



DIGITALIZATION OF THE NATIONAL TRANSIT SYSTEM

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By Pathfinder Foundation in Collaboration with VISA

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1. Executive Summary

The objective of this white paper is to focus on mobility policy that can improve the efficiency, safety, and environmental sustainability of public transit in Sri Lanka while understanding the role of payment mechanisms, with specific reference to the city of Colombo.

This document presents how the policy framework can be shaped with the support of a stable, efficient and inclusive payment system to develop transit from the perspective of the commuter, trade and commerce, and the Government.

2. Introduction

2.1. Global Scenario

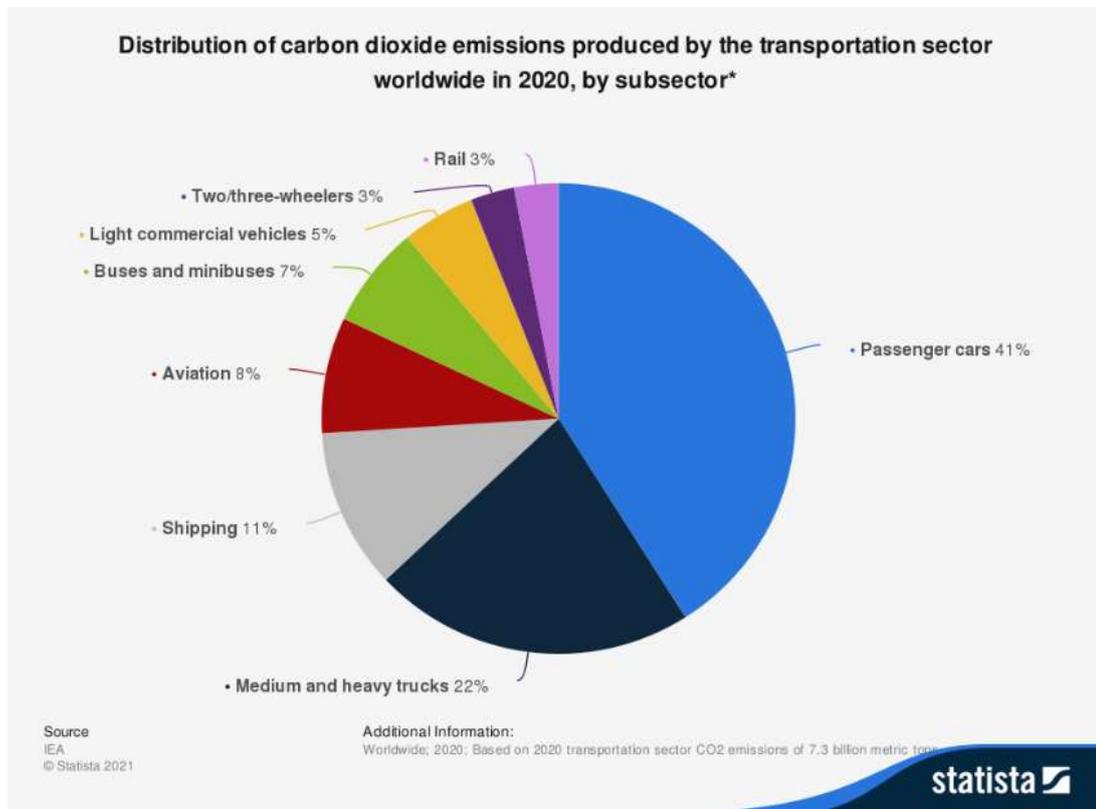
The world is rapidly moving towards a system of shared mobility as a transition to imminent disruption by Autonomous, Connected, Electric, and Shared mobility.

The world has identified that it needs to take continuous focused action to combat global warming. The recently concluded UN Climate Change Conference COP 26, held in Glasgow in October/November 2021 has targeted transportation as a major area of concern. The reason being that road transportation contributes around 26% of total global CO2 emission¹.

The bulk of this emission is from passenger cars.

¹ IEA, Global CO2 emissions by sector, 2018, IEA, Paris <https://www.iea.org/data-and-statistics/charts/global-co2-emissions-by-sector-2018>

Figure 1 – Distribution of carbon dioxide emissions produced by the transportation sector worldwide in 2020



The global thrust to control overall transport emissions is aimed at shifting transport from ‘owned’ solutions to ‘shared/mass’ solutions, whilst concurrently working towards electrifying transport, and thus reducing its emissions.

This thrust is further fine-tuned by number 11 of the UN’s Sustainable Development Goals². This goal calls for sustainable cities and states that over 70% of global carbon emission emanates from cities. Thus, all global cities have taken significant steps to reduce the emission of carbon from intra city transport.

Policy in most global cities have nudged the shift towards decarbonization promoting the use of low carbon emission and shared mobility. Some of the initiatives in this direction are;

- 2.1.1. Demand management through levies (congestion charges, city entry charges, limited and expensive parking etc.)
- 2.1.2. Carbon management (making the usage of Petrol and Diesel cars more expensive vis-à-vis electric vehicles, in terms of all charges including parking)
- 2.1.3. Convenience management (making zero carbon solutions such as walking and cycling more convenient through allocation of separate

² <https://www.un.org/sustainabledevelopment/cities/>

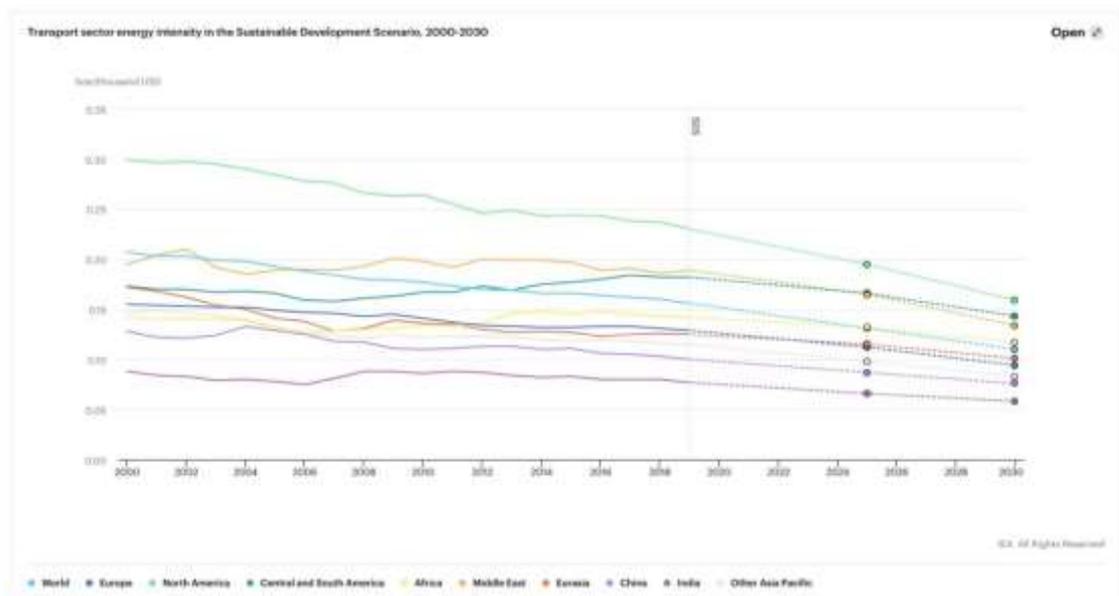
lanes, giving road prominence to shared mobility solutions such as bus and taxi lanes)

