

Sustainable Freight Transport in Sri Lanka



This document was prepared by Transport Connectivity and Logistic Section (TCLS) Transport Division of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) under United Nations Development Account project titled- Enhancing Shift towards Sustainable Freight Transport in Asia and Pacific being implemented by ESCAP.

The draft has been prepared by Paul Apthrop, Consultant and was reviewed by Sandeep Raj Jain, Transport Division. Based on the study recommendations, a draft sustainable freight transport strategy 2030 for Sri Lanka was prepared and is currently under the considerations of the Government of Sri Lanka.

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This is issued without formal editing

2022

EXECUTIVE SUMMARY

The study aims to encourage the Government of Sri Lanka and other relevant stakeholders to make freight transportation planning, policy, and investment decisions based on the three dimensions, or pillars, of sustainable development: the environmental, economic, and social dimensions (also known in economics as the triple bottom line). This study uses an understanding of the three dimensions and their interlinkages as conveyed by United Nations Conference on Trade and Development and the 2030 Agenda for Sustainable Development, including its 17 global Sustainable Development Goals (SDGs). A comprehensive desk study was conducted to inform the content of this study, consulting a wide variety of government, United Nations, and other available material.

The study aims to help guide the integration of sustainable freight transportation planning efforts—vertically among levels of government and horizontally across modes—with a balanced development of modes. It also aims to support institutional, legal, and regulatory frameworks that promote effective and sustainable freight transportation; to build capacity among transportation planners; and to promote diversified funding sources and transformative transportation technologies.

There is a special emphasis in this study on emissions reduction, including greenhouse gas (GHG) emissions (primarily CO₂ in this context). With over 20 per cent of global CO₂ emissions being derived from transportation and 40-50 per cent of that percentage coming from the transportation of freight, it is important to target the sector in the fight against climate change.

This is particularly relevant to Sri Lanka as the country's total freight transportation in ton-km continues to rise amid an outdated trucking fleet, a lack of economies of scale, poor road conditions and congestion, limited modal share, and a dependence on imported fuel. All these factors contribute to emissions, negative externalities, and economic losses that can otherwise be avoided in a world where Sri Lanka stands as one of the most vulnerable countries to GHG-induced climate change.

There is also a special emphasis in the study on the role of the Port of Colombo. As the preeminent port in South Asia, it figures prominently in the revenue generation, economy, and future of Sri Lanka. Rising to meet the challenges that come with the ever-growing number of port calls is thus important. Simplified customs formalities are central to the international transport of goods and their role in freight transportation has been underlined.

The study is divided into Sections 1-5 that feed into Section 6, where the challenges to sustainable freight transportation in Sri Lanka are articulated. **Section 1** provides a background. In this section the impetus behind this study is briefly summarized, while an economic outlook and energy overview provide some context behind two these import elements to freight transportation. Sustainable freight transportation is an important component of better trade efficiency and logistical performance and is thus important for Sri Lanka's continued development as limited economic complexity and stagnating exports necessitate changes in these areas.

Section 2 then provides a comprehensive overview of sustainable freight transportation in Sri Lanka by exploring where it is at today, the issues at hand, and the gaps between the current situation and aspirational sustainable future. This overview is primarily presented through the lens of two frameworks: the SDGs and the avoid-shift-improve framework. Some SDGs identified as relevant to sustainable freight transportation include SDGs 3.6 (road traffic accidents), 3.9 (air pollution), 7.3 (energy efficiency), 9.1 (infrastructure), 11.2 (accessible and sustainable transportation systems), 11.6 (air quality), 12.c (fossil-fuel subsidies), 13.1 (climate change adaptation and resilience), and 13.2 (climate change policies, strategies, and planning).

Upon review of these SDGs, some identified bright spots are Sri Lanka's relatively good air quality, a high density of roads and rail lines, the continued development of its nascent expressway network, a drop in the transportation sector's emission intensity, high container throughput at the port of Colombo, and a strong recognition of the issues at hand. However, noted issues are equally abundant. They include—among others—rising CO₂ emissions from the transportation sector, a badly outdated railway system, congestion in the Colombo metropolitan region, and unsafe driving conditions stemming from deficiencies in enforcement and road conditions.

Next, the SDG's means of implementation (MoI) are reviewed in Sri Lanka's context. The MoI include data, statistics, and monitoring; policy and institutional coherence; trade; science, technology, and innovation (STI); and financing for development. In summary, the study found that, while there are some bright spots, progress is needed in bridging sustainable freight data gaps (see Table 10), diversifying funding (including greater access to finance for small and medium-sized enterprises), applying STI, and improving inter-ministerial dialogue on cross-cutting issues.

After this, Section 2.A.2 explores freight transportation in Sri Lanka through the lens of the avoid-shift-improve framework. Bottlenecks in its road network capacity and the prevalence of older, smaller rigid trucks factor against *avoiding* freight movements and distance travelled and against *improving* energy efficiency. Meanwhile, over 90 percent of freight is moved via road. *Shifting* some of this modal share to rail (that can be a cost effective and emissions reducing alternative to road) encounters issues as Sri Lanka's railway network is both more passenger-oriented and not suitable for freight transportation at this moment in time. Compounding this is a need for more intermodal facilities.

