Framework for Developing a Policy on Electric Mobility, Sri Lanka

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போக்குவரத்து மற்றும் சிவில் விமான சேவைகள் அமைச்சு

Ministry of Transport & Civil Aviation

Schweizerische Eidgenossenschaft
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ASIA LEDS PARTNERSHIP

LEDS GLOBAL PARTNERSHIP

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Executive Summary

The Government of Sri Lanka, in the past has been exploring opportunities for shifting from fossil fuel based transport towards energy based transport system. Various initiatives such as policies and strategies have been formulated along with studies/ researches to determine the feasibility to initiate electric mobility in Sri Lanka. The Ministry of Transport & Civil Aviation, Government of Sri Lanka in line with these developments has seeked assistance from Asia LEDS partnership in developing the framework for Electric Mobility Policy.

The framework for Electric Mobility Policy has been prepared based on the availability of secondary information, one to one discussions/ meetings with the government officials, responses from the consultation meetings held on 27th August and 11th October 2019. It is envisaged that this framework acts as a guiding document for the Ministry of Transport and Civil Aviation to promote electric mobility in Sri Lanka.

Sri Lanka- Transport Sector

Population of Sri Lanka is about 21.2 million and it is growing at a rate of 0.96%. Transport sector in the country plays a crucial role in the economic and social development of the country. It is seen that in the year 2017, transport sector contributed significantly to the GDP along with generating employment. Importation of fossil fuel in Sri Lanka is the major fuel source to fulfill transport requirements and the GHG emissions in Sri Lanka have increased by 43% from 1990 to 2011. Among the SAARC countries, share of Sri Lanka's transport sector is 16%, however being a non-industrial country with high density of vehicles in major cities; transport sector is the major contributor of GHG emissions. Transport sector in Sri Lanka contributes to 69% of consumption of oil and petroleum products further leading to 16% share of transport sector in GHG emissions.

Sri Lanka plans to invest USD 6 billion (estimated) in development of expressways, USD 31 million in upgradation of the railway network, port improvement and converting ICE based 3 wheelers to electric vehicles. The light rail system for Colombo with an estimated cost of USD 6 billion was approved by the Government of Sri Lanka in October 2018 and the project is scheduled to start in 2020 with operations to commence in 2024.

The Government of Sri Lanka in the past has announced its plans to replace all state-owned vehicles (including buses) with electric or hybrid models by 2025, and private vehicles by 2040. Electric vehicle introduction has a significant potential of reducing emissions from transport sector. The scale of impact may differ, depending on the source of electricity used for charging these vehicles.

Framework for Electric Mobility Policy

Initiatives taken by Government of Sri Lanka till date include electric vehicle deployment, development of charging infrastructure, subsidy plan for Electric Vehicles and plans/targets for procurement but a comprehensive long term vision for Electric Vehicle Policy is still required. A comprehensive document with legal backing will help to bring all aspects related to Electric Mobility together. The policy at national level will show way forward to all the initiatives across the country and it will help to integrate the standalone efforts. In the current document, a framework has been prepared to guide the Government of Sri Lanka with a set of procedures and organise standalone efforts under one common Agenda.

The framework for Electric Mobility policy highlights the important aspects such as manufacturing & import, charging infrastructure, technology, policy & regulations, institutional capacity, incentives & subsidies etc. and outlines key considerations.The framework also discusses the possible sources of funding which may be explored by the government of Sri Lanka, anticipated risks and their solutions along with key takeaways.

Tentative Roadmap

It is very important for all the stakeholders to understand and conduct steps such as awareness generation, capacity building, promotion of electric vehicles, pilot projects, documentation of successes and learnings and scaling up linked to policy and regulatory framework.

- **Awareness Generation:** It is important for all the stakeholders to understand how increasing efficiency and organization of existing systems can lead to co-benefits of emissions reduction, air-quality and health, understanding the cost of congestion in terms of fuel consumption, air quality and emissions etc. Awareness of electrification public transit and possible other large fleets such as freight should be considered while developing the policy.
- **Capacity building:** It is significant to understand the importance of modal shift to public transit as an enabler for implementing electrification of transport fleets. This should be done through consultations, discussions and workshops for stakeholders for capacity building and suggestions.
- **Promotion of Electric Vehicles:** Methods to incentivise modal shift to public transit for people of all walks of life should be adopted. The government should start tax incentives and other incentives to promote Electric Vehicles as well, simultaneously.
- **Pilot Projects:** Initiation of pilot projects should be started with the theme of encouraging more public transit, on-time, safe and reliable public transportation. Enhancing intermediate public transit through electric 3 wheelers will enable strengthening last mile options. Gradual scaling up of the project will help in receiving concurrence from stakeholders of other areas in the city. The initial electrification fleets should be public transit related. The understandings and learning of the pilot can then be applied to freight, taxi and other large fleets.
- **Analysis and documentation:** Development and documentation of learning- successes and failures.
- **Policy and regulatory framework:** Policy and regulatory framework should be developed in order to have a legal backing for promoting electric mobility.

Project Background

At present, road transport in Sri Lanka is the major source of travel for passengers as well as goods in Sri Lanka. The Government of Sri Lanka, besides expanding the road network, is also keen on exploring opportunities for shifting from fossil fuel based transport towards energy based transport system. In its Nationally Determined Contributions (NDCs) and Nationally Appropriate Mitigation Actions (NAMAs) the National Government has identified transport as a priority sector and plans to develop and strengthen its legal framework on sustainable transport, efficient fuel & technology and electrified transport etc. Efforts are underway in the form of initiatives such as studies/ researches are being carried out to determine the feasibility to initiate electric mobility. The Ministry of Transport & Civil Aviation, Government of Sri Lanka in line with these developments has felt the need to develop a policy framework towards the same and invited Asia LEDS partnership to initiate discussions. (Asia LEDS Partnership is a voluntary network of individuals, national governments, experts providing technical assistance for various sectors.) For this engagement, ALP assisted the Ministry of Transport and Civil Aviation in developing a framework for national electric policy for Sri Lanka and provided sub national support by conducting two consultation workshops on electric mobility.

Based on the availability of secondary information, one to one discussions/ meetings with the government officials, responses from the consultation meetings held on 27th August and 11th October, Asia LEDS partnership has recommended a framework for electric mobility policy in the country. The framework is a guidance document with a set of aspects to be considered while drafting the policy and would help the country to position itself towards clean mobility in its future programs. This framework document is developed to guide the green mobility programme for Sri Lanka through assistance of ALP and SDC with the Ministry of Transport and Civil Aviation of Sri Lanka.

Background

Mobility of goods and people is an integral part of any country's economic development and human welfare. With increasing development, motorised transport is rapidly growing across the globe, more so in developing countries. It is estimated that by 2030, annual passenger traffic will exceed 80 trillion passenger-kilometers which is 50% rise from 2015, while global freight volumes will increase by 70% from 2015.[1] As a country, Sri Lanka recognises the need of mobility with development and as green and sustainable future is the need of hour, focus on green mobility is obvious.

Global Transport Scenario

Transport sector is driving economic growth through facilitation of trade and employment opportunities but the sector's contribution in GHG emission is also increasing drastically. It consumes 62.3% of global petroleum resulting into major contribution to carbon emissions.[2] Transport sector's contribution to CO_2 emissions of non OECD member countries increased considerably from 27% (2000) to 41% (2016), while the OECD member countries' contribution reduced from 58% to 43% in 2016. This is driven by the growth in passenger and freight transport activity in these countries though having a lower baseline in comparison to Europe and North America where transport per capita is higher than other regions.[3]

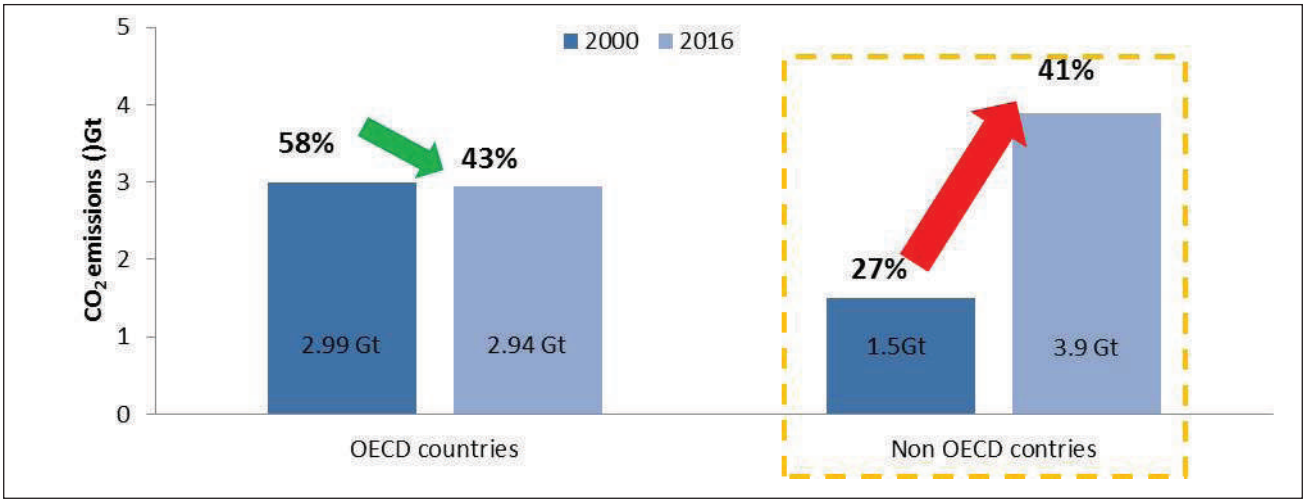


Figure 1: CO_2 emissions in 2000 and 2016 Growth of carbon emissions from transport sector has been highest in Asia (92%).[4]

Regional trends of global emissions are rising in Asia, Northern Africa and Latin America and the Caribbean due to considerable increase in urban population and simultaneous passenger travel activity leading to increased motorization. Trends of transport demand indicators and transport activity emissions are as follows[5]:

1. Sustainable Mobility for All 2017
2. YES Bank July 2018
3. SLoCaT 2018
4. (GEF& UNEP 2019) (SLoCaT 2018)
5. SLoCaT 2018

	Percentage increase		
	World	OECD[6]	Non-OECD
Travel Demand			
Population size (%age increase from 2000 to 2017)	23	12	26
Urban population (%age increase from 2000 to 2017)	44	19	55
GDP (Constant 2010 USD) (from 2000 to 2016)	52	29	130
Transport Activity			
Passenger Travel Activity(%age increase from2000 to 2015)	74	1	169
Freight travel activity(%age increase from2000 to 2015)	68	96	279
Motorization Rate (%age increase from2005 to 2015)	27	8	99
Transport Emissions			
Transport CO_2 Emissions excluding International aviation and shipping (%age increase from2000 to 2016)	31	-2	97
Transport CO_2 Emissions per capita (%age increase from2000 to 2016)	8	-11	59

Passenger travel activity (in the table above) rise also indicate increased employment, income generation and GDP leading to improved economy. At the same time, reliance of transport activities on fuel powered motorised transport result in rising global emissions. Illustration below depicts the percentage increase in global emissions from sectors (2005 to 2017)[7].

