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## **Intergovernmental Ninth Regional Environmentally Sustainable Transport (EST) Forum in Asia**

**EST for Resiliency – Building Safe, Smart, Low-carbon and Resilient Cities in Asia**

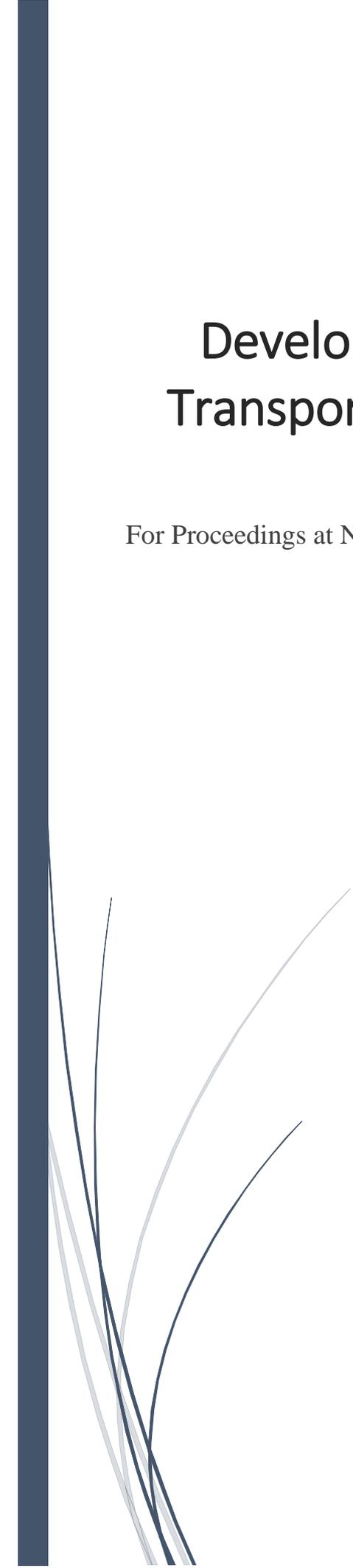
### **City Report**

**(Draft)**

**<Colombo, Sri Lanka>**

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# Development of a Disaster Resilient Transport Infrastructure for the City of Colombo

For Proceedings at Ninth Intergovernmental Regional Environmentally Sustainable  
Transport (EST) Forum in Asia

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## 1. Introduction

The ever intensifying threats of the changing climate has turned out to be a noteworthy vulnerability that has confronted today's global transportation system. These changes come in the form of rising ambient temperatures to rising sea levels, to powerful storms to dangerous droughts. (Office of Strategic Initiatives for Research and Innovation, 2014)

Super storm 'Sandy' struck the densely populated Eastern seaboard of the U.S in October 2012 unfolding a devastation beyond imagination, uprooting the entire infrastructure system including roads, bridges, mass transit, water and electricity networks, bringing the whole city to a standstill (Ceres, 2013). It has taken several such tragedies for the discussion on building cities resilient to climatic change to come to the limelight.

In order to derive solutions for resilience building, the extremely complex ecosystems of the cities needs to be clearly understood. This requires reinforcing the understanding of the history, geography, economic and cultural background of the city.

Colombo, the commercial capital of Sri Lanka, a country who's seen its development as a nation marching backwards throughout the 30 years of the civil war that ended in 2009, is emerging to becoming a noteworthy member of the global village. The recent post-war era in Sri Lanka has seen a lot of developments with regards to enhancing the infrastructure systems to meet the demands of the future.

This report aims to evaluate the current transport infrastructure system in Colombo, in order to understand its capabilities of meeting the present and future transport demands, hence, identify the underlying problems to come up with a set of mitigations to rehabilitate the existing system to become resilient in the face of climate change. Furthermore, the integration of such mitigations in the context of mega polis development projects are gauged, and the current progress is benchmarked with the internationally accepted conventions.