Section 2.B moves on to describe recent government initiatives that intersect with freight transportation. Some notable projects include the Integrated Road Investment Program, the Central Expressway, the Ruwanpura Expressway, and the Southern Railway Extension Project. Section 2.C then highlights the role of the private sector in Sri Lanka's freight transportation. While many private entities are involved in freight transportation and provide a wide range of services, there are yet investment opportunities to be had and practices that can be adopted that can facilitate a shift towards sustainable freight transportation.

Next, Section 2.D describes the role that public-private partnerships (PPPs) can play in helping governments construct infrastructure. Already, 86 PPP projects in Sri Lanka have reached financial closure since 1990. However, according to scorings by the World Bank, Sri Lanka's PPP preparedness is still subject to some improvement. Finally, wrapping up Section 2 is Section 2.E, which presents a table of gaps. Using the frameworks from Sections 2.A.1 and 2.B.2, an aspirational future for freight transportation can be visualized. Pairing this vision against the background and overview presented in Sections 1 and 2, numerous gaps between the present and desired future can be identified.

Following this, **Section 3** links Sri Lanka's policies, plans, visions, strategies, and international commitments to sustainable freight transportation. A full list can be found in Sections 3.A and 3.B. For more details on the portions that are relevant to freight transportation in one way or another, see Appendix 10.

Section 4, meanwhile, supplements this study. Section 4.A elaborates more on the key pillars of sustainable freight transportation or, in other words, the three dimensions of sustainable development as they relate to freight through a wide range of considerations. Next, Section 4.C provides a list of prospective performance indicators that can be used to measure progress towards sustainable freight transportation, organized under both the MoI and key pillars.

Section 5 then provides a brief, yet concise, overview of the impacts of COVID-19 on Sri Lanka. Like most countries, the economy of Sri Lanka had taken a hard hit. Global disruptions to the supply chain, lockdowns,

and travel restrictions have all had the effect of hurting key industries in Sri Lanka. Tourism has decreased and exports have fallen. The year 2020 also saw negative growth in container throughput at the Port of Colombo, against trends where numbers doubled in the last decade. This has all had a negative impact on the economy and revenue of Sri Lanka. However, the pandemic has also had the positive effect of accelerating paperless customs processes that had already existed in some form or another prior to the pandemic.

Coming together, **Section 6** articulates the main challenges to sustainable freight transportation in Sri Lanka. These have been identified as: Costs, Access to Finance, Systems Upgrades (e.g. Intermodal Networks, Railways, Rural Roads, and the Port of Colombo), E-commerce, Technology Platforms, Replacing the Aging Rigid Trucking Fleet, Scrapping Older Vehicles, Operator Resistance, Customs, and Enforcement and Driver Attitudes.

Abbreviations

| | |
|------------------------------------------------------------------------|--------|
| Asian Development Bank | ADB |
| Colombo International Container Terminal | CICT |
| Container Freight Station | CFS |
| Colombo Metropolitan Region | CMR |
| Electronic Data Interchange | EDI |
| Environmental Impact Assessment | EIA |
| Environmental Performance Index | EPI |
| Electronic Toll Collection | ETC |
| Export Processing Zones | EPZ |
| United Nations Economic and Social Commission for Asia and the Pacific | ESCAP |
| Foreign Direct Investment | FDI |
| Full Container Load | FCL |
| International Federation of Freight Forwarders Associations | FIATA |
| Gross Domestic Product | GDP |
| Green Freight Asia | GFA |
| Greenhouse Gas | GHG |
| Global Logistics Emissions Council | GLEC |
| Inland Container Depot | ICD |
| Initial Environmental Examination | IEE |
| International Finance Corporation | IFC |
| International Maritime Organization | IMO |
| International Sovereign Bond | ISB |
| Intelligent Transportation System | ITS |
| Key Performance Indicator | KPI |
| Less-Than-Container Load | LCL |
| Liquefied Natural Gas | LNG |
| Logistics Performance Index | LPI |
| Less-Than-Truckload | LTL |
| International Convention for the Prevention of Pollution from Ships | MARPOL |
| Multi-Country Consolidation | MCC |
| Marine Environment Protection Committee | MEPC |
| Means of Implementation | MoI |
| Monitoring, Reporting, and Verification | MRV |
| National Adaptation Plan for Climate Change | NAP-CC |
| National Council for Road Safety | NCRS |
| Nationally Determined Contribution | NDC |
| National Export Strategy | NES |
| National Road Master Plan | NRMP |
| Particulate Matter | PM |
| Public–Private Partnership | PPP |
| Rural Access Index | RAI |
| Road Development Authority | RDA |
| Road Safety Fund | RSF |
| Roll On/Roll Off | RoRo |
| Social Impact Assessment | SIA |
| Sustainable Consumption and Production | SCP |
| Sustainable Development Goals | SDGs |
| Sri Lanka Logistics and Freight Forwarders Association | SLFFA |
| Sri Lankan Port Authority | SLPA |
| Sri Lankan Railways | SLR |

| | |
|----------------------------------------------------|---------|
| Small and Medium-Sized Enterprise | SME |
| Science, Technology, and Innovation | STI |
| Sustainable Mobility for All | Sum4all |
| Twenty-Foot Equivalent Unit | TEU |
| United Nations Conference on Trade and Development | UNCTAD |
| United Nations Development Programme | UNDP |
| World Health Organization | WHO |
| Western Region Megapolis Development Plan | WRMDP |