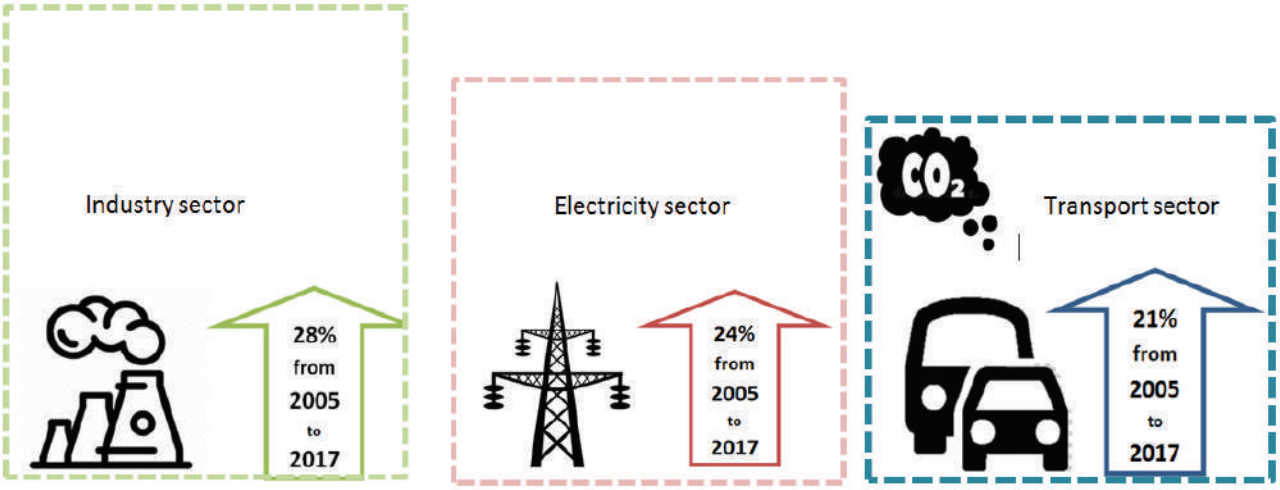


Figure 2: Increase in global emissions from different sectors (2005-2017)

Globally, transport is the third largest source of carbon emissions. Transport sector contributed to 23% of global energy related CO_2 emissions and 14% of GHG emissions (2015).

6. The 35 OECD member countries include: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea,Latvia, Luxembourg, Mexico, Netherlands,New Zealand, Norway, Poland, Portugal, Slovak Republic,Slovenia, Spain, Sweden, Switzerland,Turkey, United Kingdom, and United States.
7. Muntean M, Guizzardi D, Schaaf E, Crippa M, Solazzo E, Olivier JGJ, Vignati E 2018

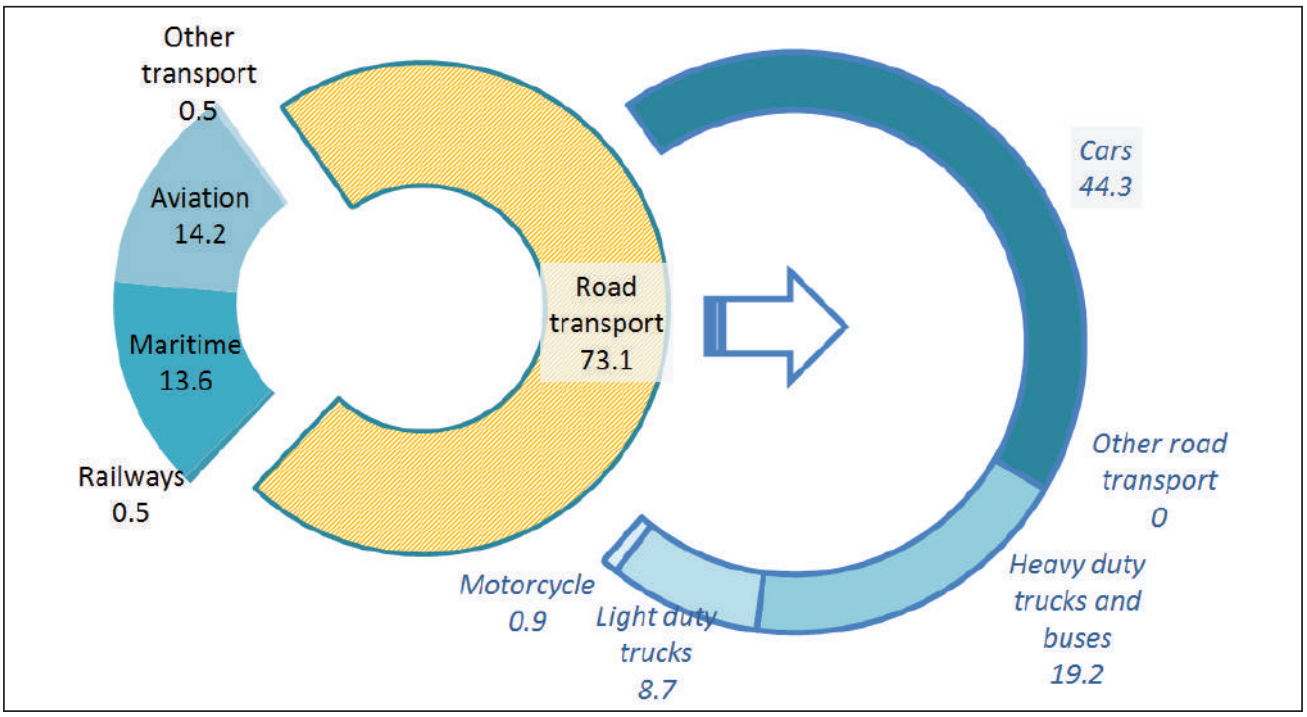


Figure 3: Share of road transport in GHG emissions accounts to almost three quarters of transport emissions (2019) while cars, 2 wheelers, 3 wheelers and mini buses contribute to 75% of passenger transport.[8]

Notably, share of transport sector in consumption of oil and petroleum products in Sri Lanka is highest in South Asian region due to dependence on road transport. Graph Illustrating the same is as follows:

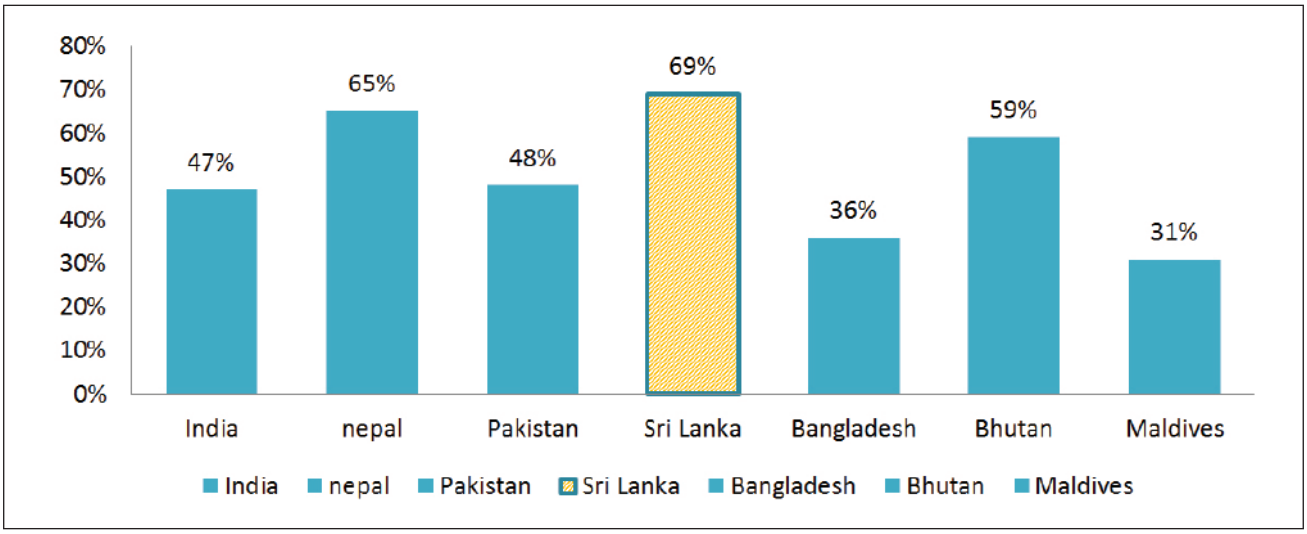


Figure 4: Share of transport in consumption of oil and petroleum products in Sri Lanka (comparison with neighboring (SAARC countries)[9]

8. EU (Convention) 2019
9. India Smart Grid Forum (ISGF) May 2019

Global Initiatives to Curb Emissions

Commitments of National Governments to curb carbon emissions from transport sector globally are as follows:

UN Framework Convention of Climate change

Paris Agreement

- National Adaptation Plan
- National Adaptation Programme of Action on Climate Change
- Nationally Appropriate Mitigation Action
- Intended Nationally Determined Contributions

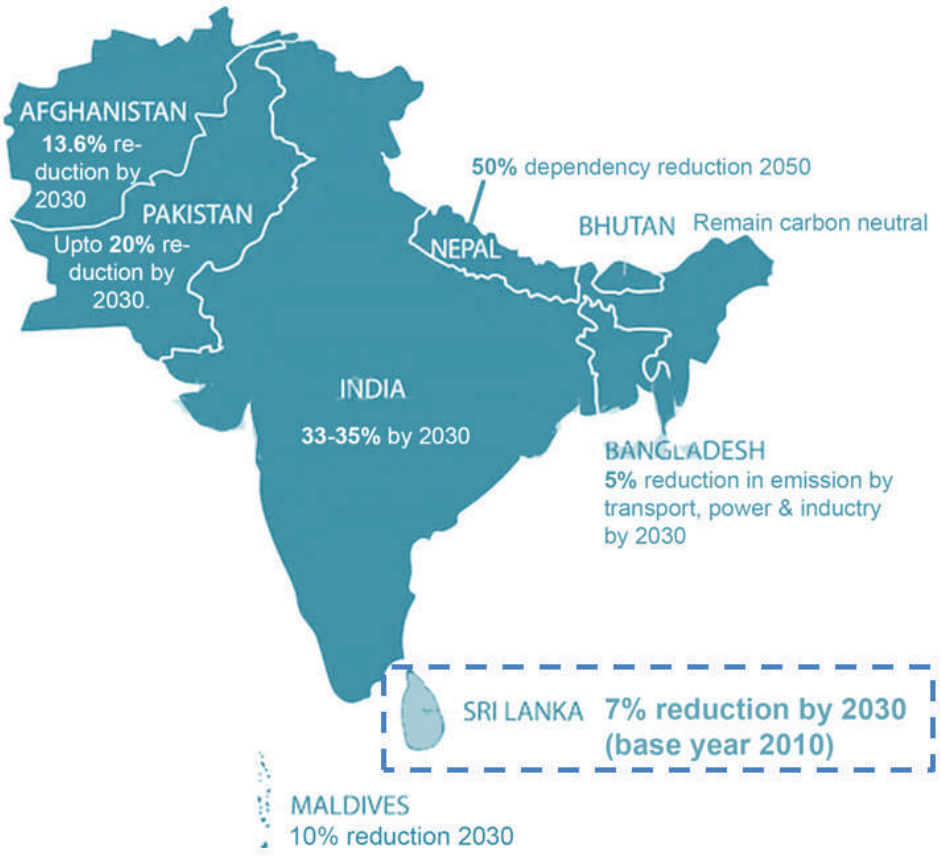
*Specific commitments have been targeted by various nations under NDCs, NAP, NAPA, NAMA.