2.1.4. Legislating to ensure fuel available and new vehicles sold are less polluting.

2.1.5. Legislating the ban of internal combustion engines in cities³.

These policies have successfully reduced the rate of increase of carbon emission in cities.

Figure 2 – Transportation sector energy sensitivity in the sustainable development scenario



Data Source: <https://www.iea.org/reports/tracking-transport-2020>

The adoption of smart cards, mobile devices and smartphones is playing a key role in transforming consumer behaviour, driving the push for cities to become more connected and networked. With an increased number of wearables such as smartwatches and NFC-enabled devices, access to (and shareability of) information has increased greatly.

Thanks to internet connectivity, local communities have formed and the concept of sharing a car, bike or any form of transport no longer seems impossible. Also, such developments become important in polluted and heavily congested cities whose citizens are demanding better mobility and user experience.

Mobility is key to successful economic growth and, therefore, it is increasingly a priority for governments and public transportation authorities. However, investing in good public transport infrastructure is only part of the equation - to make public

³ See Annex 1, for table

transport services attractive to passengers, operators must simplify and streamline the collection of fares and provide easy and convenient payment options.

2.2. Sri Lankan Scenario

The Sri Lankan mobility situation needs to develop to support the Nation's quest for macro-economic development. Transport is around 5% of global GDP⁴. However, it is around 11% of GDP in Sri Lanka⁵. This statistic could be interpreted to mean that transportation in Sri Lanka is already expensive in global terms. The expenditure on transport feeds into every economic aspect and impacts the overall efficiency of the National economy in international terms.

Professor Amal Kumarage of the University of Moratuwa has estimated Sri Lanka's current travel speed in Colombo, in 2020 at 8kmph⁶. (Refer to Annex 5 for the PowerPoint extract)

Pollution in Sri Lanka is also a concern and the air quality in Colombo is often listed as 'Hazardous'⁷.

A leading factor driving this is the rapid increase in owned mobility.

⁴ <https://ec.europa.eu/jrc/en/research-topic/transport-sector-economic-analysis#:~:text=Transport%20plays%20an%20important%20role%20in%20today%27s%20economy,for%20about%205%25%20of%20gross%20domestic%20product%20%28GDP%29.>

⁵ Department of Census & Statistics, National Accounts Estimates. See Annex 3

⁶ Professor Amal Kumarage, University of Moratuwa. See Annex 5

⁷ <https://www.iqair.com/sri-lanka/western/colombo>

Figure 3 – Vehicle fleet based on ownership



Data Source: Amal S. Kumarage, [Urban traffic congestion: The problem & Solutions](#), *Asian Econ. Rev*⁶

All National Plans by the current Government reflect their commitment to a sustainable environment and their commitment towards achieving Net Zero by 2050, and they are one of 195 signatories to the Paris Agreement of 2015. At the Conference of Parties to the United Nation’s Framework Convention on Climate Change in Glasgow 2021, Sri Lanka resubmitted our Nationally Determined Contributions (NDC’s). This document is enclosed as Annex 4, and a summary of the transport related commitments are;

- I. Reinvigorating public transport
- II. Improving inter-modal connectivity between rail, road and water-based transit systems
- III. Improve traffic management
- IV. Move goods transport to rail
- V. Introduce LRT and improve existing railway
- VI. Encourage non-motorized transport
- VII. Promote E Mobility and enhance efficiency of existing vehicle fleet
- VIII. Reduce marine greenhouse gas emissions
- IX. Implement a National Transport Policy

2.3. Facilitating Efficient Mobility Systems

Transport and Logistics sector in Sri Lanka, in particular land-based transport, is predominantly run on the network of roads. The existing ecosystem is;

- I. Heavily reliant on manual interventions

- II. Uses 'cash' extensively as a payment tool for fare collection, toll collection etc.
- III. Could benefit much more from congestion management and route optimization information
- IV. Has much to offer in terms of contributing towards reduction of the country's carbon footprint
- V. Provides opportunity to significantly improve road safety for commuters, all these being components of a holistic sustainable transit system.

The return to normalcy post covid-19 pandemic and economic revival initiatives for Sri Lanka will/should incorporate a restoration strategy to resume and aim to deliver a safe and efficient public transport mechanism which relies heavily on data driven decision making. A clear example would be the 'scheduled route base bus operations' set up in Kandy under the world bank funded Strategic Cities Development Project (SCDP) for the Central Transport Authority in association with the Sri Lanka Transport Board.

The three key stakeholder groups in the "mobility sphere" are;

2.3.1. Commuters.

It is important to recognize that public as commuters represent a key pillar of stakeholders in public transit. Their expectations will no doubt include (but is not limited to) real time vehicle location information, remote seat reservations especially for intercity travel, contactless and cashless payment, online applications for license renewal, public parking payments etc. Commuters generally look for cheaper, faster, more convenient, and comfortable means of transport. There has been a gradual shift towards private ownership-based solutions because public transit has not adequately met such expectations.

2.3.2. Trade, Commerce and Merchandise movement

This group primarily linked to business sector, looks at cost, time, and efficiency. Any additional cost in logistics undoubtedly feeds into cost of doing business and impacts margins. It is believed that transport cost accounts for approx. 11% of GDP in Sri Lanka while it is 3% in Bangladesh which places a clear case for improved efficiency of our ecosystem to enhance our competitiveness.