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1. BACKGROUND

The preoccupation with the sustainability of freight transport is a long-standing one. It is rapidly becoming a highly pressing issue owing to the escalating negative externalities caused by the transport sector. Meanwhile, there is a significant potential for improving the freight transport sustainability in the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) region. Railways and inland navigation still play an important part in the freight operations of many countries in the region but have lost a significant share to road transport. However, technological improvements in inland navigation and railways, if fostered and financed, are likely to significantly enhance their economic performance and, thus, competitiveness. Technology and innovation also continuously enhance the sustainable performance of the road sector, in some ways attenuating the need for changing the overall modal split.

Given the challenges ahead and the scope of them, there exists a strong case for dedicated national and regional policies in favor of the sustainable freight transport and numerous requirements that such policies should meet to be effective in terms of political capital and technical knowledge and capacities. This extends as well to Sri Lanka.

Sri Lanka is strategically located in the Indian Ocean in South Asia and can leverage its comparative advantage of untapped labor, natural resources, and strategic location. However, the sustainability of freight transport in Sri Lanka is constrained due to factors such as: dominance of aged, fuel-inefficient truck fleets; inadequate logistics management capacity; low safety standards and poor driver training; lack of access to financial capital for technology/truck upgrades; lack of freight data that inhibits sound road and fleet investment and policy planning; inadequate railway transport system to support rising freight volumes; and limited capacity of transport policymakers to have a systems/integrated view towards policies governing sustainable freight transport at national and regional levels.

Congestion has led to the reduction in average speed of commuting in Colombo from 14 kmph in 2017 to 8 kmph in 2019. It is estimated to further decline to 4 kmph by 2035 if left unaddressed. This also leads to a decline in air quality. Seventy per cent of Sri Lanka's total air pollution is, in fact, attributed to the transport sector. Trains in Sri Lanka are, meanwhile, under-utilized for public and goods transport.¹

Due to inadequate infrastructure, both hard and soft, the capacity to handle increasing international cargo at ports is limited. As freight transport increases on the back of increasing economic activity, it would be imperative to have national strategies and policies for sustainable freight transport in place to meet increasing freight transport demand in a sustainable manner. The initiatives of Sri Lanka need support through experience sharing and exchange of best practices for sustainable freight transport.

A. Economic Outlook

Sri Lanka's growth, as seen elsewhere in the developing world, continues to drive up the demand for consumer goods and commodities. As South Asia's population and the middle-income group expands, the subregion's demand for products for manufacturing and consumption may triple or even quadruple by 2050.² At the same time, Sri Lanka seeks to diversify its products and exports and leverage the advantages of its geographic position as a shipping hub. Moving goods efficiently, safely, and at a limited environmental cost is thus central for the sustainable development of Sri Lanka.

However, there are numerous hindrances to realizing Sri Lanka's growth potential, many of which are related to the limits of its logistical capacity and transport infrastructure. More recently, however, the global

COVID-19 pandemic has seen Sri Lanka's economy contract by 3.6 per cent in 2020, the worst growth performance on record. Growth was, however, expected to recover to 3.4 per cent in 2021, mainly reflecting a base effect and foreign direct investment (FDI) inflows according to the World Bank.³

Macroeconomic stability, meanwhile, is a concern for the country as its government debt remains one of the highest amongst emerging markets and is the result of budget deficits among other factors.⁴ Developing Sri Lanka's economy further requires large financing requirements, but rating downgrades can hamper access to financial markets and higher-than-expected deficits or lower-than-expected GDP growth can further affect market sentiments.⁵ See more under the subsection on financing for development under Section 2.1.1.

Another issue is the balance between imports and exports and low self-sufficiency. Sri Lanka imports, in terms of value, far more goods than its exports. In 2019, Sri Lanka's current account balance rested at US\$ -1.8 billion.⁶ Particularly problematic is that Sri Lanka is 100 per cent reliant on imports of foreign petroleum, which creates balance of payment pressures on the economy amid growing demand for petrol. The high expenditure on the importation of petroleum has been numerously identified as a major factor adversely affecting the economy of Sri Lanka and expenditures may amount to 6 per cent of GDP.⁷

Sri Lanka is striving towards an export-oriented and private-investment led growth model. In 2018, export growth was noted to have outpaced overall economic growth⁸ and, already, the demand for freight transport has significantly changed with agricultural products intended for the export market being supplemented by a mix of manufacturing and construction goods.⁹ In general, it has been noted that Sri Lanka's products can benefit from attaining higher value addition and that the transport and export of perishable food products requires the development of cold storage technology and a cold chain system in the country. Meanwhile, new products exported from 2003-2018 have consisted primarily of additional agricultural products. Footwear, glassware, and electrical capacitors have also figured in the mix.¹⁰

Ideally though, economic growth should be driven by diversification into new products and services that are incrementally more complex (see Appendix 1). However, outside of the shift from agriculture to textiles, Sri Lanka's economic complexity has remained static. Sri Lanka is already exporting most of its products that are related to its current comparative advantage.¹¹ A further shift towards electronics and machinery manufacturing is, for example, earmarked but skill and industry gaps limit this market's potential to a small pool of products in the stepwise climb. In other words, there are few easy investment opportunities in new sectors. These challenges can be added onto the high costs of using modern technologies and insufficient promotion and investment targeting new industries.