## 2. History of Colombo

Colombo is a naturally formed harbor utilized by regional traders for local imports and exports some 2000 years ago. Its strategic location as a potential seaport in international trade was realized by Portuguese expeditors who fortuitously landed in Colombo in 1505, who later developed the port to support their military and trade activities in the Indian Ocean. Since then,



Colombo has been at the center of the silk route, bringing a substantial amount of foreign currency in to country's economy. The British who took authority over country's administrative powers in 1815 selected Colombo as the capital city of colonial Ceylon.

The foundation for the current transport infrastructure system in Colombo was laid by the British rulers who introduced tram and bus services to Colombo's metropolitan areas and a railway network to branch out from central Colombo covering the major cities of economic importance in the island.

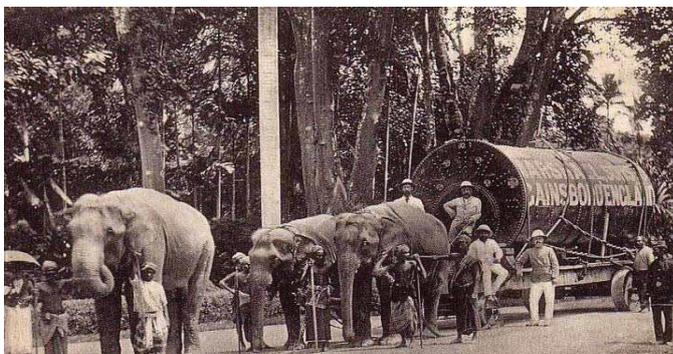


*Figure 1: Bus Service in Colombo during British Rule*

Prior to the public transport reinforcement by British, bullock and elephant carts were the favorite mode of transport among the locals, especially for transport of goods. Horse carriages and manned rickshaws were also used in metropolitan areas of the country as a personal mode of transportation.



*Figure 2: Tram Service in Colombo during British Rule*



*Figure 3: Transportation Modes in Ceylon Prior to the Introduction of Public Transport System by British*

Colombo continued to be the capital city of Ceylon upon granting of independence in 1948. The constitutional introduction of Free Trade Policy (FTP) to the country's economy in 1978 saw a colossal rise in commercial establishments within Colombo, increasing the congestion within Colombo metropolitan area. In an attempt to reduce this congestion, the administrative functions of the capital city were moved to Sri Jayawardenapura in 1982. Furthermore, Free



Trade Zones (FTZ's) were introduced in Colombo suburbs in an effort to move some of the commercial activities out of Colombo.

However, still a majority the commercial activities are centralized at the heart of Colombo giving rise to an ever increasing population density and an overwhelming traffic congestion in and out of the city.

The city of Colombo had undertaken several city development plans in the last century. First started by the British towards the latter part of their colonial rule in Ceylon, initiated the Patrick Geddes Plan and Patrick Abercrombie Plan in 1921 and 1948 respectively. Introduction of Free Trade Policy saw the instigation of Colombo Master Plan Project in 1978 to be followed by City of Colombo Development Plan in 1985. The newly elected socialist government in 1994 continued the good work in relation to developing Colombo with their CMRSP-CMR Structure Plan in 1996. Following the establishment of Urban Development Authority (UDA), the City of Colombo Development Plan of 1999 was introduced, which was amended later in 2008.

### 3. Colombo Today

The self-proclaimed commercial hub of present Sri Lanka has turned out to become a bustling city and a hopping off pivot to the picturesque beaches in the island's south. The country's heritage is reflected in every corner of the city, proudly looking back at her eventful history as a strategic point on the East-West trade route and the center for colonial administration of Portuguese, Dutch and British. *'The legacies of colonial Colombo's garden roots are still very much intact along its often shady boulevards. Fort is in the midst of widespread historic restoration of its landmark colonial architecture, while*



Figure 4: Birds Eye View of Colombo City at Night



Figure 5: Independence Arcade Shopping Arena



*Pettah brims with markets and rampant commerce.*' (Lonely Planet, 2015)

The post-war era of Colombo has seen its evolution from a mere commercial hub to a vibrant city with rich colonial architecture, public recreational facilities, relaxing beaches, fine dining, high end shopping malls also providing a colourful nightlife to tourists as well as locals.