SUSTAINABLE mobility FOR ALL

Marrakech Partnership

Global Climate Action

Commitments by Neighbouring Countries to Reduce Emission



Introduction

Sri Lanka has a population of about 21.2 million (18.4% urban population), growing at a rate of 0.96%. It has an area of about 65,610 sq.km and population density of 323.17 people per sq.km.[10] Average GDP growth of Sri lanka is 4.63% (2013 to 2016).

Transport in Sri Lanka

Transport sector plays a crucial role in its economic and social development. In 2017, transport sector directly contributed to 10% of GDP and generated 4% of employment.[11] Sri Lanka mostly relies on imports to meet its fuel requirements for transport sector along with other requirements.

Though Sri Lanka contributes to 40.75 $MtCO_2e$ i.e.0.1% of global emissions (2014) but GHG emissions have increased by 43% from 1990 to 2011.[12] Among SAARC countries, share of Sri Lanka's transport sector is 16%. However being a non industrial country with high density of vehicles in major cities, transport sector is major contributor of GHG emissions.[13] Transport sector in Sri Lanka contributes to 69% of consumption of oil and petroleum products further leading to 16% share of transport sector in GHG emissions.

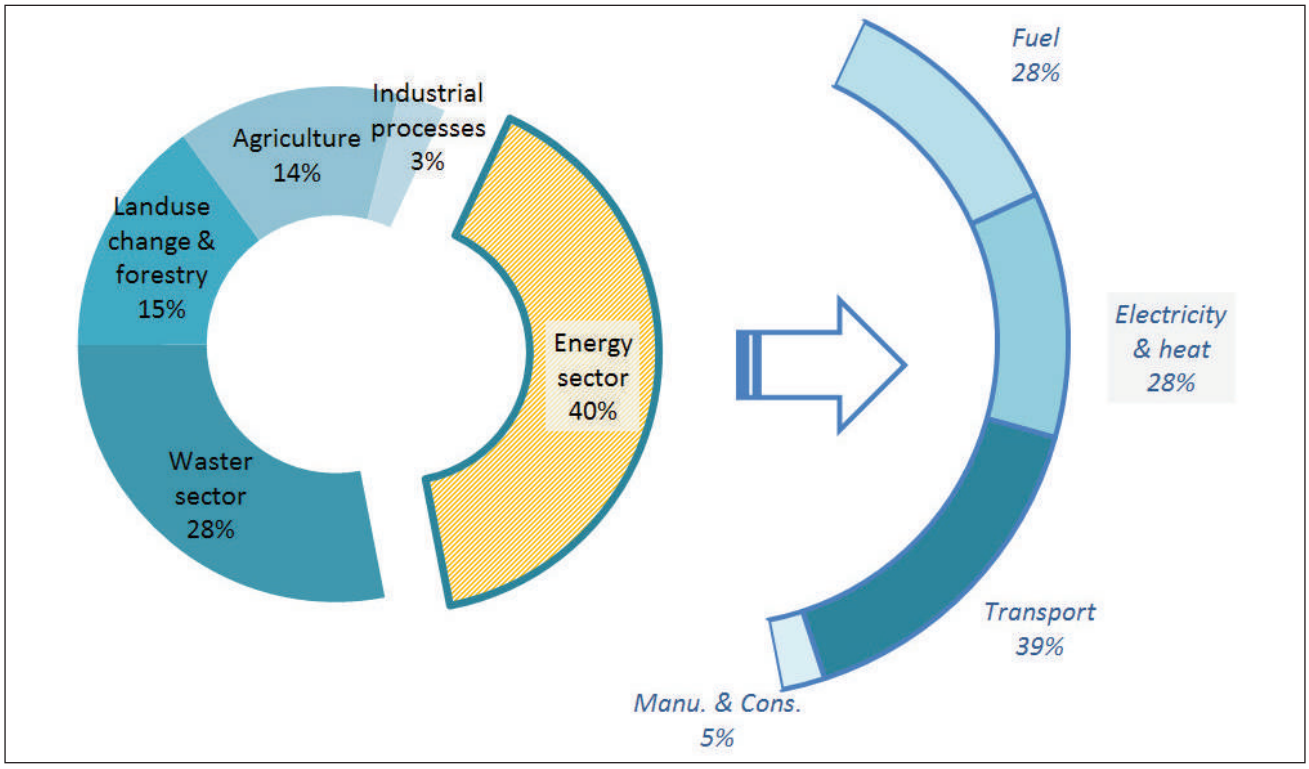


Figure 5: Sector wise contribution to GHG emissions (2011)[14]

10. PwC December 2017
11. India Smart Grid Forum (ISGF) May 2019
12. WRI, USAID 2011
13. Ministry of Mahaweli Development and Environment August 2019
14. WRI, USAID 2011

Energy sector contributes to about 40% of total emissions in Sri Lanka. GHG emissions from various vehicles and chart of modes of transport prevalent in the country is illustrated as follows:

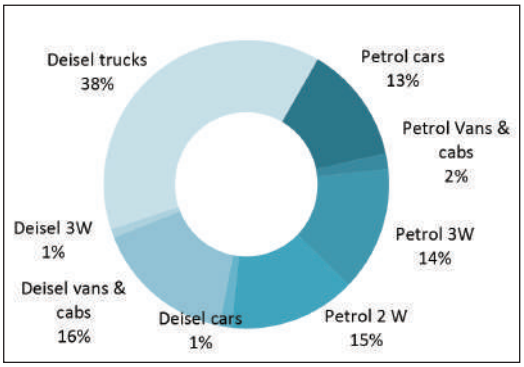


Figure 6: GHG emission ($kTCO_2e$/year) from vehicles (2015)[15]

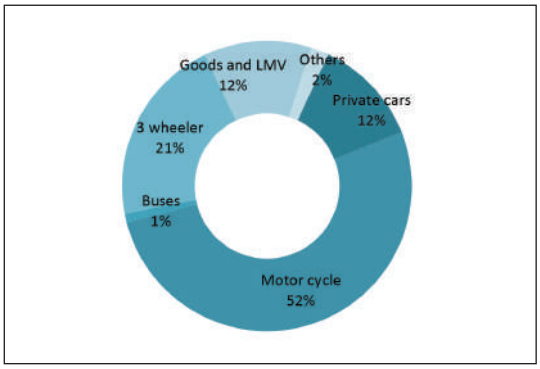


Figure 7: Modal share of road transport (2016)

Road transport: Roads are the backbone of transport sector in the country. Road network contributes to 93% of total passenger demand and 97% of goods transport services contributing to 39% of total transport emissions.[16] According to the World Bank, in 2016, Sri Lanka had the highest road density in South Asia i.e. 173.9km of roads per 100 sq.km of land.

In 2016, Sri Lanka had 31,262 km of roadways having 4,737,314 vehicles with valid registration operating on it.[17] Road network includes 11,700 km national highways, 15,500 km of provincial roads and 65,000 km of local authority roads and 24,000 km of roads owned are by irrigation, wildlife and other government authorities.[18]

Sri Lanka Transport Board operates 5,314 buses daily, moving about 16,143 million passenger km across the year. Further, 17131 buses being are operated by private owners.

Modal split of vehicles on road is illustrated in Figure 7 (above).[19] Public transport (buses) contribute to only 1% of the total modal share with 21% of Intermediate Public Transport (IPT), 52% motorcycles and 12% private cars.

Railways: At present, rail network handles a very small fraction of country's transportation needs and has broad guage route length of 1,562 km. The route has 336 stations and carries 136 million passengers and 2 million tonnes of goods per annum (2016)[20]. Railways play an important role in facilitating the floating population on daily basis in Colombo region.

Air transport: Sri Lanka has 14 domestic airports and 3 international airports. 4.5 million people and 102,734 tonnes of cargo is transported annually by air transport (2016).[21]

Water transport: 7 ports handle about 51.8 million tonnes of cargo annually. Ports of Colombo, Trincomalle and Galle are three major ports. Passenger movement is almost negligible by waterways, only internal movement with ferries and fishing boat carry both passengers and cargo in Sri Lanka.

15. K.A.I.Wijesena (Bsc Eng, CIMA) n.d.
16. Climate Smart Initiatives Pvt. Ltd 30 April 2019
17. PwC December 2017
18. KPMG India, UNDP n.d.
19. PwC December 2017
20. PwC December 2017
21. PwC December 2017

Figure 8: Road network[22], railways[23], airports and ports[24] in Sri Lanka

Proposals for Future Development in Transport Sector

The country has estimated to invest USD 6 billion in development of expressways (Central Expressway and the Ruwanpura Expressway), USD 31 million in upgradation of railway network, port improvement and conversion of ICE 3 wheelers to electric vehicles.[25]

The light rail system for Columbo with an estimated cost of USD 6 billion, was approved by the Government of Sri Lanka in October 2018. It is scheduled to start in 2020 and operation is expected to start in 2024.[26]