At the same time, "Low-cost logistics is critical to Sri Lanka's economic efficiency and transition to an export-oriented economy because it affects both the competitiveness of exported goods and consumer price of imported goods of the country," according to the Asian Development Bank (ADB).¹² For example, while most freight generating centers are noted to be "well connected by highway networks,"¹³ and overall road coverage in the country is good, the penetration of expressways remains limited, which results in higher travel times, especially during peak hours within and between cities.¹⁴

Compounding this, the existing road networks were not designed with the current capacity in mind and are, in some places, restricted in their width and lack multiple lanes. The rail system, on the other hand, is badly outdated and almost unused in the shipment of cargo, which represents a lost opportunity in the utilization of a mode that can be cheaper, safer, and more environmentally friendly than road transport (see Section 2.A.2).

Table 1. Major Freight Generating Centers

| Center | Province | Freight |
|-----------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Port of Colombo | Western | Containerized Goods, Dry Bulk, Wet Bulk |
| Katunayake Export Processing Zone | Western | Manufactured Goods (e.g. apparel, electronics, tobacco, steel products) |
| Biyagama Export Processing Zone | Western | Manufactured Goods (e.g. processed food, tobacco, apparel, chemicals, plastics, rubber products) |
| Koggala Export Processing Zone | Southern | Manufactured Goods (e.g. apparel, plastics, rubber products, paint) |
| Seethawaka Export Processing Zone | Western | Manufactured Goods (e.g. apparel, mineral products, tea, rubber products) |
| Horana Export Processing Zone | Western | Manufactured Goods (e.g. tires, glass, fast-moving consumer goods, steel products, plastics, paper products, beverage cans, hair products, spices) |
| Mirigama Export Processing Zone | Western | Manufactured Goods (e.g. apparel, mineral products, grain products, processed foods, furniture) |
| Trincomalee | Eastern | Flour, Fertilizer, Cement |
| Puttalam | Northwestern | Cement |
| Dambulla | Central | Vegetables and other Agro Products |
| Nuwara Eliya | Central | Vegetables and other Agro Products |
| Hambantota Port | Southern | Vehicle and Machinery Imports |
| Jaffna | Northern | Local Produce |
| Northeastern Sri Lanka | N/A | Construction Materials (e.g. sand) |

Sources: Questionnaire, ESCAP (2021). Google Maps, accessed 15 April 2021.

Sri Lanka also remains a uniquely rural country with an official urban population of only 18.7 per cent.¹⁵ There are few population centers or major cities within the country outside of the Colombo metropolitan region (CMR) in the Western Province that accounts for a very large share of the country's economic activity and industrial output. Kandy, the country's "second city," has only 100,000 inhabitants for example. Other provinces, especially in the north, may be at greater risk of being left out. Furthermore, it has been noted that "poor supply chain management and inefficiency in freight transport is likely to retard economic growth in rural communities especially in agricultural, fishery and small industries."¹⁶

Sri Lanka's Vision 2025 policy document outlines an ambition to establish new economic corridors "with geographically widespread growth to assure prosperity for all sections of the population." These include the Southwestern corridor; the Northeastern corridor; a corridor cutting across the country between Colombo and Trincomalee to facilitate industrial development; and others.¹⁷ In general, a C-shaped corridor can be drawn from Trincomalee to Hambantota (see Appendix 2). Most export investors, however, would prefer to be located by the Port of Colombo or the Bandaranaike International Airport to reduce transit times. However, there is a lack of industrial land near the port and congestion in Colombo seems to worsen perennially. As a result, potential investors that can bring in much needed knowhow for more complex activities are not setting up shop.¹⁸

As part of its early efforts to build up the industrial base and diversify its economy, Sri Lanka had set up several export processing zones (EPZs). However, most zones are now at or near capacity and the government of Sri Lanka has not opened a new EPZ in the better part of two decades. As such, creating or

expanding EPZs that are connected to transport infrastructure and international production networks has been touted by one study as a means of promoting export-oriented growth and the diversification of the economy.¹⁹ Accordingly, the Government of Sri Lanka has indicated plans to expand its industrial zones.

Under the ambitious Western Region Megapolis Development Plan (WRMDP), both the Mirigama and Horana EPZs have been identified for potential expansion into industrial cities. Despite being at capacity, land-wise, both EPZs have lower levels of water and electricity utilization than other EPZs according to 2016 figures.²⁰ Mirigama, meanwhile, has both rail connection and is near the A1 highway, which offers entry points to the Northern, Eastern, and Central Provinces, including a direct route to Kandy. Once complete, the Central Expressway (E4) will include two interchanges serving Mirigama: Mirigama North and Mirigama South. In addition, this EPZ is relatively close to the Bandaranaika International Airport and the Port of Colombo. Some proposed facilities to accommodate for development within the industrial area include a container yard, a container handling facility, warehousing, cold storage, intermodal transfer facilities, and rail connectivity for cargo.²¹