2.3.3. The Government

Congestion and pollution are two key concerns for any government in addition to the dependency on fossil fuel for transport and logistics which is estimated to cost USD 4 billion per annum. Transit is said to account for approx. 44% of our national CO2 emissions. In addition to the above, collection of revenue from transit in a manner which is fast, convenient, and fraud proof also will no doubt contribute towards efficiency of the sector.

3. Stable, Efficient & Inclusive Payment System

The Central Bank of Sri Lanka has led an initiative to develop a regulatory framework for a transit payment mechanism. The framework set up is;

- Financial – Card issuer, transport provider and card acquirer to be remunerated 1% of each transaction
- Platform - Runs offline
- Regulatory - Accepts KYC/Non-KYC
- Medium - Issues as virtual card (embedded in mobile device)
- Conductor Cards – To be used when user cannot acquire a card, it is issued by conductor
- Season Cards – Existing cards to be converted

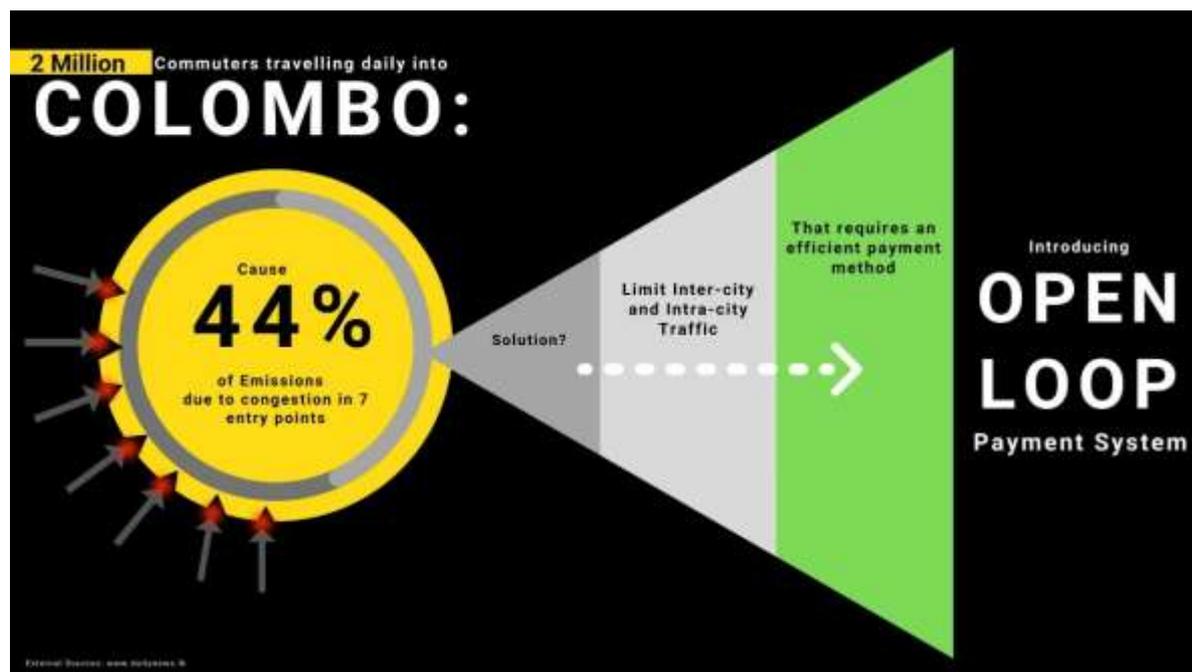
All global cities have adopted the hassle-free instant payment mechanism of ‘touch & go’ open loop payment gateways. The key reasons for this method of payment to be adopted are;

- I. International usability
- II. Usable across multiple platforms and service providers
- III. Totally contactless
- IV. Secure and transparent

Please refer to Annex 2, for more details on global adoption of an open Loop payment system.

4. Focus areas in establishing an efficient transit system

Figure 4 - Introducing open loop payment systems for daily commuters



Once a robust payment platform has been established, this platform can facilitate the digitization of the mobility eco system and unleash significant efficiencies in terms of congestion management, pollution control and deliver a much better commuter experience. The main areas that are,

- 4.1 Shared Mobility
- 4.2 Congestion Management
- 4.3 Incident Management
- 4.4 Public Parking

4.1 Shared Mobility

Shared mobility is the **shared use of a vehicle, motorcycle, scooter, bicycle, or other travel mode**. Shared mobility provides users with short-term access to one of these modes of travel as they are needed⁸.

In Sri Lanka, we have seen the price reduction of travel after the popularization of Uber and Pick Me. We have also seen the increased convenience of these services. The economics of shared mobility is based on the cost advantages derived from;

- I. Efficient Asset Utilization – A study shows that a privately owned vehicle has a utilization of 4% per day, and a shared mobility vehicle on average has utilization of 40% per day⁹. Based on this, a study conducted in Ann Arbor by the University of Michigan estimated that one ride sharing vehicle could displace 9-32 privately owned vehicles¹⁰.
- II. Shared mobility includes public transport such as the bus and the train, and even water-based transport that may emerge in Sri Lanka.
- III. The ability to combine modes of transport will enable further economic efficiency.

4.2 Congestion Management

4.2.1. City Entry Tariff

Cities like London and Singapore have been using congestion management mechanisms for decades. Charging a privately owned vehicle to come into the City of Colombo could be a means of driving the shift from owned to shared mobility. The fact that Colombo has seven corridors of entry aids this strategy. An open loop payment system will enable vehicles to move through the payment gateway much

⁸ <https://www.sae.org/shared-mobility> - Shared mobility is the shared use of a,these modes of travel as they are needed

⁹ RethinkX. *Rethinking Transportation 2020-2030*. May 2017. https://static1.squarespace.com/static/585c3439be65942f022bbf9b/t/591a2e4be6f2e1c13df930c5/1494888038959/RethinkX+Report_051517.pdf.

¹⁰ Serafeim George, Freiberg David, *The Future of Mobility – Economic, Environmental and Social Implications*, Harvard Business School, March 19, 2019 (9-118-008)

faster than in a physical payment system through use of contactless payment methods. A closed loop system can also facilitate this, but then it requires a separate card for this specific purpose, and requires money to be stored in an account and topped up regularly, manpower for collection etc.

4.2.2. Tiered Revenue Licenses

Levying a premium on vehicle revenue licenses that are authorized to enter the city during peak hours, can also assist the management of congestion and drive commuters to shared solutions.