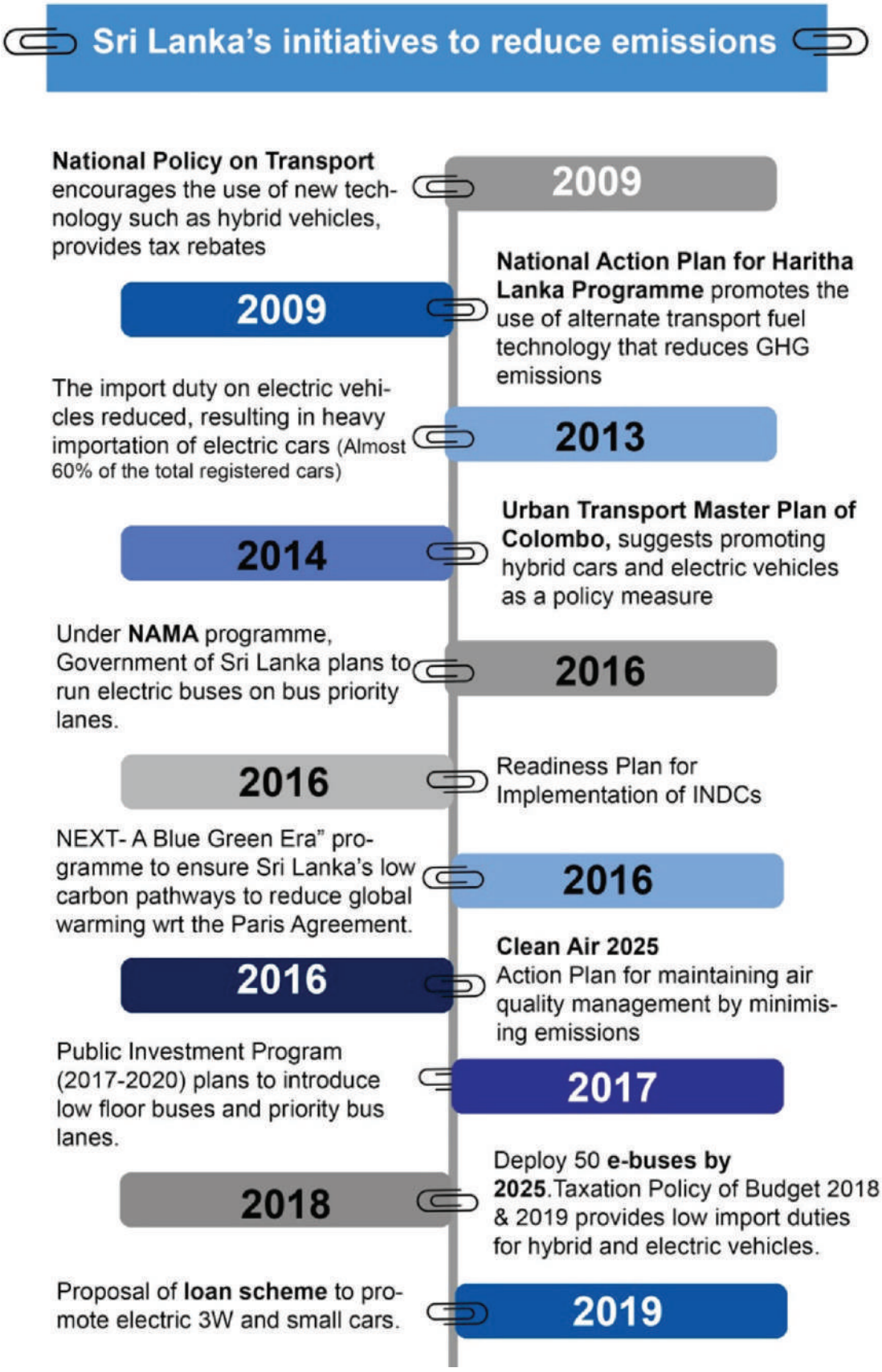
A proposal for electrification of the suburban railway network in Colombo is under discussion.[27] Sea port development and cargo village is also proposed.

Initiatives

Sri Lanka announced plans to replace all state-owned vehicles (including buses) with electric or hybrid models by 2025, and private vehicles by 2040.[28]

Over the last decade, Sri Lanka has taken various policy initiatives to reduce emissions from transport sector which are as follows:

22. Map source- www.mapofworld.com
23. Sri lanka Railways 2009
24. Map sources- Google
25. PwC December 2017
26. Ministry of Megapolis and Western Development
27. ADB 2012
28. SLoCaT 2018 Timeline developed by author after collecting information from secondary sources



Apart from the above initiatives, feasibility studies have also being undertaken with assistance from technical institutions/ universities such as University of Moratuwa.[29]

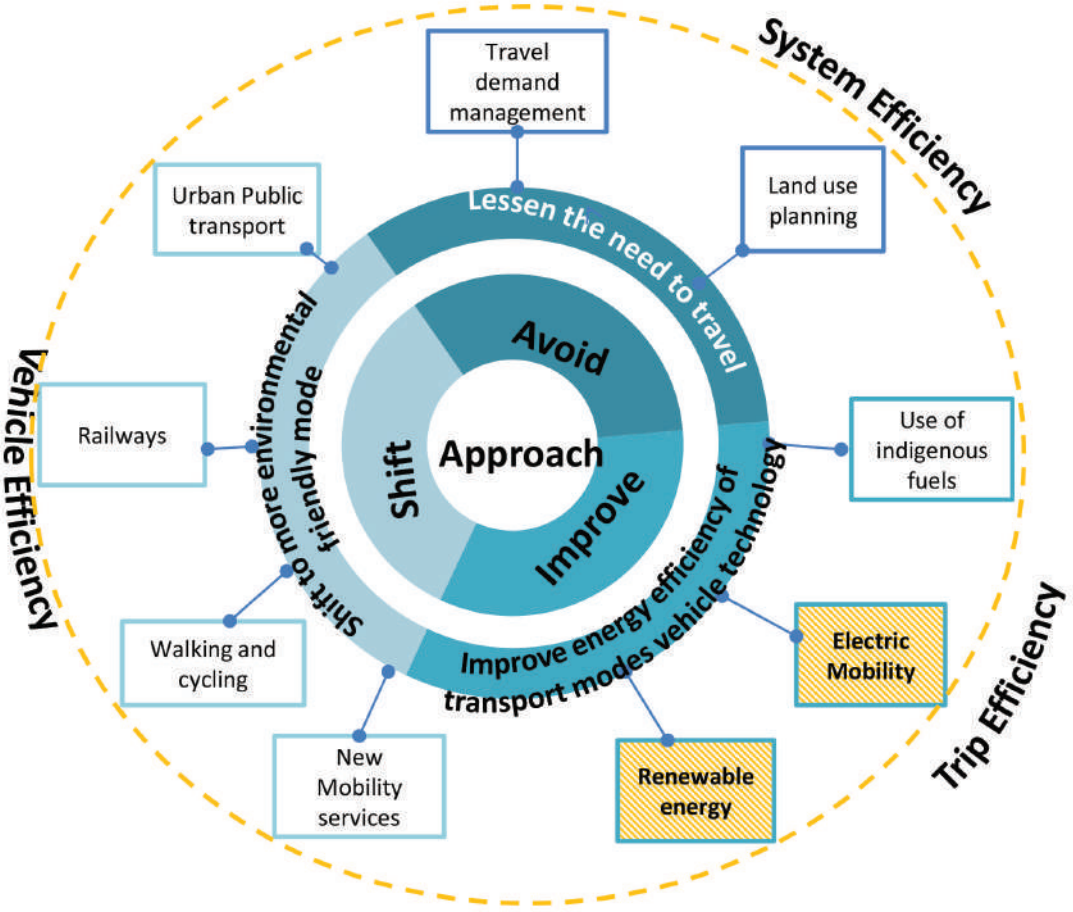
29. Climate Smart Initiatives Pvt. Ltd 30 April 2019

Ways to Address Transport Emissions

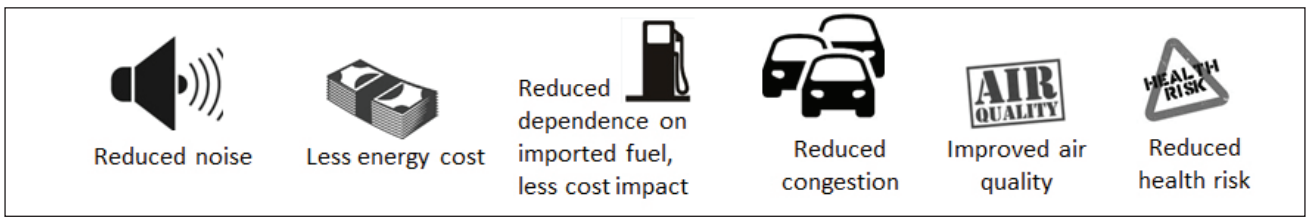
Transport emissions may be controlled by using principles of sustainable transport i.e. the approach of "Avoid, Shift and Improve".[30]

Objectives

- Reduction in GHG emissions
- Reduced energy consumption
- Creating livable cities
- Promotion of alternative mobility solutions and developing sustainable transport system.



Benefits of this approach



30. Information source - Slocat 2018.
Image sources- 123rf.com, cliplibrary,HiClipart, Owips.com

Electric Vehicle (EV) as a Solution and Game Changer

EV introduction has a significant potential of reducing emissions from transport sector. The scale of impact may differ, depending on the source of electricity used for charging vehicles. In case of charging from national grid, the demand for coal and other thermal sources of energy may increase leading to an increase in grid emissions. If electricity for charging EVs is produced from renewable sources, then GHG emission is expected to be reduced.

EV introduction

An EV uses one or more electronic motors for propulsion. EVs have gained prominence around the globe due to their focus on renewable energy, environmental impact and depletion of fossil fuels.

EVs – Global uptake

As per the estimates, global E-cars sales has surpassed 1 million in 2017, additional sale of 100,000 buses and 30 million 2-wheelers was also observed. In terms of total EV stock, more than 3 million cars, 370,000 buses and around 250 million 2 wheelers, are predicted to be existing globally.[31]

Global EV sales trend from 2010 to 2017 is illustrated in the graph below[32]. Sales have increased by almost 57% from 2016 to 2017.

EV vehicles existing in market are as follows:

EV Scenario in Sri Lanka

Sri Lanka has taken initiatives including electric vehicle deployment, development of charging infrastructure,

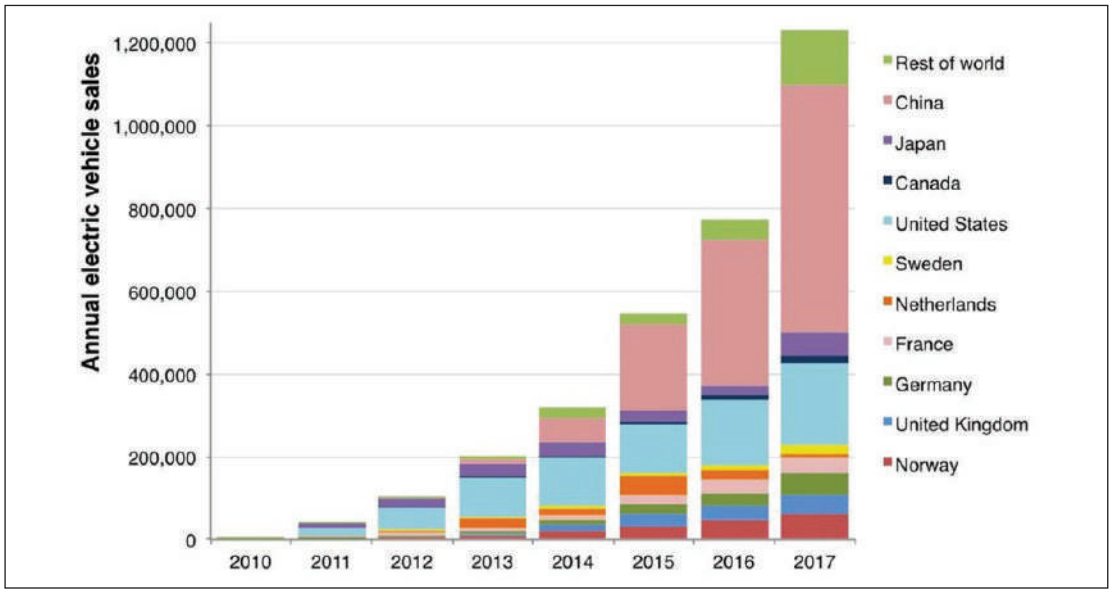


Figure 9: Country wise annual sales of EVs – 2010-2017

31. Estimates by Bloomberg (2018), IEA (2018) and ZEV Alliance (2018)
32. Chris Busch; Forbes 30 May 2018

subsidy plan for EVs and plans/targets for procurement but there is need for a long term comprehensive EV