The Horana EPZ is located along highway A3 and is near the Southern Expressway that services the Western and Southern Provinces, including the cities of Galle and Matara. Horana will also be situated along the planned Ruwanpura Expressway.²² A plan to develop the Biyagama EPZ into a model industrial city—one that is sensitive to the environment yet caters to industrial needs with the proper infrastructure and facilities—has been floated as well. Its proximity to the Outer Circular Highway (expressway E2) is also expected to help drive the plan's growth.²³ Developing the logistics corridors connecting Colombo to the harbor city of Trincomalee and Hambantota Port using both rail and road has also been emphasized in Sri Lanka's 2030 Vision policy document.²⁴ The country's Vision 2025 also notes the potential for economic zones in Bandaragama, Embilipitiya, Vavuniya, Kuliapitiya, and Eravur.²⁵

One of the issues that EPZs intend to address are complex legal environments surrounding land rights in Sri Lanka that can stall or even cancel planned FDI projects.²⁶ According to the Vision 2025, growth in Sri Lanka is hampered by regulatory barriers, including a dearth of land for commercial and other purposes. It is, however, a middle-of-the-road performer on the World Bank's Ease of Doing Business ranking system, ranking 99th out of 190 economies in 2019 but with poorer scores for enforcing contracts, registering property, and getting credit.²⁷ Shoring up some of these issues above could theoretically aid in obtaining the private investment, including FDI, mentioned by the World Bank as being required for the transition to an export-oriented economy.²⁸

Barriers to business/trade aside, Sri Lanka is, perhaps, an unrivaled transshipment location in South Asia, being in the vicinity of major international shipping routes. Sri Lanka is strategically positioned just south of the massive economy of India and can act as a distribution hub for emerging markets and is the only location that connects the Far East with the Middle East within four days of sailing or four hours of flying.²⁹ Sri Lanka is thus positioning itself as a hub for multi-country consolidation (MCC) services, where less-than-container load (LCL) cargo from different countries can be combined into a single container before being shipped off to the country of destination.

MCC optimizes cargo flow and is useful for both large companies and small and medium-sized enterprises (SMEs) alike. For these reasons, the Port of Colombo is fast growing and ranks as the busiest in South Asia.³⁰ It is therefore important to the economy and revenues of Sri Lanka and can attract new industries seeking to take advantage of this location. However, Sri Lanka runs the risk of being left behind if it does not strengthen the port's capacity and competitiveness by improving infrastructure, operational efficiency, and institutions in the face of competition with other ports.

According to its 2018 Logistics Performance Index (LPI) score, Sri Lanka ranked in the bottom half of countries in terms of overall logistics performance. While not up to date, this ranking provides an indication of current performance. Using this information, timeliness seems to be the biggest issue, followed by international shipments and logistics competence.

Table 2. Logistics Performance Index 2018: Sri Lanka

| LPI Rank | LPI Score | Customs | Infrastructure | International Shipments | Logistics Competence | Tracking & Tracing | Timeliness |
|----------|-----------|------------------|------------------|-------------------------|----------------------|--------------------|-------------------|
| 94/160 | 2.6 | 2.58 (79/160) | 2.49 (85/160) | 2.51 (112/160) | 2.42 (109/160) | 2.79 (78/160) | 2.79 (122/160) |

Green denotes top half, Red the bottom third, and Orange in between.

Source: Logistics Performance Index, World Bank. Available at: <https://lpi.worldbank.org/>

Bringing all of this together is Sri Lanka's National Export Strategy (2018-2022), abbreviated as NES. Sri Lanka's export development vision laid out in the NES is to make Sri Lanka an export hub driven by innovation and investment. It is guided by four strategic objectives:

1. To have a business enabling, predictable, and transparent policy and regulatory framework that supports exports.
2. To strengthen Sri Lankan exporters' market-entry and compliance capacities.
3. To become an efficient trade and logistics hub to facilitate exports.
4. To drive export diversification through innovation and by strengthening emerging sectors.³¹

Logistics is given special attention in the NES. According to the strategy,

This objective will be achieved through a dual approach of increasing transshipment, multi-cargo consolidation (MCC) and commercial hub activities for international shipments; simultaneously ensuring improved services for Sri Lanka's own transport and exports of goods. A key focus of the Strategy is reforming the logistics ecosystem by adjusting key regulations such as the Sri Lanka Port Authority Act, the Electronic Transactions Act and Commercial Hub Regulations to favour increased sophistication and quality of services. The NES also recommends provision of adequate facilities, such as warehouses, bonded logistics centres and common user facilities, as well as improved rail connections between ports and airports, in order to increase storage capacities, facilitate e-commerce operations, attract more transshipment and increase overall capacity.³²

The strategy also notes a dearth of cold storage, reefers, and dry ports outside of the Western Province, with limited loading/unloading points along trade corridors. Additionally, the NES cited long handling and de-stuffing times for LCL and a lack of good MCC, bonded logistics, and fresh produce multi-user storage facilities as being problematic for expediting shipments.³³