A robust payment system can facilitate the payment of revenue licences, and facilitate a one-off peak city entry payment etc¹¹. This will also facilitate data collection and sharing of data and reduce both the use of paper and manpower.

Revenue Licensing can be charged and checked through a payment system.

4.2.3. Traffic Management

To again cite the example of Singapore, the use of CCTV cameras at points on the road system allow real time traffic data to be analyzed by algorithms and by traffic planners, to optimize traffic flow. This can be done through traffic light timing, alternate route suggestions communicated via LED screens, and even with the radio. Whilst there is no direct relevance to an open loop payment system here, better traffic management can reduce the accident rate in Sri Lanka and the road fatality which was 3,590 in 2018¹².

4.3 Incident Management

A digitized incident management mechanism is taking the management of the incident from the road where a motorist is stopped and having a discussion with a policeman. This will assist the flow of traffic and increase the transparency of traffic management. Traffic offences can be monitored and charged via the payment system - again allowing the deployment of manpower to other areas and reducing corrupt practices.

4.4 Public Parking

Parking is a significant deterrent away from owned mobility. Parking can be used twofold – by increasing cost and the other by limiting availability. Priority can be given for the parking of EV's. Reduced/ free parking should be provided for differently abled

¹¹ The link shows how London city entry tariff and congestion charge is levied via an open loop payment system
<https://tfl.gov.uk/modes/driving/congestion-charge>

¹² <https://www.worldlifeexpectancy.com/sri-lanka-road-traffic-accidents#:~:text=According%20to%20the%20latest%20WHO%20data%20published%20in,population%20ranks%20Sri%20Lanka%20%2396%20in%20the%20world.>

drivers and passengers being driven with a suitable badge to be displayed at the reserved parking slot.

A payment system can be used to facilitate payment for parking, a strategy that is used effectively in UK and many other countries¹³.

5. Key Take Home Points

Key Take Home Points for further action from discussion with stakeholders held on December 2, 2021

- Can existing cards in circulation be used for transit applications?
 - All Visa contactless cards in circulation in Sri Lanka issued after 2015 supports Account Based Ticketing transit payments.
 - Steps will be taken to obtain details of the number of cards in circulation that are compliant (issued after 2015) and the number of cards that are non-compliant (issued before 2015).
- Can the payment collection machines that bus operators already have in their possession be used with an open loop type payment system?
 - Visa to test a sample of the machines with bus companies for compliance with current transit open loop operation and based on this test to make recommendations of a way forward.
 - The device to be used at collection point could be given to the bus operator by the bank and so will not be a cost to the bus operator.
- Stakeholder Discussions:
 - Initiate a more detailed discussion between LCL, CBSL and other stakeholders where the guidelines set can be discussed in depth
 - At this discussion, the stakeholder acceptability of the set fee of 1% could also be an agenda item
- Costs cannot be passed onto the commuter
 - The DG NTC stressed that the commuter cannot bear the cost of issue of a card, which would not arise if existing cards could be used
- Non-nationals & KYC
 - Non-nationals can use the cards they have, in an open loop type system, and the issue of non KYC cards would then not arise

6. Conclusion

6.1. Recognise that digitalization of national transit is a progressive evolution and has to be implemented in stages.

¹³ <https://www.cityoflondon.gov.uk/services/parking/parking-tickets>

- 6.2. Recognise the need to cohabit with existing cash/ paper ticket-based solutions which need progressively to be phased out over a specified time (the same way small denominated coins and notes were phased out of circulation/ acceptance by the CBSL).
- 6.3. Recognise the need for and opportunity to, introduce digitalization of transit related payments using an 'open loop' solution rather than limited consumer choice with a single card solution.
- 6.4. Encourage the continuation of the current JCB linked card project while opening the 'loop' to accommodate any debit/ credit card supported by a card payment company (such as Visa, Mastercard) approved by the CBSL.
- 6.5. Deploy "Point of Sale" devices at transit points which are QR code enabled so that we parallelly promote CBSL's quest to promote QR code linked payment alongside card-based solutions.
- 6.6. Open the payment loop of National Transit to also accept Mobile device linked (Lanka Clear accredited) wallets such as Dialog Ez Cash, Mobitel Mcash and Bank led payment apps such as HNB Solo, Combank Q +, Peoples Bank PeopleWave etc.
- 6.7. Continue Engagement with NTC, Lanka Clear and Central Bank on mapping the future of digitalizing National Transit beyond fare collection covering aspects such as congestion management, traffic fines, parking fees, annual licensing fees, Electric/ hybrid vehicle charging fees, route optimization, CO2 emission reduction tracking etc. Visa/ PathFinder is pleased to partner with NTC in such a mapping exercise to bring best in class 'use case' examples from the region.
- 6.8. Link the approval of local, inter district, inter provincial approvals to transport timber and other products under licensing to the smart phone QR which can be (paperless) shown/scanned at any checkpoint/ toll gate to facilitate smooth, fast and efficient movement of goods.
- 6.9. Visa is also pleased to introduce a senior resource from a major National Transit Authority to share insights on the road map implemented, challenges encountered, lessons learned etc.
- 6.10. The Government has given a clear direction towards the reclamation of land in developing the Port City and now established a governance framework under the Port City Commission. It is opportune timing to link the Policy Road map of Transit with Port City Development to ensure that this important new urban township benefits from digitalisation in areas such as contactless mobility, payments, traffic / congestion management, zoned parking and Zero carbon emission tracking etc.

7. Annexes

Annex 1: Tables & map showing timeline for the country banning of ICE's

Country	Year	Source
Brussels, Belgium	2035	https://www.forbes.com/sites/davekeating/2019/10/27/brussels-to-ban-conventional-cars-by-2035/?sh=7eb8f7005970
Canada	2035	https://interestingengineering.com/canada-is-banning-internal-combustion-engines-but-what-about-the-cold
Britain	2030	https://interestingengineering.com/canada-is-banning-internal-combustion-engines-but-what-about-the-cold
Norway	2025	https://interestingengineering.com/canada-is-banning-internal-combustion-engines-but-what-about-the-cold
Chile	2035	https://www.electrive.com/2021/10/18/chila-to-ban-sale-of-internal-combustion-engines-in-2035/
China	2035	https://www.weforum.org/agenda/2020/11/china-bans-fossil-fuel-vehicles-electric/
France	2040	https://www.weforum.org/agenda/2020/11/china-bans-fossil-fuel-vehicles-electric/
Germany	2040	https://www.weforum.org/agenda/2020/11/china-bans-fossil-fuel-vehicles-electric/
Ireland	2030	https://www.weforum.org/agenda/2020/11/china-bans-fossil-fuel-vehicles-electric/
Netherlands	2030	https://www.weforum.org/agenda/2020/11/china-bans-fossil-fuel-vehicles-electric/
Spain	2040	https://theicct.org/blog/staff/global-ice-phaseout-nov2020
Cape verde	2035	https://theicct.org/blog/staff/global-ice-phaseout-nov2020