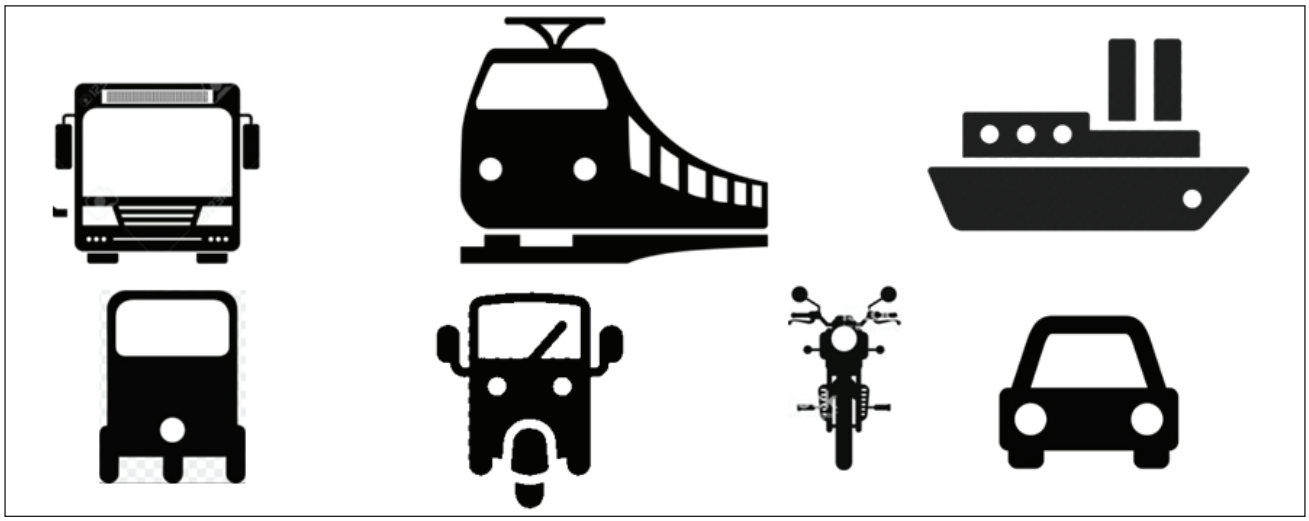


Figure 10: Modes of EV available- Public transport - Bus, Commuter train (require overhead wire), battery ship; IPT - 3 wheeler modes (e-rickshaws and e-auto); Private electric vehicles (2 wheeler, electric car and 3wheeler scooter)[33]

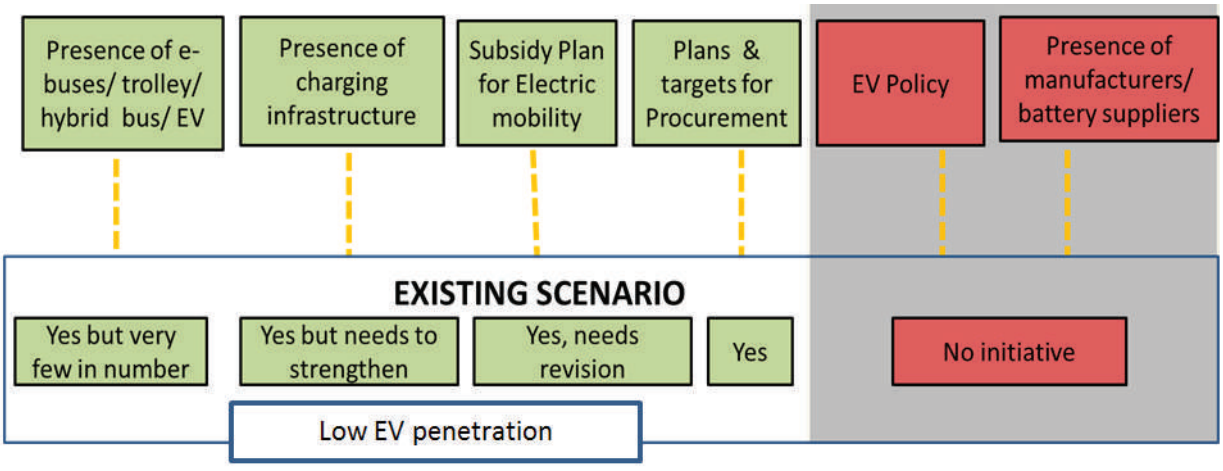
Policy.

At present over 5,400 electric cars, 2,300 electric bikes and over 40,000 hybrid vehicles are in use in Sri Lanka and 90% of these vehicles are using Lithium Iron batteries .[34] The country imports its vehicles/parts from other countries and does not have an existing manufacturing/ supplying infrastructure.

There has been an increase in the amount of hybrid and electric vehicles in the country due to special tax structure introduced for hybrid vehicles since 2011 and making zero tax for electric vehicles in 2014. In 2018, about 44.6% of total registered cars were hybrid/electric cars.[35] 90% of cars were used vehicles which require battery replacement but there are no e-battery importers. No formal method is available for recycling/reuse of battery/other parts.

Impact of shift from ICE to EV in Sri Lanka

If electricity is generated from renewable sources, for charging infrastructure of EVs, then it would be helpful



33. Image sources- Imgbin.com, istockphoto.com, 123rf.com, stickpng.com, iconfinder.com, clipartax.com, ww51.com, iconlibrary.net
34. MoHUA 2019
35. Climate Smart Initiatives Pvt. Ltd 30 April 2019

in reducing the overall emissions from transport sector. GHG Emission in $KgCO_2e$ for every 10 km travelled is illustrated below:[36]

Need for EV Policy

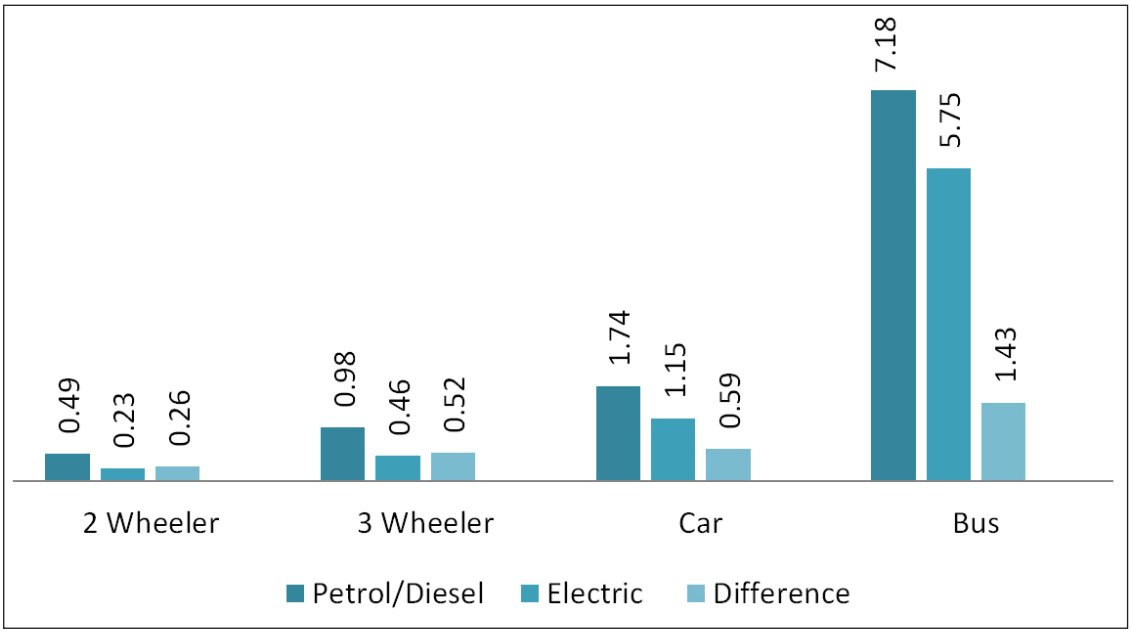


Figure 11: Difference in GHG emission from ICE and electric vehicle

It is observed that though various initiatives have been taken by Government of Sri Lanka but an intervention at policy level does not exist. Therefore, a comprehensive document with legal backing will help to bring all aspects related to Electric mobility together. The policy at national level will show way ahead to all the initiatives across the country and will help to integrate the standalone efforts.