Figure 6: Floating Market in Colombo

### 3.1 Governance of Colombo

The land and water combined total area of Colombo comprised 37 km<sup>2</sup>. The irrigation system of city including the famous Beira Lake, covers an area of approximately 160 acres. The North-Eastern boarder of the city is defined by the third longest river in the country Kelani River meeting the sea in Modara.



Figure 7: Beira Lake, the Heart of Colombo's Irrigation Network

The multi-cultural, multi-ethnic Colombo's largest communities are Sinhalese, Sri Lankan Moors and Tamils. The residential population of the city as per government's census records in 2012 is 555,031 and 647,100 in 2001 (Department of Census and Statistics, 2012), with an approximate average floating population of 500,000.

The body of authority in charge of the administration of the charter city is Colombo Municipal Council (CMC) based at their headquarters in Town hall, yet another architectural attraction of the city. The head of political body for the city is the Mayor while the head of administrative body is the Municipal Commissioner. The Colombo Municipal Council which was established in 1865 during the British rule is celebrating her 150<sup>th</sup> anniversary in 2015.



Figure 8: Town Hall Building



The geographical land is divided into 6 districts for systematic administration. CMC comprises of 15 departments, responsible for the provision of services such as Public Health and Curative, Solid Waste Management, Maintenance of Road Network & Street infrastructure, Traffic Management, Lands & Environmental Management, Development Control, Sewerage & Drainage Services, Veterinary Services, Library Services, Sports & Recreation, Finance, Secretarial and Human Resource Training. All the activities within these departments are subjected to the provisions given in the Municipal Council Ordinance.

#### 4. Current Transportation System in Colombo

The centralised economical activities and the recent development of the city as a tourist attraction has seen a mammoth increase in congestion. Traffic engineered surveys conducted by CMC speckled at 3 peak periods of intensive traffic in and out of the city every day.

1. Morning Traffic (6.30am – 9.00am): Flow of vehicles into the central city from Colombo suburbs.
2. Afternoon Traffic (1.00pm – 3.00pm): Internal circulation and out flow of vehicles transporting students from schools to their residences.
3. Evening Traffic (5.00pm – 8.00pm): Flow of vehicles out of central Colombo to its suburbs.

Upon inquiry it was understood that the root cause for this awful traffic congestion is the location of most of the popular schools, private and governmental organisations within the city limits. It was counted that the daily vehicular inflow to Colombo city is approximately 300,000. A study was conducted by Japan International Corporation Agency (JICA) at the request of the Ministry of Transport, Sri Lanka to propose an Urban Transport Master Plan. This study has revealed a number of alarming problems within the current transport system in Colombo, particularly in the sub-transport sector, in contrast to the most sought out problem, traffic congestion.

##### 4.1 Problems Identified in the Current Transport System (JICA, 2014)

###### 1. Problems of the Railway Network

- Insufficient linkage of the network
- Lack of feeder services
- Insufficient integration among public transport



- Lack of railway access to the international airports
- Slow operational speed of rolling stock
- Deteriorated rolling stock, track and signalling systems
- Insufficient line capacity
- Insufficient revenue of Sri Lanka Railways Authority
- Insufficient expenditure for maintenance
- Low level service of 'Kelani' Valley Line

## **2. Problems in Bus Transport and Other Road Based Public Transport**

- Low bus operation speed due to traffic congestion on roads
- 'Pettah' centred bus network
- Lack of integration with railways other bus terminals
- Low service level of bus operations
- Difficulty in improvement of government owned bus services
- Inconvenient bus operation for passengers due to the bus rental system of private bus operators
- Difficult coordination between public and private bus operators
- Insufficient support for bus fare discount for the transport poor
- Insufficient management on bus operations
- Market driven regulatory scheme of road based public transport modes

## **3. Problems on Road Network**

- Insufficient road network
- Lack of pedestrian space
- Lack of a robust road network master plan for the Colombo metropolitan region
- Lack of engineering design standards for urban roads
- Low accessibility of the existing expressway network
- Necessity to enhance access to Colombo port and cargo transport
- Lack of linkage of expressway network



#### **4. Problems on Traffic Control and Traffic Management**

- Traffic congestion at intersections
- Reduction of traffic capacity due to on street parking
- Increasing traffic accidents involving pedestrians and motorcycles

#### **4.2 Rehabilitation and Improvement Program for a Better Transport System**

The study conducted by JICA outlined a series of policy measures for urban transport development programs to be implemented in order to minimise the current concerns in the transport system in Colombo.