B. Energy Overview

Sri Lanka is 100 per cent reliant on imported petroleum to meet its growing transport demands, which is noted to be an economic burden. At present, exploration for hydrocarbons in Sri Lanka is ongoing, but proven reserves remain at zero. Rising demand from the transportation and power generation sectors has only increased the country's dependence on fossil fuel energy sources.³⁴ With very little electrification and alternative fuel used in Sri Lanka's transportation, the sector accounts for almost 50 per cent of total greenhouse gas (GHG) emissions from the energy sector³⁵ and 70 per cent of all air pollution. However, Sri Lanka intends to be energy self-sufficient by 2030 and to increase the share of renewable energies in its overall energy mix to 80 per cent by that year.³⁶ Accordingly, it is shifting priority from coal in power generation to renewables and gas. Should electrification become more prominent in the transport sector, the energy used can well be derived from renewable sources. Already, 40 per cent of the country's electricity is derived from hydropower; however, this also leaves the country vulnerable to changes in rainfall patterns.³⁷

Sri Lanka's Road Map for cleaner fuels and vehicles also makes recommendations for introducing alternative fuel blends using ethanol or biodiesel with conventional petroleum, as well as exploring the introduction of liquefied natural gas (LNG) for transport, power generation, and industry.³⁸ According to a 2019 report from the ADB, LNG is marked for potential use in the transport sector while the promotion of biofuels as a high priority research and development need—as identified in the National Energy Policy and Strategies (2008)—has not yet been implemented.³⁹

In addition, the Clean Air Action Plan 2025 mentions the “promotion of alternative fuels for transport.”⁴⁰ It is worth noting, however, that alternative biofuels such as ethanol and vegetable oils that are derived from food crops (ex. sugarcane, corn, oil palm, and etcetera) can carry their own serious environmental and social considerations. While their burning may be regarded as cleaner, more circular/renewable, and otherwise more “sustainable” than fossil fuel hydrocarbons, their production could present more problems than solutions. For example, their demand can accelerate tropical deforestation; contribute to agriculture-related emissions, pollution, and water stress; and raise food prices and food price volatility.

As such, the creation of biofuels from organic wastes or algae, for example, may be a more sustainable option. Sri Lanka's Road Map for cleaner fuels and vehicles suggest algae-based biodiesel as a solution in order to avoid conflicts with food security.⁴¹ LNG meanwhile is often touted as a cleaner fuel in terms of emissions and soot by-products (a form of particulate matter [PM]) and an option for greening freight transport. In addition, LNG tanks are comparably lighter than diesel or petrol tanks and may be well-suited for long haul operations. However, some contend that LNG is, in fact, not an adequate bridge technology for decarbonizing freight transport. For example, a study by the European Federation for Transport and Environment found that gas vehicles perform similarly to other fossil fueled vehicles and that LNG trucks offered no meaningful PM benefits as compared to vehicles complying with the Euro VI emission standard.⁴² In addition, LNG is not a net-zero CO₂ fuel such as, for example, methanol or hydrogen synthesized with electricity generated by renewable energy. Additionally, different fuel types all contain varying energy densities and weights—among other considerations—and methanol, for example, offers a lower energy density than LNG or petrol. See Appendix 3.

On the subject, setting emission standards and the provision of cleaner fuels is incorporated into many of Sri Lanka's relevant plans and policy documents. For example, The Clean Air Action Plan 2025 includes a clear strategy to manage emissions from the transport sector through a green freight transport system and cleaner fuels, technologies, and practices⁴³ such as the provision of cleaner vehicle fuel in parallel with Euro standards.⁴⁴ Likewise, energy efficiency in the transport sector is also a priority for Sri Lanka given the negative externalities of fuel burn, as will also be discussed more in this paper.

2. SUSTAINABLE FREIGHT TRANSPORT IN SRI LANKA AND GAPS

This section will provide an overview of the sustainable freight transport situation in Sri Lanka. Next, it will identify gaps in sustainable freight transportation in Sri Lanka that can be useful for identifying future actions. Gaps will be determined by analyzing the baseline and current trends against an aspirational, sustainable future in the freight sector.

The aspirational future will be derived from the perspectives of several frameworks: the Sustainable Development Goal (SDG) framework and the avoid-shift-improve framework (as well as key government documents listed in Section 3). The baseline, meanwhile, will be informed by the review from Sections 1.A and 1.B and in Sections 2.A, 2.B 2.C, and 2.D below. Section 2.A.1 begins by breaking down the sustainable freight transport situation based on the SDGs. Next, Section 2.A.2 provides a similar breakdown based on the avoid-shift-improve framework while Sections 2.B, 2.C, and 2.D do so based on actions taken by the government and private sector.

A. Frameworks

1. Sustainable Development Goals Framework

| Contents of this Subsection (2.A.1) | |
|-----------------------------------------------------------|-----------------------------------------------------|
| Voluntary National Review | SDG 3.6 |
| SDG 3.9 | SDG 7.3 |
| SDG 9.1 | SDG 11.2 |
| SDG 11.6 | SDG 12.c |
| SDG 13.1 | SDG 13.2 |
| Data and Statistics | Science, Technology, and Innovation |
| Policy Coherence and Capacity Development | Financing for Development |

The Sustainable Development Goals (SDGs) are a comprehensive framework of sustainable development targets and indicators, collectively forming the core of the largest global aspirational sustainable development agenda to be met by 2030, known as the 2030 Agenda for Sustainable Development, or Resolution 70/1 adopted by of the United Nations General Assembly in 2015. In their matrix, the SDGs also incorporate sustainable freight transport. The SDGs are divided into 17 thematic goals that are broken down into 169 targets, measured by 231 unique indicators. The Goals cover the gamut of developmental issues from poverty and inequality, to health and well-being, to environmental degradation, all with a special emphasis on peace and partnerships as enabling factors—represented by SDGs 16 and 17 respectively.