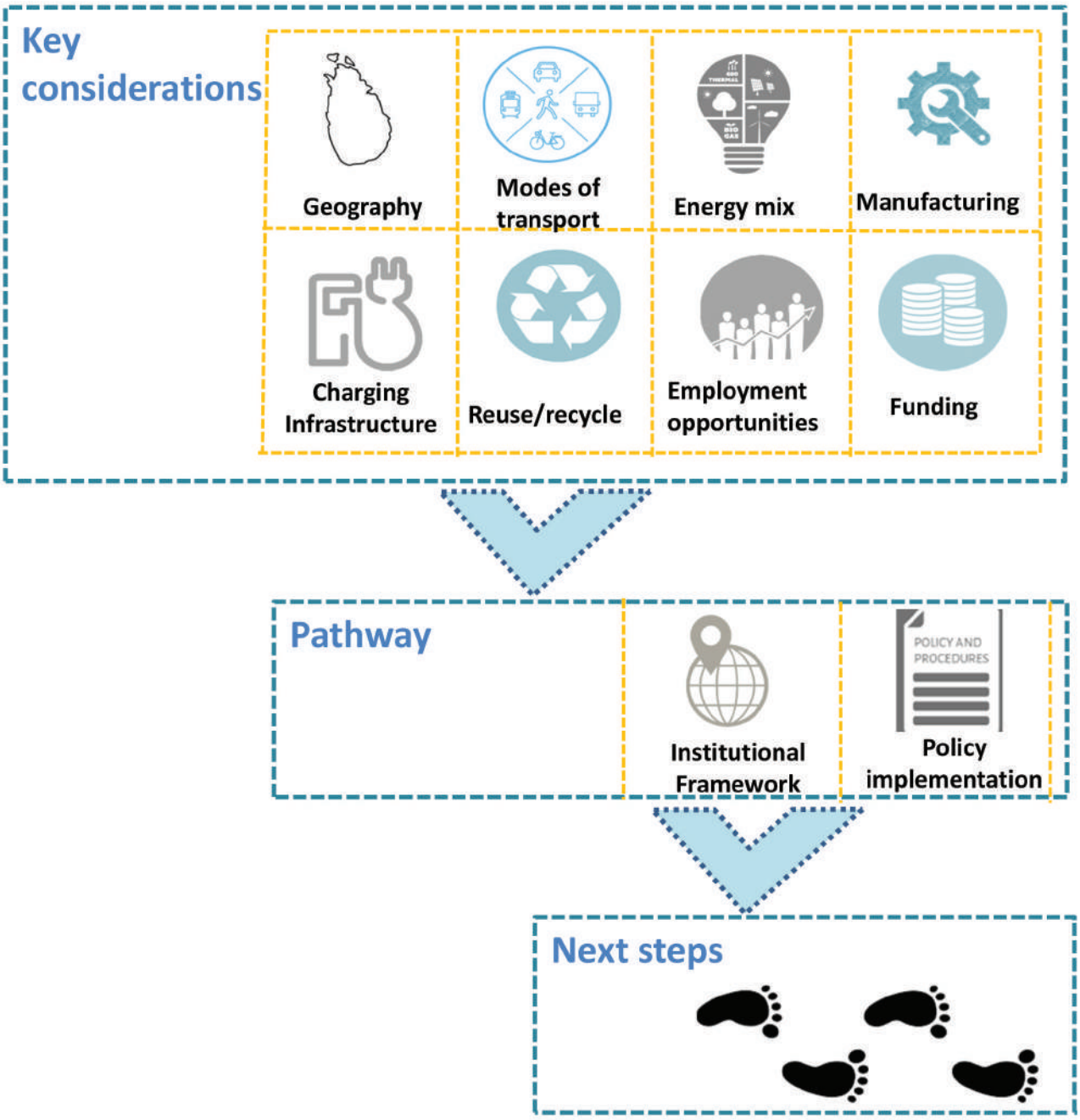
Need for National Level EV Framework

- Development of EV Policy Framework is one step before development of electric mobility policy.
- The framework will be a guidance document with a set of procedures to be undertaken while drafting the policy
- It will aim at organising the on-going standalone efforts under one common agenda/ frame
- It would address aspects such as – manufacturing & import, charging infrastructure, technology, vision, policy & regulations, institutional capacity, incentives & subsidies etc.

Structure of Proposed EV Framework for Sri Lanka

36. K.A.I.Wijesena (Bsc Eng, CIMA) n.d.

Geography


Key considerations
Geography
Modes of transport
Energy mix
Manufacturing
Charging Infrastructure
Reuse/recycle
Employment opportunities
Funding
Pathway
Institutional Framework
POLICY AND PROCEDURES
Policy implementation
Next steps

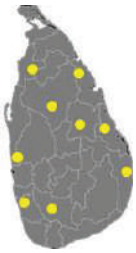
21.2 million population
18.4% urban

65610 sq.km.

61% of total urban population resides in **Western province.**

It is preferable to deploy EVs in **urban areas** to cater to larger demand of people and improve connectivity from urban agglomeration.

Terrain remains a major consideration in deployment of EVs in an area, as efficiency of EVs is reduced while operating on sloped terrain.

Model options	Detail	Comments
a. 	**Cluster based deployment** ● This caters to the demand of a priority city/urban area along with its urban agglomerations in vicinity. ● Supporting infrastructure may be planned for a cluster. ● Range of distances in an urban cluster is small, so this is a feasible option for electric vehicle deployment currently.	● This type of deployment may be most appropriate in Western province.
b. 	**Project based deployment** ● It may cater to the demands in urban areas and its adjacent urban agglomeration spread across the country. ● EV deployment may be planned on pilot basis in areas of the country. ● Supporting infrastructure is required in a larger area which requires larger investment.	● This deployment may be most appropriate in cities with larger %age of urban population. E.g. Columbo, Sri Jayawardena Kotte, Kandy, Galle, etc
c. 	**Corridor based deployment** ● Intra city connectivity may be catered if EVs can cover larger distances. ● Provision of supporting infrastructure has to be planned to cover entire area. ● Electric vehicles have a range of about 100km/charge. Thus it limits intercity or interstate use of EVs unless proper charging stations are installed on these routes	● In case of Corridor based deployment, options of train with overhead wire, elevated electric LRT connecting suburbs,Trolley bus (bus operating with overhead power line) may be considered to strengthen the public transport.

Institutions

Ministry of Mahaweli Development & Environment, Ministry of Transport and Civil Aviation, Ministry of Megapolis & Western Development.

Proposed first steps

- Promote high occupancy public transport vehicles as per National Transport Policy 2009 which may help in shift from use of private vehicles to public transport.
- Identify and announce potential areas for EV deployment after consultation.
- Encourage ULBs to initiate integration of EVs as a modal option to shift from private vehicles to public transport.

Information source- (C.M.S.P. De Silva 14 May 2019), National Land Transport Policy 2010.Base map source -https://simplemaps.com/resources/svg-lk

Modes

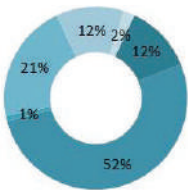
Modal split in Sri Lanka

1% buses

21% IPT (3W)

52% motorcycles

12% private cars



Major dependence on **road transport** in Sri Lanka

In current fleet, majority of EVs are **private cars.**

Prioritisation of shared transport (public transport and 3 wheeler) is required.

Model options	Detail	Comments
a. 	**Public transport- bus/train** • Only 1% of the total vehicles in Sri Lanka are buses with 53,787 diesel buses in 2018. • Buses contribute to 22% of the emissions and 21% of thSe fuel usage but serves 54% of the people km.(2015)	• Intra-city buses may be replaced with E-buses, however for intercity, replacing diesel buses to EV may be limited to operation on expressway due to range limitation of 120km. • Future targets(2025) of LRT would also increase the demand for feeder buses.
b. 	**IPT- 3 wheeler** • IPT share second largest vehicle fleet share with 21% as three wheeler vehicles. • 3 Wheeler contribute to 18% of GHG emissions, 12% of fuel usage and serves 9% of people km.(2015) • Budget 2019 proposed loan scheme for 3W to upgrade to electric.	• Incentives to encourage shift to EVs may include rebate in road tax and registration fee and increasing tax on ICE vehicles.
c. 	**Private 2/4 Wheeler** • 64% of total vehicles are private vehicles. • 44.6% of registered cars are hybrid/electric (2018) These have increased after tax exemption in 2014. • Cars contribute to 17% of the fuel usage, and 17% of the emissions but serves only 4% of the people km (2015)	• Incentives for purchase and use of 2 W EVs. • Hail and Ride scheme may be allowed for private vehicles. • Around 98% of E-cars which were imported to Sri Lanka were used vehicles.

Institutions

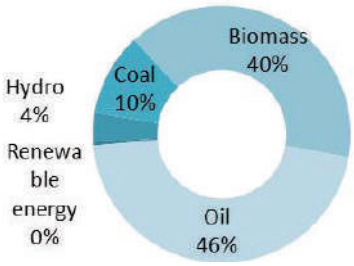
Ministry of Transport & Civil Aviation, Ministry of Finance, Ministry of Mahaweli Development & Environment and Ministry of Megapolis and Western Development. Other boards including National Transport Commission, Sri Lanka Transport Board, Department of Motor Traffic and Road Passenger Transport Authority, Western Province.

Proposed first steps

- Conduct a detailed study of existing traffic pattern and modes of transport.
- Prioritise electricification of high use vehicles shared vehicles (including public transport and 3W) and government vehicles to achieve considerable reduction of emissions.
- Undertake pilot project to deploy e-buses in different routes to assess the viability and profitability and document the learnings.
- Promote high occupancy vehicles as per National Transport Policy 2009.
- Remove tax on EVs and increase tax on ICE.

Information source- (PwC December 2017), (SLoCaT 2018), (Climate Smart Initiatives Pvt. Ltd 30 April 2019) , (GEF& UNEP 2019);
Image source -Imgbin.com, istockphoto.com, 123rf.com, stickpng.com, iconfinder.com, clipartax.com, ww51.com, iconlibrary.net

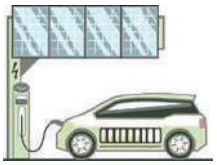
Energy Mix



Country is majorly dependent on imports to meet primary energy requirements.

High dependence on **fossil fuels (46%)** for electricity generation and other uses.

Transport sector consumes **70%** imported petroleum, causing burden on the economy.

Model options	Detail	Comments
a. 	**RE based charging stations** ● Clean charging station depend on renewable energy source as electricity generation source. ● RE infrastructure required only for charging stations requiring no change in existing electricity grid.	● No change in existing grid required.
b. 	**Project based deployment** ● Proposed establishment of large scale wind farm of 514 MW. ● Solar power plant with capacity of 115 MW to be established. ● Adding 104.62 MW power generation through biogas by 2025. ● Mini Hydro plant with 176 MW capacity, to be established.	● Support the energy requirement to promote shift towards electric vehicles. ● Clear demarcation of roles and responsibilities of stakeholders required.
c. 	**Non- renewable sources- Fossil fuels** ● Import of fossil fuels results in increase in import expenditure. In 2014, about 3385 thousand metric tons of refined petroleum products were imported bearing an expenditure of 3 bn USD. ● Country is working towards commercially exploiting discovered oil and gas reserves in Mannar and Cauvery basins.	● Country should make efforts to reduce dependence on non-renewable sources. ● Action plan for 5-10 years should be developed for the same.

Institutions

Institutions
Ministry of Power & Energy, Ceylon Electricity Board, Sri Lanka Sustainable Energy Authority, Public Utilities Commission of Sri Lanka, Central Envionment Authority

Proposed first steps

- Develop a strategy to increase dependence on renewable sources in order to achieve INDC target. Colombo Municipal Corporation is taking initiatives for the same.
- Develop an action plan for renewable energy to enhance electricity generation from existing grid to promote use of EVs.
- Make future electricity demand estimation to shift towards electric.
- Encourage RE based charging stations in home premises through tax exemptions and incentives.

Information source- (CRISIL December 2018), ALP Consultation Workshop 2019
Image source - 123rf.com,ifuturz.com

Manufacturing

Near absence of manufacturing industry in Sri Lanka.

Only **assembling** of vehicles carried out by Some private companies.

The cost of vehicles directly depends upon **import tax.**

Model options	Detail	Comments
a. 	**Manufacturing of ICE vehicles** ● Majority of vehicles/parts are imported in Sri Lanka. ● Manufacturers which manufacture Lead battery for ICE vehicles exist in Sri Lanka ● Repair and maintenance is carried out locally.	● Few companies are working in the sector of assembling ICE vehicles in Sri Lanka
b. 	**Manufacturing of Electric vehicles** ● Currently, EVs are imported in Sri Lanka. ● Majority of these vehicles are used vehicles.	● Some private companies are planning to introduce EV manufacturing in Sri Lanka.

Institutions

Ministry of Industry and Commerce, Ministry of Labour and Trade Union Relations, Ministry of Science and Technology.