##### **1. Program for Promotion of Public Transport**

- Introduction of a monorail system
- Modernization of the existing railway system
- Construction of an airport connection line
- Development of access roads to railway stations and the proposed transit systems
- Introduction of bus rapid transit (BRT)
- Road development to introduce BRT
- Regulatory scheme for road-based public transport modes

##### **2. Program for Alleviation of Traffic Congestion**

- Ring road development
- Expressway network development
- Flyover development
- Port access road
- Traffic control measures such as traffic signal control development, traffic information system and parking information system
- Transport demand management (TDM)

##### **3. Program for Reduction of Air Pollution, Noise Control and Promotion of Health**

- Establishment of environmental management system
- Establishment and enhancement of air pollutant emission standards for newly manufactured and imported vehicles
- Enhancement of vehicle inspection and maintenance programs



- Low Sulphur diesel programs
- Promotion of natural gas vehicles
- Promotion of hybrid cars and electric vehicles
- Promotion of walking and bicycle use for energy saving and to promote health
- Provision of side walks

#### 4. Program for the reduction of fatalities and injuries in traffic accidents and improvement of safety

- Education on traffic safety
- Rehabilitation and installation of traffic signal system
- Rehabilitation of railway signal system
- Analysis on causes of traffic accidents
- Provision of sidewalks and pedestrian crossings
- Establishment of urban road design standard for sidewalks

Furthermore, the study by JICA identified 7 corridors for vehicular inflow into the city, and recommended an initiative plan for improvement outlined in Table 1 below.

*Table 1: JICA Recommended Development Options for Selected Corridors of Vehicular Inflow into Colombo City*

<b>Corridor</b>	<b>Selected Development Options</b>		
	<i>Railway</i>	<i>New Transit System</i>	<i>BRT/Bus/Road</i>
<b>Negambo</b>	Modernized	-	Bus Priority
<b>Kandy</b>	Modernized	-	BRT
<b>Low Level Road</b>	-		Bus Priority
<b>Malambe</b>	-	Monorail	-
<b>High Level Road</b>	-	Monorail	-
<b>Horana</b>	-	-	Bus Priority
<b>Galle Road</b>	Modernized	-	BRT supported by Marine Drive Extension



## 5. Progress of Urban Transport Development Plan for Colombo

As per the discoveries of JICA, the relevant authorities has taken many initiatives to rehabilitate the transport network in order to meet the demands of the present and the future. Some of the corrective actions taken are already contributing toward the smooth running of today's system. The 2020 Bangkok declaration for promoting sustainable transport goals for the decade of 2010-2020 has been closely associated when designing the said corrective actions.

Furthermore, all the urban development activities are being well controlled by the 'Zonal Plan 2020' prepared by the Urban Development Zone Authority (UDA) to avoid mis-management and ineffective resource allocations. The convenience of the citizens is given the uppermost priority during the development planning to ensure the smooth flow of industrial, commerce and administrative activities centred in Colombo. The Zonal map (figure 9) produced as an interactive tool of the 'Zonal Plan 2020' details the flow of development projects in particular zones. Moreover, all the development planning activities has conceptually incorporated strategies to avoid unnecessary travel within the city and reduce trip distances.

