investments and exclusive urbanization encircling Beira Lake. Today, this trend

had continued to grow attracting more and more high-end investments such as Altair Project, CTC etc.

At present, another project named 'Beira Lake Intervention Area Development Plan' jointly conducted by UDA, SLLRDC, NHDA and line agencies with the technical support of Singaporean Experts. This project focuses on East Beira on which none of the interventions on rehabilitation have been made so far. With this project, it is expected to attract more high-end investments to the area encircling Beira Lake.

A clue on how Environmental Potentials can be used as Solutions for City Issues

When considering the example of Beira lake, where its modern transformation attracted a significant number of high-end investments resulting an enhanced image of exclusive character and an increase in land value in the overall area, it gives a clue on how other deteriorating and less exposed areas of Colombo Commercial City with similar environmental potentials can be transformed interlinking with city economic potentials. Accordingly, it gives a clue on how to reduce the disparity of land values of different areas of Colombo Commercial City by enhancing the values of hidden lands associated with riverscapes, canals and wetlands which are currently being treated as backyards of the city. By doing

Figure 156: *High-end Developments encircling the Beira Lake*
Image Courtesy: tripadvisor.lk

that, many issues explained above can be strategically solved by utilizing the city economic potentials to the fullest.

3.6.3. Ongoing and Proposed Mega Projects of Colombo Commercial City

When utilizing above mentioned city potentials to manage existing issues of Colombo Commercial City, it is also important to integrate ongoing and proposed projects of numerous sectors conducted by various stakeholders to maximize their benefits to the city.

3.6.3.1. Transport Projects

Figure 157: *Port Access Elevated Highway Project – (2018 – 2030)*
Image Courtesy: Road Development Authority

I. Roads

(a) Port Access Elevated Highway Project (PAEH) – (2018 – 2030)

The trace of Port Access Elevated Highway (PAEH) starts from Ingurukade Junction and ends at Port City which lies through the Colombo Port. The project is implemented by Road Development Authroity.

II. Railway

(a) Railway Electrification from Polgahawela to Kalutara

Railway Department of Sri Lanka has proposed a project to electrify the railway line from Polgahawela to Kalutara.

Figure 158: *Image of a similar electrified railway in Greater Britain*
Image Courtesy: homesecurity.press

III.Light Rail Transit (LRT)

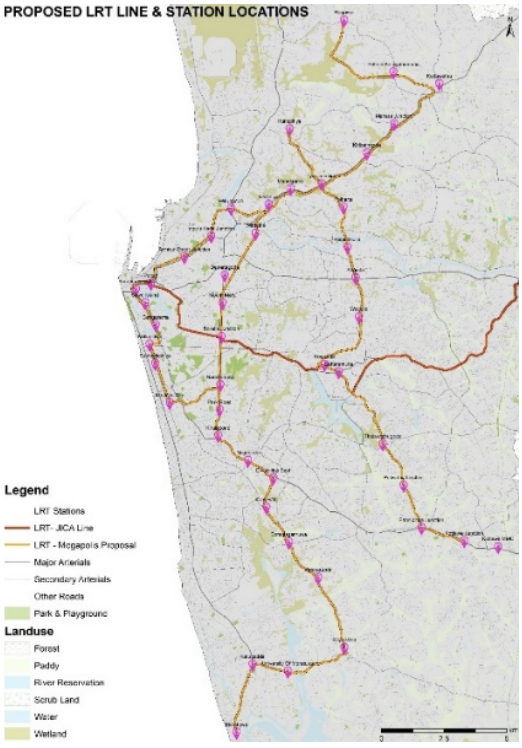

Figure 159: *Proposed LRT Lines and Stations*
Source: Ministry of Megapolis & Western Development

Light Rail Transit System is a project implemented by Ministry of Megapolis & Western Development of Sri Lanka. The proposed LRT system of Colombo is consisted of two major lines such as JICA line and Megapolis Lines based on funding source and construction works of JICA line has already been commenced.