Proposed first steps

- Create awareness and build the capacity of stakeholders.
- Conduct negotiations with relevant business communities to promote cleaner package at a subsidized rate.
- Initiate government support for the private sector to attract investors by tax concessions and faster approvals of solutions related to deployment of e-trains , e-buses and other sustainable solutions.
- Involve local agents to undertake feasibility study to promote local EV manufacturers.
- Encourage manufacturers who have been credited in the manufacturing sector

Information source- (C.M.S.P. De Silva 14 May 2019)
Image source –icon-library.net, clipartwiki.com, Drive Electric Minnesota,

Supporting Infrastructure

Minimal supporting infrastructure existing in **Columbo** (majority for private vehicles)

Currently, majority of the existing electric vehicles in Sri Lanka are **private**, therefore charging is generally done at household level

Public Charging Infrastructure is proposed along with additional slow chargers and plug sockets.

RE based public charging stations may be encouraged to prevent the rise in dependency on non renewable sources for electricity.

Model options	Detail	Comments
a. 	**Private charging points** ● Some cities including Columbo has existing private charging infrastructure as majority of EVs are private cars.	● Building byelaws should be updated catering to intercity and intra city charging needs depending in the requirements. ● Electricity tariff plan for charging EVs. ● Finalisation of plan after consultation with CEB, power distribution agency to ensure adequate supply infrastructure is available for installing charging points
b. 	**Public charging points** ● CEB and LECO have proposed to establish 25 public EV charging stations with DC charging capacity in strategic locations. ● DC Fast Chargers- 50 (no), annexed to some business activity proposed. ● Some private companies are working towards developing some public charging stations.	● Develop a plan to develop supporting infrastructure in the city. ● Responsibility and specifications of charging stations. ● Locations and guidelines for battery charging/ swapping stations.

Institutions

Ministry of Power and Energy, Ceylon Electricity Board, Public Utilities Commission of Sri Lanka, Lanka Energy Conservation, Sril Lanka Sustainable Energy Authority, Ministry of Labor and Trade Union

Proposed first steps

- Identify potential locations for developing supporting infrastructure for EVs.
- Establish public charging stations at locations.
- Allow free parking for EVs in government owned parks to promote EVs.
- Remove tarriff for private owners to encourage

Information source - (Climate Smart Initiatives Pvt. Ltd 30 April 2019)
Image source – virta.global

Reuse/Recycling of Batteries

Disposal of batteries is a **major concern** as there are no e-battery recyclers..

Majority of imported vehicles need **battery replacement.**

No clear regulations to import new batteries which create difficulty in tracing EV battery importation.

Sri Lanka is a signatory to the **BASEL convention** and not allowed to import/export hazardous chemical waste.

Thus **regulations and policies are required** to track import, use, recycling and disposal of EV batteries.

Model options	Detail	Comments
a. 	**Lead acid battery recycling** ● Several battery manufacturers in Sri Lanka manufacture lead-acid batteries for internal combustion engine vehicles but no method to dispose them. ● These may cause serious environmental hazards in case these are not recycled/ reused after end of their life cycle.	● Lead acid batteries costs less as compared to Li-Ion but has a lesser life cycle. ● Running hours after full charging are less.
b. 	**Li-ion battery recycling** ● Currently there is no established manufacturing or recycling industry in Sri Lanka. ● Batteries may be reused to support grid alongside energy sources like solar or wind power.	● Li-Ion has high initial cost but are perceived to be more efficient, can cover larger distance in a single charge and has a longer life cycle as compared to Lead acid batteries.

Institutions

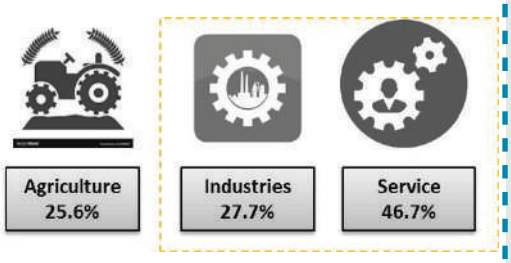
Ministry of Mahaweli Development & Environment

Proposed first steps

- Develop a system backed by policies to recycle materials from batteries and minimise waste disposal.
- Provide technical knowledge for establishing an effective manufacturing/recycling industry required.
- Develop regulations and provide incentives for setting up recycling business.
- Enforce restrictions and heavy penalties on disposal of batteries on landfills/ disposal sites, with scrap agencies.
- Create awareness related to reuse and recycling of batteries.

Information source - (Climate Smart Initiatives Pvt. Ltd 30 April 2019), (C.M.S.P. De Silva 14 May 2019), Janathakshan (Gte)Ltd.
Image source - Nissan, greencarreports.com

Employment Opportunities



Existing employment structure would not be affected if importation of EVs continue.

In case manufacturing/assembling of EVs is carried out in Sri Lanka, Population is majorly imployed in agriculture, industries and service sector.

Direct impact in the workforce participation is anticipated in **industry & service sector** with **rise in employment** opportunities in electricity, manufacturing, transport, research & development

Model options	Detail	Comments
a. 	**Employment opportunity linked with Electric vehicles** • EV have low regular maintenance. • EV industry may create new job opportunity in manufacturing of parts and selling industry. • Female employment may also increase as EV involve more technical assistance and less mechanical assistance.	• Manufacturing EVs in the country may create job opportunities.
b. 	**Employment opportunity linked with ICE vehicles** • Regular maintenance of ICE vehicles have created a large group of repair mechanics and spare part seller.	• Currently the county majorly imports vehicle/parts and involve a group of people only in repair and maintenance.

Institutions

Ministry of Labour and Trade Union Relations, Ministry of Industry and Commerce

Proposed first steps

- Create awareness among people engaged in repair and maintenance of ICE vehicles.
- Offer low cost training programs for EV repair trainings in the government owned technical college.
- Encourage NGOs having role in engaging stakeholders in awareness and capacity building sessions.
- Encourage skill development for repairing and maintenace staff.
- Create awareness and organise training program for operating EVs efficietly with an emphasis on life period of e-batteries.

Image source –udb.com, imagesearch.com

Funding

A model which is feasible, results in public benefits and offers higher economic returns is required for EV deployment project. conomic viability is preferred over financial viability.

Projects are proposed to be developed preferably through Public Private Partnership to reduce the risks and improve possibility of generating considerable return.

Grant

- Grant may be provided for a project.
- Grant is received from funding agencies including Green Climate Fund, Global Climate Facility, etc.

Bilateral and Multilaterals

- Multilateral donors provide long term loan for development projects. These include World Bank, ADB, Japan International Cooperation Agency (JICA) etc.
- Bilateral donors include India, Japan, and Germany, fund major projects by providing long-term concessional loans

Foreign Commercial Borrowing

- The government may seek foreign commercial borrowing for EV deployment.
- Companies registered in Sri Lanka are also allowed to borrow loans from abroad.

Retained Profits

- Short term borrowing financing is provided by retained profits finance.
- Stock market and corporate securities are also used to raise capital.

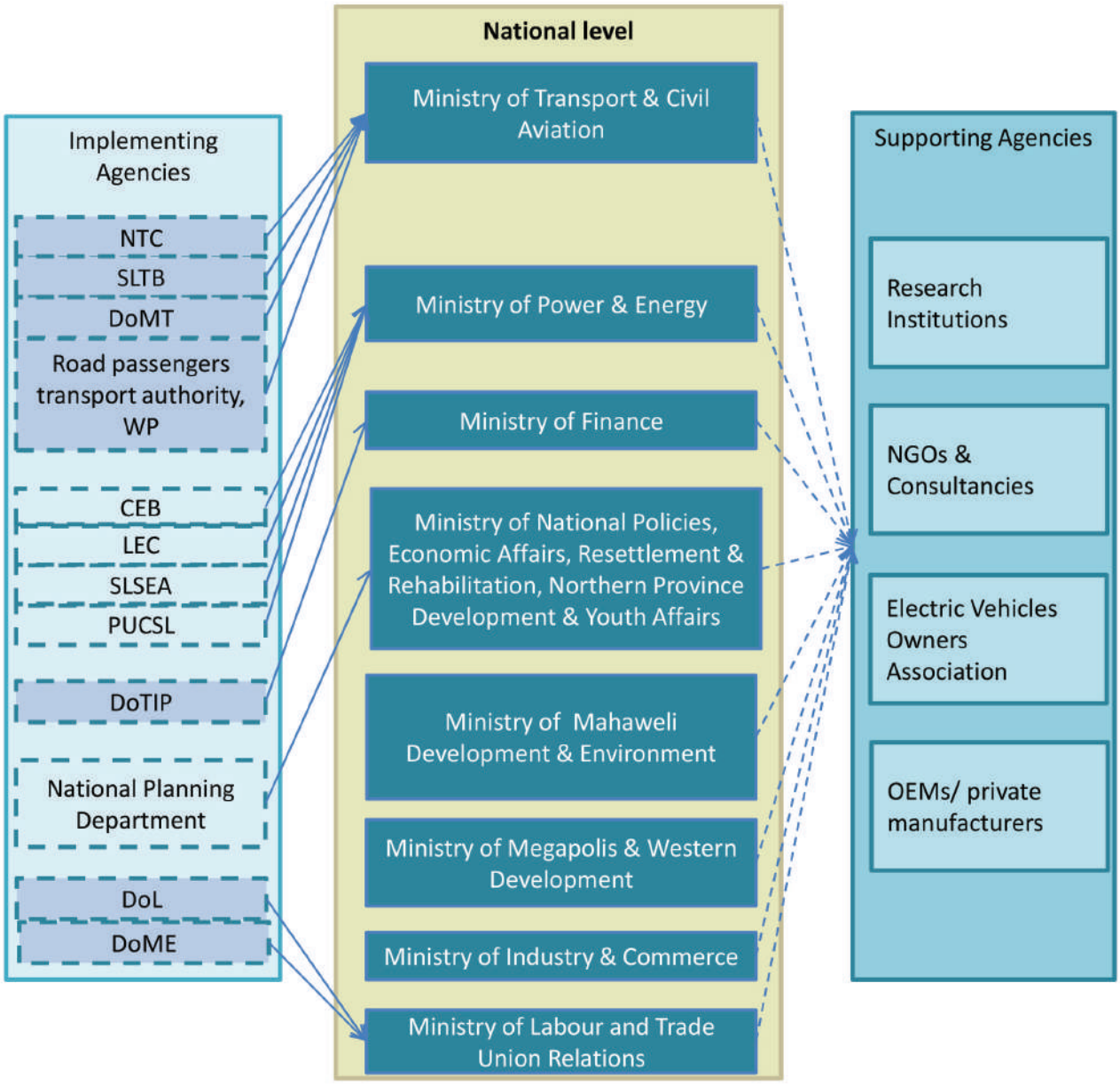
Local Commercial Banks

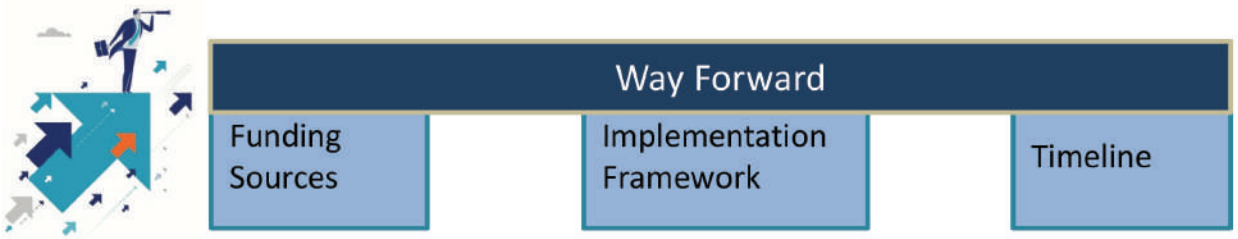
- Local commercial banks provide low interest loans to operators to procure EVs. Grant by government may be used as seed money which may be provided to private operators.