Governments with set targets for phasing out all new sales of internal combustion engine passenger cars

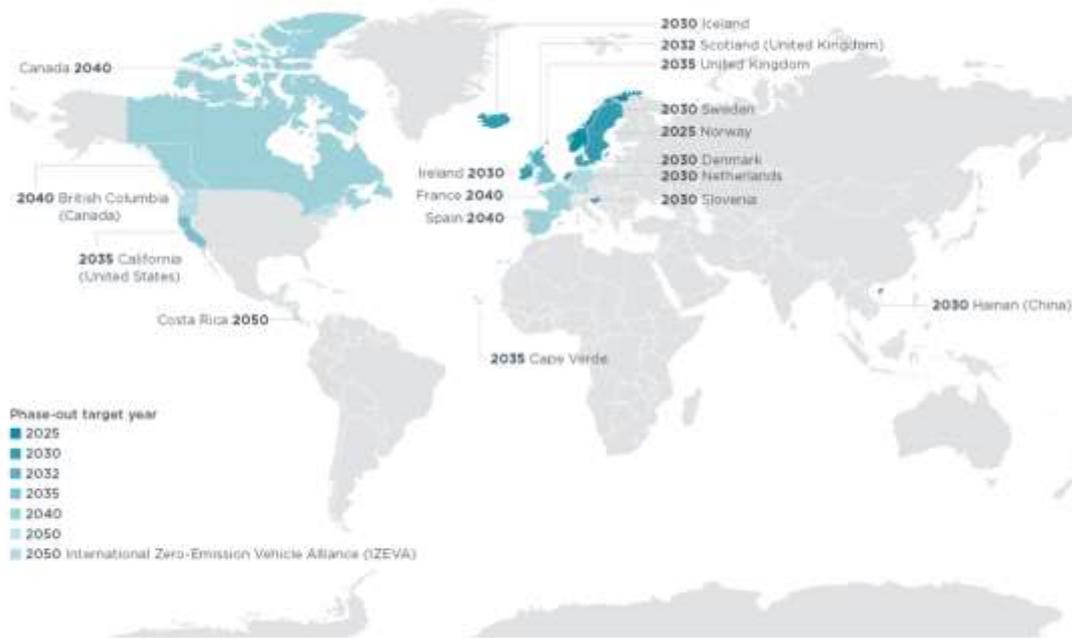


Figure 1. National, provincial, and state governments with defined targets to fully phase out sales of new ICE cars.

Government	Year	Vehicle category*	Target vehicle types*	Policy document**
EUROPE				
Norway	2025	Passenger cars, light commercial vehicles, urban uses	New vehicle sales 100% zero-emission	National Transport Plan 2018-2029 (2017)
Netherlands	2025	Urban buses	New vehicle purchases 100% zero-emission	Mission Zero (2019)
	2030	Passenger cars	New vehicle sales 100% zero-emission	
Denmark	2030	Passenger cars	No new gasoline or diesel vehicle sales	Climate and Air Plan (2018)
	2035		No new gasoline, diesel, or plug-in hybrid vehicle sales	
Iceland	2030	Passenger cars	No new gasoline or diesel vehicle registrations	Iceland's Climate Action Plan for 2018-2030 (2018)
Ireland	2030	Passenger cars	No sales of new fossil fuel vehicles	Climate Action Plan 2019 (2019)
Slovenia	2030	Passenger cars, light commercial vehicles	No new registrations of vehicles with CO ₂ emissions above 50 g/km	Market Development Strategy for the Establishment of Adequate Alternative Fuel Infrastructure in the Transport Sector in the Republic of Slovenia (2017)
Sweden	2030	Passenger cars	No sales of new gasoline or diesel vehicles	Climate Policy Action Plan (2019)

Scotland (United Kingdom)	2032	Passenger cars, light commercial vehicles	No sales of new gasoline or diesel vehicles	Climate Change Plan (2018)
United Kingdom	2035	Passenger cars, light commercial vehicles	No sales of new gasoline, diesel, or hybrid vehicles	Consulting on ending the sale of new petrol, diesel, and hybrid cars and vans (2020)
France	2040	Passenger cars, light commercial vehicles	No sales of new fossil fuel vehicles	Mobility Guidance Law (2019)
Spain	2040	Passenger cars, light commercial vehicles	New vehicle sales 100% zero-emission	Draft Law on Climate Change and Energy Transition (2020)
Germany, Baden-Wuerttemberg (Germany)	2050	Passenger cars	New vehicle sales 100% zero-emission	IZEVA commitment (2015), not yet reflected in national Climate Protection Plan
NORTH, CENTRAL, and SOUTH AMERICA				
California (United States)	2035	Passenger vehicles, light-duty trucks	New vehicle sales 100% zero-emission	Executive Order (2020)
Colombia	2035	Public transport	New purchases 100% electric or zero-emission	Law for the Promotion of Electric Vehicles in Columbia (2019)
British Columbia (Canada)	2040	Light-duty vehicles (passenger cars, light commercial vehicles)	New vehicle sales and leases 100% zero-emission	Zero-Emission Vehicles Act (2020)
Canada	2040	Light-duty vehicles (passenger cars, light commercial vehicles)	New vehicle sales 100% zero-emission	Canada's Federal Budget (2019)
Costa Rica	2050	Light vehicles (passenger cars, light commercial vehicles)	New vehicle sales 100% zero-emission	National Decarbonization Plan (2019)
Connecticut, Maryland, Massachusetts, New Jersey, New York			New vehicle sales	IZEVA commitment (2015), not yet reflected in official state or

Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, Vermont, Washington (United States)	2050	Passenger cars	New vehicle sales 100% zero-emission	IZEVA commitment (2015), not yet reflected in official state or provincial-level strategic documents
California, Connecticut, Colorado, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, District of Columbia (United States)	2050	Medium- and heavy-duty vehicles	New vehicle sales 100% zero-emission	Memorandum of understanding (2020), not yet reflected in official strategic documents
ASIA				
Hainan (China)	2020	Government and car-sharing vehicles, light-duty trucks	New vehicle sales 100% electric	Clean Energy Vehicle Development Plan (2019)
	2020	Buses, ride-hailing vehicles	No sales of new gasoline or diesel vehicles	
	2025	Coaches, rental cars	No sales of new gasoline or diesel vehicles	
	2030	Private cars	New vehicle sales 100% electric	
Israel	2030	Private vehicles	New vehicle sales 100% electric	Energy Economy Objectives for the Year 2030 (2018)
AFRICA				
Cape Verde	2035	Passenger cars, light commercial vehicles, buses, medium and heavy trucks, two-wheelers	No imports of internal combustion engine vehicles using fossil fuels (gasoline or diesel)	Electric Mobility Policy Charter (2019)

Source: <https://theicct.org/blog/staff/global-ice-phaseout-nov2020>

Annex 2: Open Loop payment systems vs Closed Loop Payment Systems

Open loop only	Closed loop only
Cuba	Vatican city
Ghana	Chad
Haiti	Comoros
Iraq	Eritrea
Kosovo	Marshall Islands
Lebanon	Nauru
Liberia	Tuvalu
Libya	
Macedonia	
Pakistan	
Palestinian territories	

Sudan	
Syria	
Timor-Leste	
Trinidad & Tobago	
Afghanistan	
Puerto Rico	

Note: Rest of the countries have a mixed loop system.

Sources used to arrive at the above consolidated list;

- 1) List of countries where Visa, Mastercard and AMEX used;
<https://merchantmachine.co.uk/visa-mastercard-amex/>,
<https://wallethub.com/answers/cc/most-widely-accepted-credit-card-2140668987/>
- 2) [Countries with the Eurail train pass which provides a global pass to travel to certain countries within Europe through train](#)
- 3) [Countries which use smart transport cards](#)
- 4) [Countries where PayPal is available](#)

Annex 3: Department of Census & Statistics, National Accounts Estimates

GDP at constant prices Rs Mn										
Source: Census & Stats: national Accounts Estimates Table 11										
Gross Value Added (GVA) by economic activity (SLSIC)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Agriculture, Forestry and Fishing	544,914	569,954	592,443	611,676	639,696	669,725	644,655	642,159	683,816	687,857
Growing of Cereals (except rice)	10,548	10,593	12,521	14,307	13,969	14,984	13,158	11,503	11,736	10,615
Growing of Rice	60,086	70,205	62,289	65,607	61,019	76,293	52,388	48,648	70,380	70,169
Growing of Vegetables	47,704	52,349	51,244	54,153	55,244	56,730	58,349	55,240	57,439	58,298
Growing of Sugar cane, tobacco and other non-perennial crops	2,442	2,142	2,254	2,441	2,287	1,882	2,347	2,044	1,820	1,973
Growing of fruits	36,610	37,791	38,248	37,385	40,888	48,038	46,512	49,961	55,654	60,399
Growing of Oleaginous Fruits (Coconut, king coconut, Oil palm)	60,231	57,110	62,201	53,424	64,158	67,514	66,971	53,773	57,577	68,062
Growing of Tea (Green leaves)	72,208	71,769	72,100	74,734	73,936	72,051	63,972	66,879	67,141	66,300
Growing of other beverage crops (Coffee, Cocoa etc..)	1,295	1,287	1,319	1,321	1,538	1,259	1,354	1,268	1,592	1,219
Growing of spices, aromatic, drug and pharmaceutical crops	28,468	28,147	44,426	50,833	57,505	60,797	62,931	63,200	66,914	66,223
Growing of rubber	44,411	45,956	44,249	37,987	28,688	25,783	23,028	24,165	24,085	21,807
Growing of other perennial crops	14,496	14,666	15,167	14,344	15,402	16,839	16,484	16,717	16,303	16,255
Animal Production	27,230	26,359	29,511	36,599	47,950	51,857	55,631	58,729	63,418	65,440
Plant propagation and agricultural supporting activities	8,533	8,436	9,105	9,183	9,767	10,421	10,210	9,238	9,258	8,675
Forestry and Logging	43,339	42,505	38,188	43,044	47,450	48,362	52,485	62,545	62,020	59,036
Marine fishing and Marine Aquaculture	77,579	89,575	97,063	103,879	105,822	104,413	105,100	103,043	102,175	96,589
Fresh water fishing and Fresh water Aquaculture	9,737	11,065	12,560	12,435	14,072	12,503	13,735	15,208	16,304	16,797
Industries	1,708,867	1,866,947	2,035,601	2,119,080	2,218,711	2,267,725	2,396,833	2,509,421	2,540,315	2,608,211
Mining and quarrying	124,926	148,100	184,468	198,447	201,613	191,145	217,577	237,827	225,505	231,893
Manufacture of food, beverages & Tobacco products	433,769	487,943	507,121	507,127	513,960	528,821	529,786	534,924	556,140	574,888
Manufacture of textiles, wearing apparel and leather related products	264,905	238,254	244,496	264,527	276,800	282,719	289,001	304,090	314,442	326,803
Manufacture of wood and of products of wood and cork, except furniture	26,318	31,521	23,472	25,258	23,139	27,320	32,855	32,909	33,845	31,178
Manufacture of paper products, printing and reproduction of media products	26,094	27,605	24,738	24,925	24,968	27,728	30,283	31,885	32,226	30,803
Manufacture of coke and refined petroleum products	22,281	35,457	28,858	27,514	28,723	29,075	31,245	29,743	27,312	33,694
Manufacture of chemical products and basic pharmaceutical products	69,450	67,644	75,582	81,982	82,243	83,179	90,095	93,552	96,761	100,511
Manufacture of rubber and plastic products	63,257	75,656	83,307	82,187	71,909	76,144	77,055	86,202	88,147	83,009
Manufacture of other non-metallic mineral products	79,267	86,204	87,090	81,037	78,671	75,191	69,660	77,821	85,031	85,341
Manufacture of basic metals and fabricated metal products	31,665	26,295	24,591	26,589	24,882	28,953	38,577	43,862	48,111	46,328
Manufacture of machinery and equipment i.e.	35,909	33,650	30,849	30,845	32,064	38,848	46,610	50,967	52,075	52,578
Manufacture of furniture	56,402	53,352	63,922	67,488	82,748	94,489	96,303	97,920	100,302	100,797
Other manufacturing, and Repair and installation of machinery and equipment	48,660	34,555	41,962	44,443	55,993	68,509	70,923	76,943	78,408	75,404
Electricity, gas, steam and air conditioning supply	68,491	73,927	75,262	76,789	80,298	85,202	92,356	94,803	100,382	104,437
Water collection, treatment and supply	9,381	9,846	10,554	10,975	11,504	12,023	12,972	13,562	14,351	15,139
Sewerage, Waste, treatment and disposal activities	11,712	12,141	14,572	15,511	17,355	21,681	25,539	28,316	30,207	32,403
Construction	336,381	424,798	514,757	553,438	611,842	596,697	645,994	674,097	657,070	683,371
Services	3,504,323	3,817,155	4,245,461	4,405,644	4,618,501	4,894,717	5,127,616	5,313,435	5,555,303	5,680,757
Wholesale and retail trade	705,778	788,048	848,686	859,977	884,094	933,216	957,088	993,667	1,040,360	1,071,847
Transportation of goods and passengers including Warehousing	662,153	745,891	805,391	849,539	885,506	931,529	982,703	1,013,857	1,034,755	1,049,566
Postal and courier activities	4,066	4,068	4,441	4,364	4,056	4,052	4,260	4,425	4,485	4,752
Accommodation, Food and beverage service activities	87,693	105,372	134,160	126,392	131,481	134,017	139,443	146,432	154,794	147,671
Programming and broadcasting activities and audio video productions	2,526	2,178	2,252	2,422	2,513	2,624	2,831	2,804	2,519	2,639
Telecommunication	22,931	24,420	26,450	27,395	30,986	34,146	36,984	41,503	45,830	53,695
IT programming consultancy and related activities	6,194	7,216	7,972	9,693	10,579	12,148	13,015	13,564	15,072	17,044
Financial Service activities and auxiliary financial services	274,933	314,678	364,688	386,009	420,223	493,785	554,564	606,512	687,918	701,880
Insurance, reinsurance and pension funding	67,830	67,596	69,026	70,854	74,978	82,013	92,172	95,925	112,493	118,987
Real estate activities, Including Ownership of dwelling	307,112	328,076	369,719	417,024	444,049	489,352	520,085	544,733	566,078	579,601
Professional services	112,062	127,358	155,741	161,963	166,486	154,266	152,229	158,755	165,550	169,523
Public administration and defense; compulsory social security	383,823	367,093	385,615	382,470	402,205	430,105	452,586	430,672	428,022	437,065
Education	138,553	136,172	167,107	157,477	173,751	159,875	171,830	172,701	179,524	185,116
Human health activities, Residential care and social work activities	136,574	155,994	173,898	146,551	147,962	160,056	162,405	174,155	179,356	182,777
Other personal service activities	592,095	642,995	730,316	803,514	839,633	873,534	885,421	913,729	938,547	958,592
Equals Gross Value Added (GVA), at basic prices	5,758,104	6,254,056	6,873,506	7,136,401	7,476,908	7,832,167	8,169,103	8,465,015	8,779,434	8,976,825
(+) Taxes on products	687,833	737,357	748,362	744,923	791,696	857,040	894,210	920,927	927,445	950,026
(-) Subsidies on products	32,269	38,693	33,351	35,121	33,174	41,373	27,483	26,795	38,279	37,473
Equals Gross Domestic Product (GDP), at constant market prices	6,413,668	6,952,720	7,588,517	7,846,202	8,235,429	8,647,833	9,035,830	9,359,147	9,668,600	9,889,379
Taxes less subsidies on products	655,564	698,664	715,011	709,801	758,521	815,667	866,727	894,132	889,166	