Figure 1. The 17 SDGs



Source: United Nations. Available at:

<https://www.un.org/sustainabledevelopment/news/communications-material/>

A country's obligation to implement the 2030 Agenda presents an opportunity to incorporate the SDGs into their development strategies, harmonizing action across ministries and other relevant stakeholders as they collectively strive to meet the Goals by 2030. In addition, systematic follow-up and review (FUR) at the national and subnational levels is instrumental to guiding and accelerating effective implementation of the 2030 Agenda.⁴⁵

The main responsibility for FUR lies with national governments that have certain modalities to report on implementation, with the main one being the Voluntary National Review (VNR). By sharing experiences, best practices, and lessons learned, the preparation of the VNR can spark multi-stakeholder support that improves awareness around the SDGs and the 2030 Agenda across governments and societies and, furthermore, provides a chance to anchor sustainable development at the highest political level under the guidance of key ministries.⁴⁶ Sri Lanka conducted its first VNR in 2018. Meanwhile, what are called the means of implementation (MoI) form thematic work streams that help to integrate, implement, and review the SDGs. Key MoI include data, statistics, and monitoring; policy and institutional coherence; trade; science, technology, and innovation; and financing for development.

The SDGs provide a readily available avenue, or framework, for conceptualizing sustainable freight transport. While Sri Lanka integrates the SDGs into its planning process and development, sustainable freight transport must, by default, be considered. As pointed out by the Partnership on Sustainable, Low Carbon Transport (SLOCAT Partnership), "Without sustainable transport, the 2030 Agenda for Sustainable Development and the Sustainable Development Goals will not be achieved." Furthermore, according to SLOCAT Partnership, there is a consensus that sustainable transport is a key factor in SDG implementation,⁴⁷ meaning they are not divisible halves.

To be truly sustainable (i.e., balancing the three dimensions of sustainable development), sustainable freight transport must address diverse environmental, economic, and social considerations (see Section 4 for more on the three dimensions of sustainable development).⁴⁸⁻⁴⁹ Through this, sustainable freight transport cuts across many SDGs. However, narrowing this down, SDGs directly relevant to sustainable transport can be identified as (but not necessarily limited to) SDGs 3, 7, 9, 11, 12, and 13. Table 3 below details the SDG targets directly relevant to sustainable transportation. In formulating their mid-term and annual development plans aligning with the SDGs, as well as its sector plan 2021-2025, the Ministry of Transport in Sri Lanka has identified targets 3.6, 9.1, and 11.2 as relevant to their work.⁵⁰ While this is a good starting point, the additional SDG targets below can also be given consideration.

Table 3. SDG Targets Directly Impacting Sustainable Freight Transport

| | |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 3: Good Health and Well-Being | Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents. |
| | Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. |
| SDG 7: Affordable and Clean Energy | Target 7.3: By 2030, double the global rate of improvement in energy efficiency. |
| SDG 9: Industry, Innovation, and Infrastructure | Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. |
| | Target 9.a: Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States. |
| SDG 11: Sustainable Cities and Communities | Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons. |
| | Target 11.6: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management. |

| | |
|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SDG 12: Sustainable Consumption and Production | Target 12.c: Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances. |
| SDG 13: Climate Action | Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. |
| | Target 13.2: Integrate climate change measures into national policies, strategies and planning. |

Voluntary National Reviews

Completed with input from the Ministry of Transport, Sri Lanka's first VNR—published in 2018—provides a relatively comprehensive review of the SDGs in Sri Lanka and offers a solid base to build off of in the FUR process. Among the report's relevant proposed actions for key areas of sustainable development are the development of the transport sector and controlling carbon emissions.⁵¹ Sri Lanka's second VNR was released in 2022; however, as this was after this study's writing, the contents are not included in this paper. See more on the second VNR here: <https://hlpf.un.org/countries/sri-lanka/voluntary-national-review-2022>

SDG 3.6: Road Traffic Accidents



Road safety is still a major concern in the transport sector in Sri Lanka according to its VNR. The country's death rate due to road traffic injuries was at 14.9 deaths per 100,000 people in 2016,⁵² which is a better figure than in many countries in the ESCAP region but high when compared to top performing countries such as Singapore, Japan, Australia, and the Republic of Korea. According to the National Council for Road Safety (NCRS), an average 38,000 crashes result in around 3,000 fatalities and 8,000 serious injuries annually.⁵³ This may also result in Rs 40 billion per year in costs.⁵⁴ However, up-to-date, and reliable figures are hard to find, and it stands to reason that there is a relatively large gap yet to fill in meeting target 3.6's goal of halving road traffic deaths and injuries by 2030. Additional investment of almost US\$2 billion may be required to meet this goal.⁵⁵

A leading cause of this issue appears to be based on the high fatality rate associated with motorized 2/3-wheelers that are omnipresent in Sri Lanka.⁵⁶ This does not mean that road hazards in Sri Lanka extend only to the inherent risk of operating a 2/3-wheeler. There are several hazards existing on Sri Lanka's roadways that can be pertinent to freight transport and that contribute to its relatively high incidences of road fatalities and injuries. For example, road conditions and driver attitudes factor into this. Driver attitudes have been cited by the Road Development Authority (RDA) as a major risk factor, and this includes a failure to obey traffic rules (including speed limits), wear seat belts, or drive with a license.⁵⁷ This stands against Sri Lanka's existing regulations.