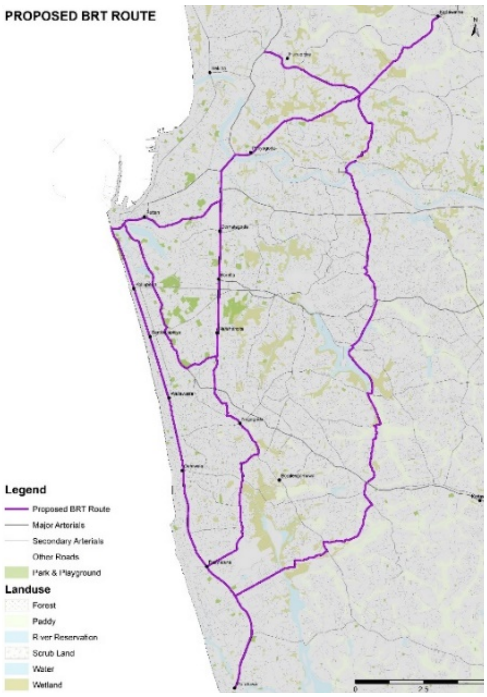

Figure 160: *Proposed BRT Routes*
Source: Ministry of Megapolis & Western Development

IV.Bus Rapid Transit (BRT)

Bus Rapid Transit System has also been proposed by Ministry of Megapolis & Western Development for Colombo Commercial City.

3.6.3.2. Mega Mixed-Development Projects

I. Colombo International Financial City Project (Port City)

Colombo International Financial City is a collaboration project of Ministry of Megapolis & Western Development, Urban Development Authority, Sri Lanka Ports Authority and CHEC Port City Colombo. The vision of the project is to 'Build a World Class City for South Asia'. The city is proposed to be built on reclaimed land of 221 hectares adjacent to Galle Face Green – Colombo. It is

Figure 161: *Proposed Colombo International Financial City Project (Port City)*
Image Courtesy: portcitycolombo.lk

proposed to have 173 hectares of marketable land and to accommodate around 75,000 population.

Figure 162: *Beira Lake Intervention Area Development Plan*
Source: Urban Development Authority - 2018

II.Beira Lake Development Project

At present, 'Beira Lake Intervention Area Development Plan' jointly conducted by UDA, SLLRDC, NHDA and line agencies with the technical support of Singaporean Experts. The objective of the project is to clean the East Beira Lake and transform its surrounding area through strategic interventions.

III. Maritime City Development Project

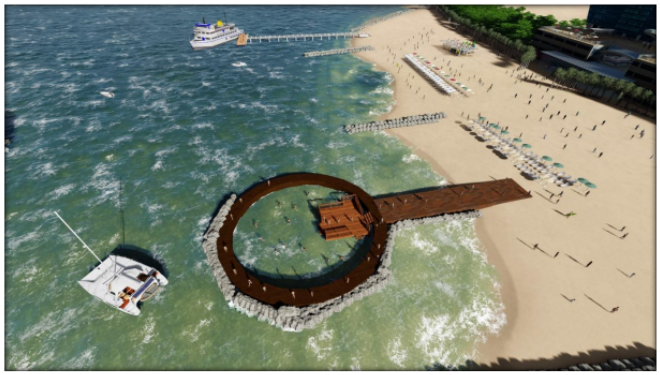

Figure 163: *Proposed Beach Nourishment by Maritime City Development Project*
Source: Ministry of Megapolis & Western Development

Maritime City Development Project is coordinated by the Ministry of Megapolis & Western Development and it aims at developing a recreational beach area (approximately 6.2km long beach strip of 85 ha) from Colpity to Wellawatta.

3.6.3.3. Port & Logistics related Projects

I. Colombo Port Expansion Project

Sri Lanka Ports Authority implements 'Colombo Port Expansion Project (CPEP)', in order to cater to the increasing demand of services in the international shipping industry. The Colombo Port Expansion Project is situated west to the existing port of colombo comprising an area of approximately 600 hectares. The new harbour has 3 terminals each having 1,200m length and facilities to accommodate 3 berths alongside. The small boat harbour at the end of secondary breakwater has 400m length of quay wall. The Port of Colombo which had a capacity about 4.5 million TEUs and to be increased the total capacity by another 7.2 million TEUs in two separate phases under this development.