Note: * Gross Value Added (GVA) is at Basic Prices and GDP is at Market Prices

Key Highlights of Sri Lanka's Nationally Determined Contributions and Vision for a Low Carbon Future

Sri Lanka is highly vulnerable to the adverse impacts of climate change. The country focuses on building the resilience of **Agriculture, Fisheries, Livestock, Health, Water, Biodiversity, Coastal and Marine, Tourism, Urban Planning and Human Settlement** sectors

Sri Lanka's per capita greenhouse gas emission in 2010 was **1.02** tons and its global cumulative contribution in 2019 was **0.03%**.

Despite this low carbon footprint and highly vulnerable status, Sri Lanka commits to increase **32%** forest cover by 2030 and reduce greenhouse emissions by **14.5%** for the period of 2021-2030 from **Power (electricity generation), Transport, Industry, Waste, Forestry, and Agriculture**

In order to realize this ambitious target, Sri Lanka further commits;

- To achieve **70%** renewable energy in **electricity generation** by 2030
- To achieve **Carbon Neutrality** by 2050 in electricity generation
- **No** capacity addition of **Coal** power plants

Sri Lanka has already launched following major initiatives;

- Adopting 'Colombo Declaration on Sustainable Nitrogen Management' with an ambition to halve nitrogen waste by 2030
- Banning agro-chemicals and chemical fertilizer
- Promoting organic fertilizer and farming
- Banning single-use plastics
- Promoting E-mobility
- Promoting circular economy