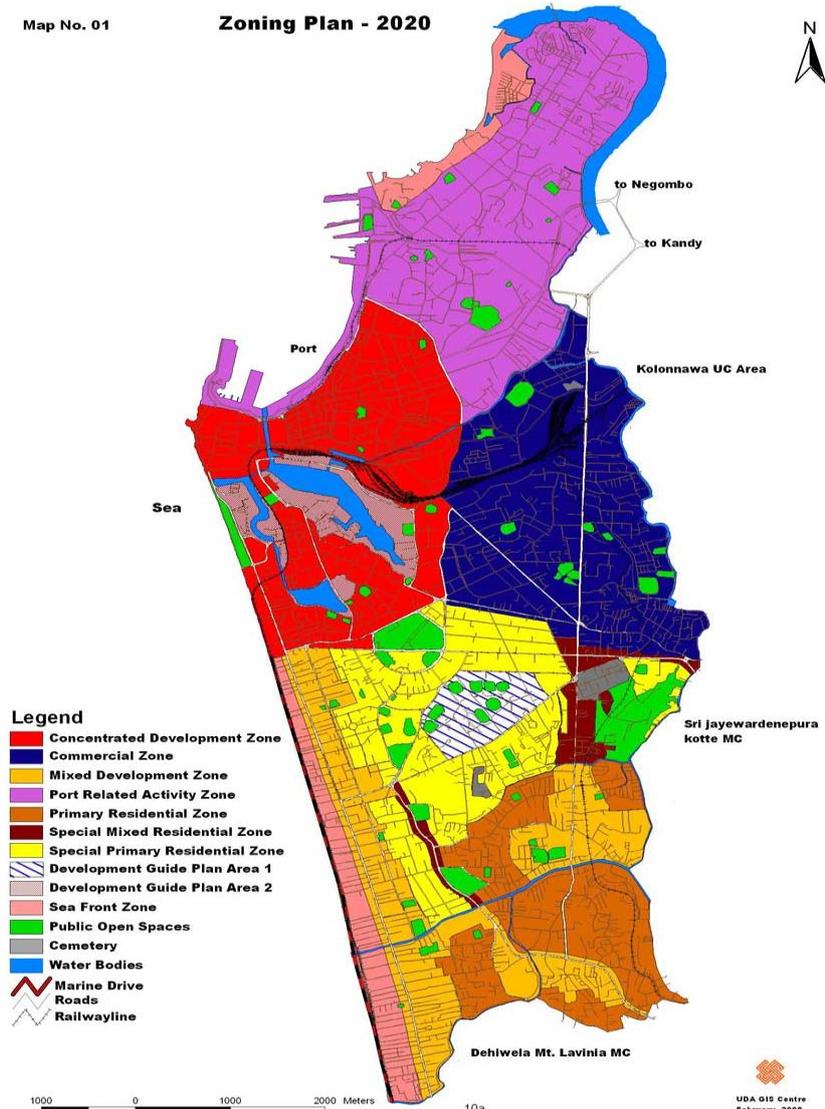


Figure 9: Colombo Zonal Development Map 2020 (UDA, 2015)



## 5.1 Strategies to Shift Towards Sustainable Development Modes

### Promoting Non-Motorised Transport

Pedestrian facilities are being improved in 50 km of road network with connectivity to significant commercial locations and recreation facilities. These roads are rehabilitated by improving the walkability with better quality sidewalks for pedestrians including disable facilities, bicycle tracks for cyclists, spacious parking bays, ground landscaping with trees planted to shade the pedestrians during day time, street lighting for dark hours, as well as installing additional pedestrian crossing, both signalized and zebra crossings.



*Figure 10: Walkability Improvement Work with Cycle Lanes*

While the improvements of road infrastructure facilities are made to reduce the traffic congestion, a new potential cause of traffic is raising its head – the increasing number of personal vehicles imported to the island. Recent research shows that this number is correlated to the non-transport related developments happening within the city. It is clear that this is a result of the public transport system within the country is not convenient enough to provide the service expected by the users, hence the users tend to move in to the more comfortable option, using a personal vehicle.

Electrifying the railway network is expected to reduce the traffic congestion. It is suggested to reduce the current energy cost in railways by approximately 70% while providing a higher acceleration and deceleration, hence a higher average speed could be achieved. The overall fuel efficiency will be higher while generating lower noises, no oil spills and no emissions at railway stations. Moreover, the enhanced comfort due to less noise and vibration will make it a pleasant journey for the passengers. This program is at the feasibility stage.