Technical assistance

Apart from the financing sources, technical assistance is provided to develop a loan project. UNDP, ADB, etc offer technical assistance for projects.

Institution Framework

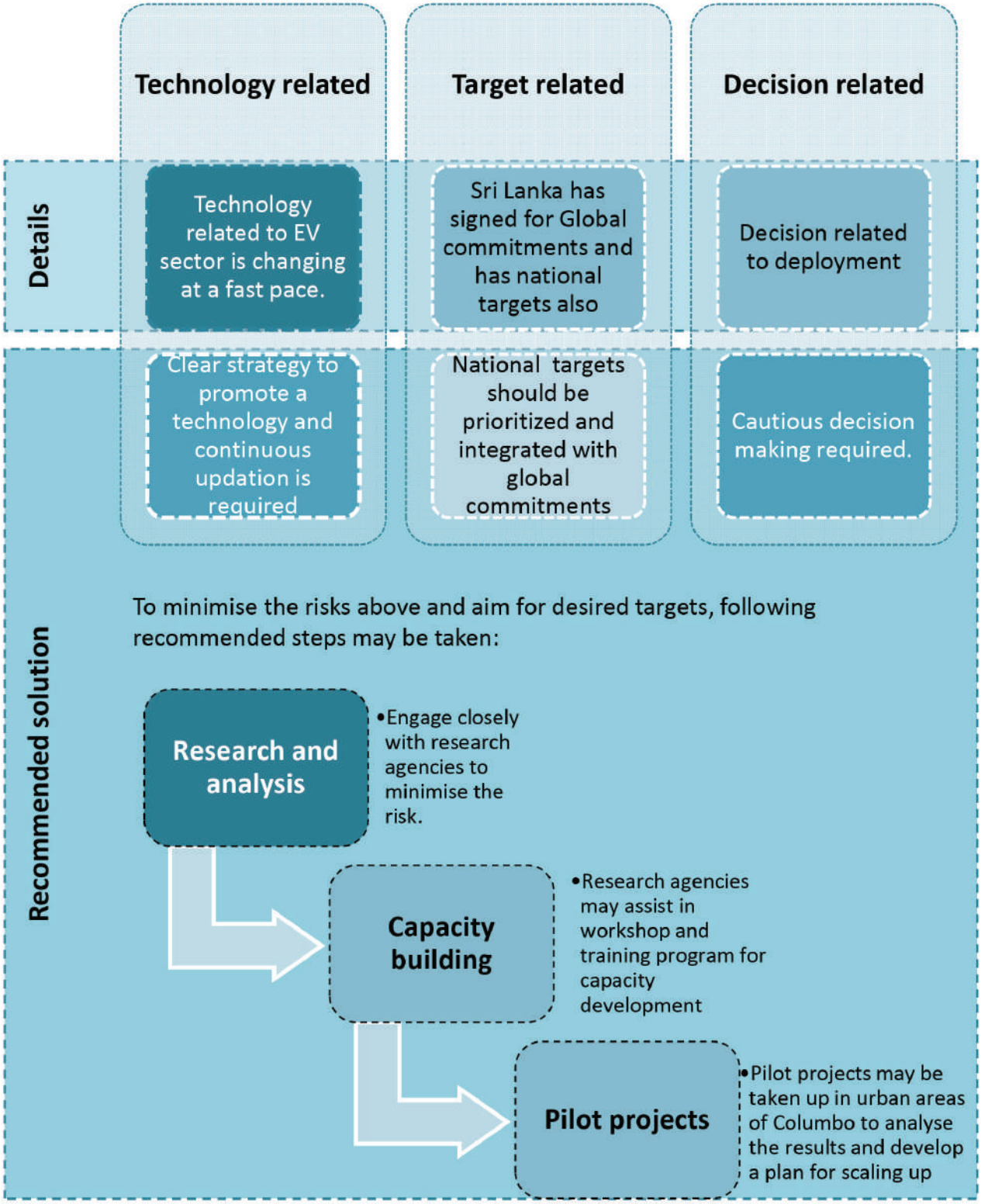




NTC - National Transport Commission, SLTB- Sri Lanka Transport Board, DoMT- Dept. of Motor Traffic, CEB-Ceylon Electricity Board, LEC- Lanka Energy Conservation, SLSEA- Sri Lanka Sustainable Energy Authority, PUCSL- Public Utilities Commission of Sri Lanka, DoTIP- Department of Trade and Investment Policy, DoL - Department of Labor, DoME- Department of Manpower and Employment.

Anticipated Risks and Recommended Solutions

Shift towards Electric Mobility is a new initiative, it will involve following risks.



Responses during the Consultation Sessions

Responses collected during the consultation sessions have provided insights while developing the framework for electric mobility policy in Sri Lanka.

Colombo Municipal Corporation

Sri Lanka is majorly dependent on fossil fuel for meeting its travel demand which is being imported from other countries. There is a need of developing a strategy for increasing the reliance on indigenous fuels instead of fossil fuels. Hence there is a requirement of a specific policy/ strategy for meeting electricity demand if the government planned to shift towards electric mobility as a step at national level will have a great impact. ULBs should be considered as a major part of institutional setup because ULBs are the agencies which play a major role in implementing projects in the cities.

Electric Vehicle Club, Sri Lanka

Public Utilities Commission of Sri Lanka has drafted the guidelines for public charging stations. The country is planning to reuse batteries and as of now two companies are already working on reuse and recycling of batteries in Sri Lanka. Strategies' such as citizen awareness, charging during night time as effective solutions for promoting efficient electric mobility in the country should be promoted.

Ministry of Transport & Civil Aviation

Regulatory framework for EVs while developing the framework should be considered as it is an important aspect while developing any framework or policy.

National Planning Department

The Government is already planning to go ahead with electrification of intermediate public transport as a part of enhancing last mile connectivity. The attitudinal problem of the user group is very important and needs to be tackled strategically as people generally have old mind set and are comfortable using the conventional fuel vehicles so it is difficult for the government to convince them shifting towards electric vehicles. He also said that promoting public transport is always a top priority but the governments should strategize its priorities aptly so that it is able to control the emissions from the transport sector and at the same time strengthen public transport in the country

Ministry of Megapolis and Western Development

In the past few years various concepts have been floated for promoting electric mobility in the country but most of the concepts are standalone and promote converting small cars into electric. It is very important to promote railways because they carry more number of passengers at a time. Though railway electrification is an age old process and technology but it has not happened yet in Sri Lanka. Before converting into electrification, the country needs to think about the existing fleet.

Ceylon Electricity Board

As of now there are 7 charging stations in Sri Lanka and the Ministry of Power plans to expand the network. Research activities are being undertaken in Sri Lanka for developing more efficient charging infrastructure.

Sri Lanka Sustainable Energy Authority

A proper legislative framework and guidelines are very important for any country to develop. Ministry of Transport & Civil Aviation should initiate task forces to get financial assistance.

Ministry of Mahaweli Development & Environment

The government of Sri Lanka has taken many initiatives in promoting electric mobility in Sri Lanka. They have identified and drafted activities done to promote electric mobility and plan to phase out ICE vehicles. The framework being developed by the ALP team should be amalgamated with existing and on-going studies to have a comprehensive document which would be very useful for the country.

Key Takeaways

Geography

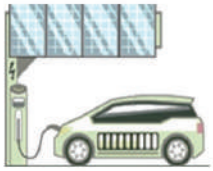
Considering the range limitation of EV (100-120km), 'Urban cluster' based deployment may be a better approach for EV deployment in Sri Lanka.

Major urban centres are located in a cluster near Columbo which may be considered for EV deployment.

Modes

Prioritisation of shared transport including public transport and 3 wheelers is required. Electrification of public transport may be taken as priority along with the a shift towards from private usage to public transport

Energy Mix



RE based charging stations may be considered as the most viable option as they don't require any change in existing grid and infrastructure for electricity generation would be required only for charging EVs.

Manufacturing

Considering the near absence of ICEV manufacturing landscape, EV manufacturing may be preferred as it may reduce EV import and cost related to the same. The country may also be able to achieve its national target of reducing GHG emissions.

Charging Infrastructure

RE based public charging stations may be preferred to improve infrastructure related to public EVs. Development of public charging stations may encourage people to shift towards EVs.

Reuse/ recycle

Clear regulations and guidelines may be developed for implementation of recycling plan for batteries used in EVs.

Employment Opportunities

EVs manufacturing may improve employment opportunities. Female employment would also be improved as EV manufacturing sector involves technical support instead of mechanical support in ICEV manufacturing.

Tentative Road Map

Awareness Generation

- Awareness related to EVs, among citizens and other stakeholders

Capacity Building

- Consultation, discussions and workshops for stakeholders for capacity building and suggestions
- Low cost training programs for EV repairs for improving employment opportunities

Promotion of Electric Vehicles

- Tax incentives and other incentives to promote EVs

Pilot Projects and Scale Up

- Initiation of pilot projects
- Gradual scaling up of the project will help in receiving concurrence from stakeholders of other areas in the city

Analysis and Documentation

- Development and documentation of learnings- Success and failure

Policy and Regulatory Framework

- Required to have a legal backing for promoting electric mobility

Ministry of Transport should initiate formation of presidential task force which will also be a source of funding and will help to bring in investors in Sri Lanka to manufacture and promote electric mobility.

Mr. Bangsa Jayab, Chairman,
Sri Lanka Sustainable Energy Authority

Ministry of Transport & Civil Aviations is taking initiatives to address transport issues and developing the framework for electric mobility policy is one step towards controlling emissions from transport sector.

Mr. Thilakratne Banda, Additional Secretary,
Ministry of Transport & Civil Aviations, Sri Lanka

National Planning Department is also of the view that public transport in the country needs to be strengthened and for future they are focussing on the idea to improve first and last mile connectivity through electric vehicles. He said that LRT is a good option but people need some mode to reach to the LRT and probably that last mile connectivity through auto rickshaws/ motorcycles leads to heavy emissions and hence such modes should be converted into electric.

Mr. Thennakoon T.M.D.P, Assistant Director,
National Planning Department, Sri Lanka

Asia LEDS Partnership Secretariat

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