Figure 164: *Proposed Colombo Port Expansion Project*
Source: Sri Lanka Ports Authority

II. Development of Bloemandhal Area for Port Related Logistics

Development of Bloemandhal Area for Port Related Logistics is jointly conducted by Sri Lanka Port Authority (SLPA), Sri Lanka Customs (SL Customs) and Ministry of Megapolis & Western Development with the intention of increasing capacity to handle port-bounded logistics related activities, extensively.

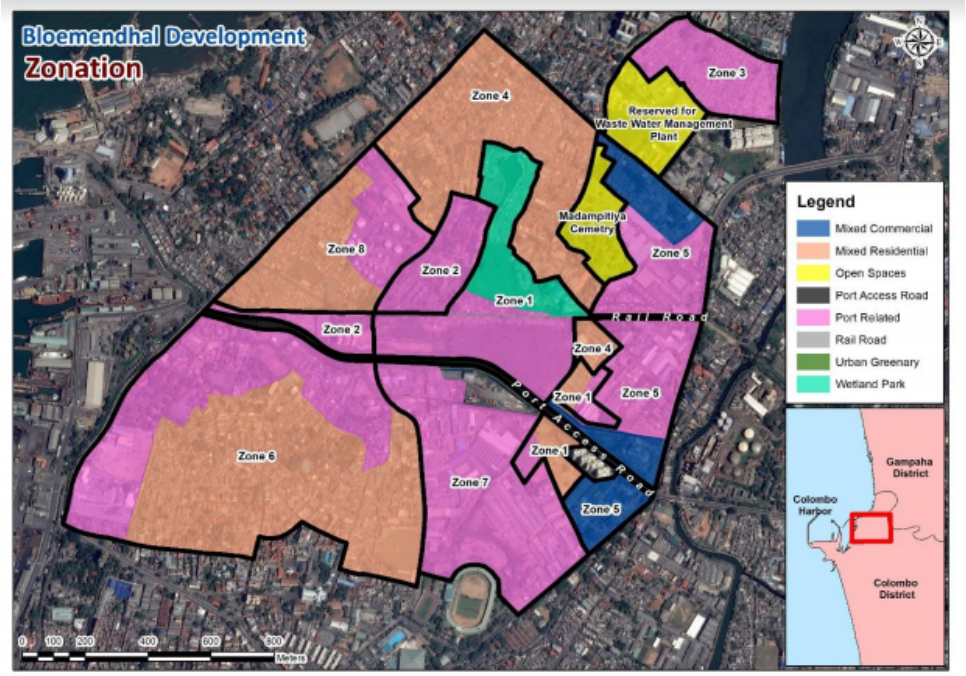

Figure 165: *Proposed Port Related Logistics Development at Bloemandhal Area*
Source: Ministry of Megapolis & Western Development

3.7. Conclusion

As explained in the above sections, the existing issues of Colombo Commercial City were analyzed comprehensively in terms of context, magnitude and significance. Then, the existing city potentials were studied in detail to identify the possibility of harnessing them strategically to be the solutions for existing issues of Colombo Commercial City. When studying the linkages which can be built in between city potentials and issues, it can be observed that most of the issues can be solved directly or indirectly by harnessing the environmental potentials of the city. The most important environmental potential of the city is the existence of approximately 100 km of waterfronts of variety of experiences.

If these waterfronts which are currently being treated as backyards of the city are exposed and transformed into front yards, it will enable an overall transformation of the city, exposing deteriorated areas to cater the market demands and opportunities created by economic potentials and ongoing & proposed projects.

Thus, the need of Colombo Commercial City Development Plan is to realize the above with strategic interventions to manage the existing issues of Colombo and promote its role as an International Business Hub of South Asia.

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