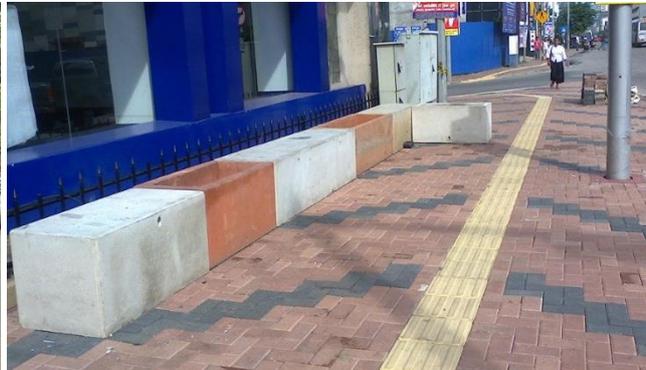


## Managing Motorised Transport

One way schemes have already been introduced to roads in many areas of the city where road widening is not possible. Pedestrian overhead bridges installed are sure to increase the safety and wellbeing of pedestrians while making a smooth flow of traffic in roads.



*Figure 11: Overhead Pedestrian Bridge*



*Figure 12: Furniture on Side Walks*

Redesigning road intersection at junctions have been carefully done giving a great deal of attention to detail. This effort has been complimented by the promising results shown in traffic surveys at redesigned intersections.



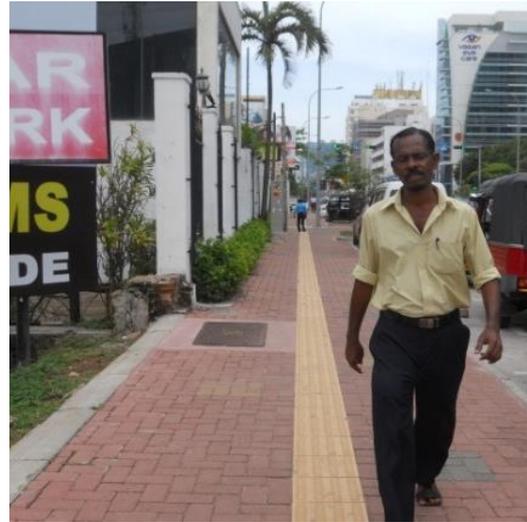
*Figure 13: Smooth Vehicular Flow at Redesigned Intersections*

Increasing awareness of road users and enforcement of legal boundaries are in practice now as a measure to reduce traffic congestion. Furthermore, Transport Demand Management (TDM) is initiated by introducing parking bays in the city. A pilot project to installation and experiment parking meter is in progress. It is proposed to introduce 1300 parking bays with meters to be expanded to 5000 in near future.



### Cross Cutting Strategies

In order to adopt a zero-fatality policy with respect to transport safety, law enforcement is strictly done for the motor drivers who consumes liquor prior to taking in charge of the wheel. Road safety awareness programs are now conducted for school children and additional safety sign boards are being erected at selected locations. Special provisions are provided for disabled road users such as tack tile paths for blind and facilities to move wheel chairs. Black spot surveys are done and speed limits are introduced as remedial measures.



*Figure 14: Disabled Walking Facilities in Side Walks*

Several proactive actions have been taken to improve the air quality of the city that is promising in reducing the health and safety impacts due to motor emissions. Sustainably designed motor vehicles and equipment are being promoted for use. One such example is the tax reduction for import of hybrid vehicles, enforcing laws for routine vehicle inspection and emission testing. The police officers who are exposed to potentially polluted air are given safety gears to avoid the exposure.

The newly established national unity government in August 2015, has introduced a new cabinet ministerial portfolio for ‘Mega Polis and City Development’ with a vision to bring forth a mega development centred on the commercial hub Colombo, that could interact hand-in-hand with the leading mega cities in the world. The Ministry of Mega Polis and City Development has already formulated several mega scale infrastructure development projects that is sure to supplement a sustainable transport system.



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