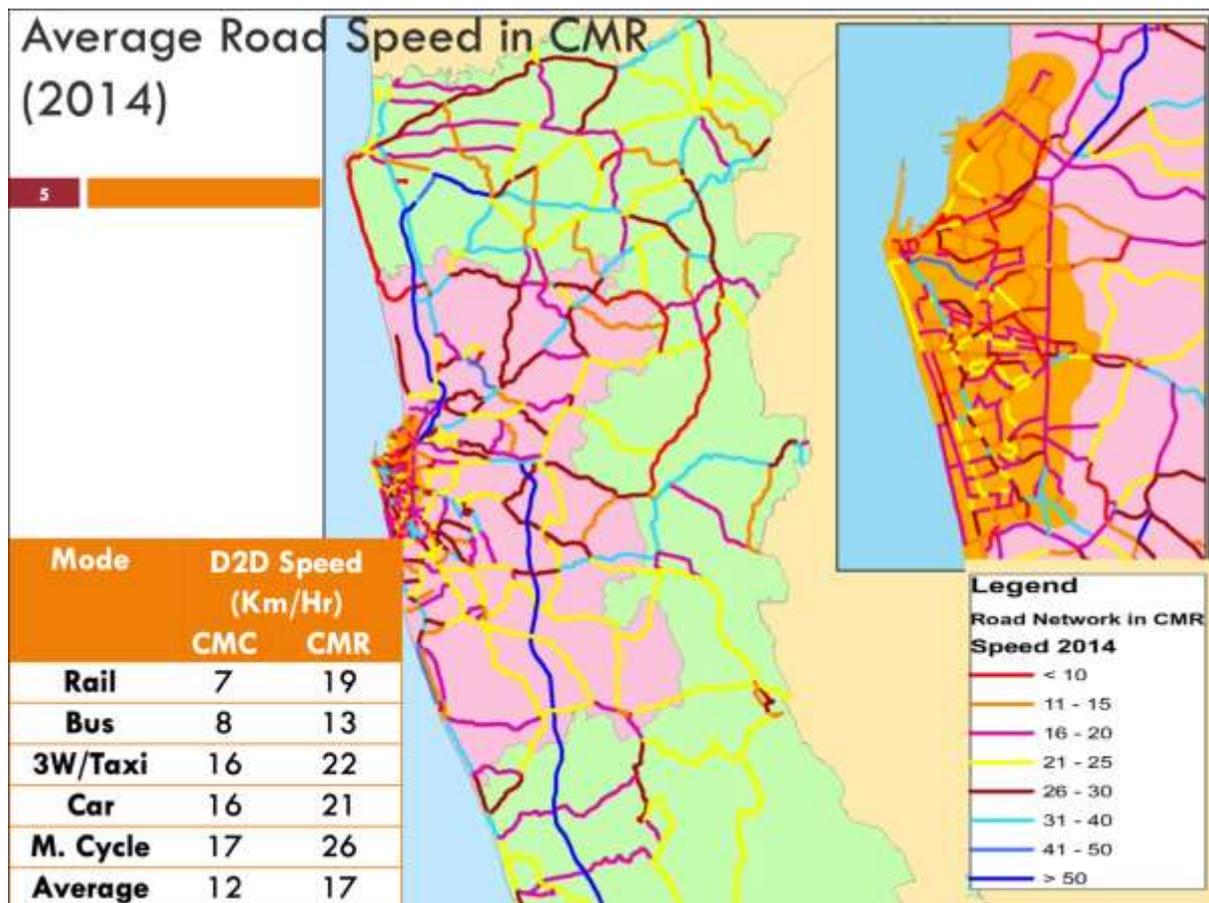
Sri Lanka expects to achieve its **Carbon Neutrality** by 2060

NDC's specific for the transport sector

NDC #	NDCs and Actions	Timeline
NDC 1	Transport sector system improvement	2021-2030
	1.1 Avoid the need to travel	2021-2030
	1.2 Reduce commuting distances and travel time	2021-2030
	1.3 Improve traffic and traffic light management	2021- 2030
	1.4 Improve parking management	2021- 2030
	1.5 Introduce intelligent transport management systems	2021-2030
	1.6 Improve road architecture (road designs, road signs, signaling, signage, etc.)	2021-2030
NDC 2	Promote public passenger transport	2021-2030
	2.1 Improve public road transport for reliability, affordability, accessibility, availability, comfort and safety	2021-2030
	2.2 Improve railway transport for reliability, affordability, accessibility, availability, comfort and safety	2021-2030
	2.3 Integrate transport modes	2021-2030
	2.4 Improve last mile connectivity	2021-2030
NDC 3	Shift freight to efficient modes	2021-2030
	3.1 Switch back to rail from road transport	2021-2030
	3.2 Promote transporting petroleum products by pipeline	2021-2030
	3.3 Introduce rail-based transport system with inland container depots	2021-2030
NDC 4	Rapid transport for passenger transport	2021-2030
	4.1 Introduce Light Rail Transport in Colombo city	2021-2030
NDC 5	Promote non-motorized transport modes	2021- 2030
	5.1 Promote the use of bicycles	2021-2030
	5.2 Improve the facilities for pedestrian walkways	2021-2030
NDC 6	Introduce taxes and other instruments to promote public transport	2021- 2030
	6.1 Change the existing vehicle emission charging system from the present vehicle based to vehicle type, fuel used and emission-based system plus the total km travel	2021-2030
	6.2 Restrict the entry of individual modes of transport to sensitive areas and congested areas of major cities during peak hours through a levy	2021-2030
	6.3 Develop park and ride infrastructure developments combined with Corden based pricing mechanism	2021-2030
NDC 7	Introduce inland water transport modes	2021-2030
	7.1 Introduce canal-based water transport using diesel or grid electricity-powered boat service for selected canal routes	2021-2030
NDC 8	Modernizing and upgrading of suburban railway	2021-2030
	8.1 Electrification of railway lines	2021-2030
	8.2 Develop new railway lines and expansion of existing railway network	2021-2030
NDC 9	Promote electric mobility and hybrid vehicles	2021-2030
	9.1 Increase tax concessions for electric & hybrid vehicles	2021-2030
	9.2 Facilitate supportive infrastructure developments such as charging stations, battery swapping & replacements	2021-2030
	9.3 Tax & Duty concessions for batteries used for electric and hybrid vehicles after introducing a specific HS code	2021-2030
NDC 10	Improve vehicle fleet efficiency	2021-2030
	10.1 Improve efficiencies of the existing vehicle fleet	2021-2030
	10.2 Promote the import of fuel-efficient vehicles	2021-2030
	10.3 Introduce programmes to change driver behaviours	2021-2030

NDC 11	Road infrastructure development	2021-2030
	11.1 Development of provincial and rural road infrastructure for improved mobility	2021-2030
	11.2 Expansion of expressway network	2021-2030
NDC 12	Reduce GHG emissions from the marine sector	2021-2030
	12.1 Ratify Annex VI of MARPOL convention to enforce provisions in Sri Lanka	2021-2030
	12.2 Study the impact of shipping on GHG emissions (coastal traffic and ports) depending on evidence-based information and introduce measures to address the issues	2021-2030
	12.3 Promote sea transportation	2021- 2030
	12.4 Introduce energy efficiency measures and fuel quality improvement programmes to coastal shipping and fishing boats and vessels	2021- 2030
NDC 13	Generic enabling activities	2021-2030
	13.1 Introduce new national policy or make amendments to relevant existing policies to promote environmentally sustainable transport modes including electric mobility and hybrid vehicles	2021-2030
	13.2 Introduce fuel-based carbon tax	2021-2030
	13.3 Include climate change measures in maritime policy making	2021-2030

Annex 5: Extract from presentation by Prof Amal Kumarage, University of Moratuwa (2017)



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