Axel loads are also regulated by the Motor Traffic Act,⁵⁸ but overloading of trucks is mentioned to be rampant in the country, which carries safety concerns as well as concerns for infrastructure quality. Reportedly, regulations on overloading of trucks are not strictly enforced as there are no facilities for the safekeeping of offloaded cargo.⁵⁹

Driver fatigue is also noted to be an issue and may affect up to 15 per cent of commercial drivers and be linked to heavy vehicle crashes. In some countries, fatigue may also encourage the use of unlawful substances (e.g. stimulants), which would be in violation of Sri Lanka's laws against drug driving. However, this law was also noted to be difficult to enforce due to a lack of equipment and regulations for detecting drug abuse.⁶⁰ In addition, improving safety performance standards for light and heavy vehicles has also been recommended in the case of Sri Lanka. As can be seen in Appendix 9, Sri Lanka's biggest safety gaps under the United Nations Global Plan for the Decade of Action for Road Safety pillars are in vehicle safety. Furthermore, according to the RDA's National Road Master Plan (NRMP), set for 2018-2027, vehicle conditions are also one of the major risk factors and high vehicle taxes prevent people from being able to buy safer vehicles.⁶¹

Aside from driver attitudes, safety issues, and enforcement gaps, infrastructure plays a role in the road safety environment. For example, railroad crossings are noted to be a location of many fatalities. According to the World Bank report *Delivering Road Safety in Sri Lanka*, "anecdotal evidence points to speed, drunk driving, fatigue, and burst tire/animal crossing as the main causes for crashes; [and]...about 10 percent of the fatalities could be at railroad level crossings."⁶² While some of this is due to drivers attempting to pass railway-level crossings when the gates are down, another part is due to a lack of under and overpasses at these crossings, which has been marked as a construction priority going forward. Sri Lanka's National Policy on Transport (2009) also states that the government will intervene in order to "implement a program to reduce rail-road crossing accidents."⁶³

Table 4. Proposed Safety Improvements at Hazardous Road Locations

| Item | Component | Outputs and Outcomes |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sharp bends | Warning signs, advisory speed signs, road markings, guideposts | Reduce the accident rate and improve the safety of vehicle movement. |
| | Curve widening | Drivers have a tendency to follow outer edge of the pavement to have better visibility and large radius curved path. Necessitates extra width of the road. |
| | Mirrors | Risk of accidents can be minimized especially in bad weather conditions and at night. |
| Deep embankments | Safety barriers, delineators | Drivers can be protected from running into dangerous area. |
| Overtaking sight distances not available | Restricting the possibilities of overtaking | Prevention of all dangerous overtaking Maneuvers. |
| Hazardous intersections | Building roundabouts instead of intersections, signalization, slow moving traffic/heavy vehicles | Avoid large differences in speed and direction. Reduce accidents. |
| Slow moving traffic/heavy vehicles | Climbing lane/relegate slow traffic to a suitable parallel link if existing or providing | Avoid the presence of vehicles driving at largely varying speeds. |
| Structures narrow locations | Signs and markings | Chevrons and delineators. |

| | | |
|------------------------------------|-----------------|----------------------------|
| By road connectivity points | Traffic mirrors | Improvement in visibility. |
|------------------------------------|-----------------|----------------------------|

Source: *National Road Master Plan*, Road Development Authority of Sri Lanka (2018), page 93. Available at: https://www.rda.gov.lk/supported/noticeboard/publications/NRMP_2018-2027/NRMP2018-2027_Draft-final.pdf

Congestion can also factor negatively into road safety. In Sri Lanka, congestion is the result of some combination of the following according to the RDA:

Lack of network capacity (Bottlenecks)

- Not maintaining a uniform lane width along the national highways.
- Roadside parking within the restricted area of a junction.
- Illegal constructions, erecting of advertisements boards on roadsides.
- Unplanned city developments by local authorities.
- Locations of bus stops/shelters/ bus bays closer to the junctions.
- Three-wheeler parking along the national roads.
- Narrow bridges.
- Not providing slip lanes at junctions.

Higher number of access roads on road sections

- Higher number of access roads by roads connecting to main roads within a short distance.
- Deficiencies in road infrastructure design.

Inadequate pedestrian facility

- Restrictions in providing walkways.
- Obstacles on walkways.
- Improper use of roadsides and walkways.
- Poor quality and inadequate widths of walkways.

Driver behavior

- Drivers not following traffic regulations.
- Drunken drivers.
- Problems with attitudes/not respecting others' rights.

Road infrastructure condition

- Poor maintenance.
- Damage to road surface.
- Poor attention on road infrastructure components and road furniture.

Poor enforcement mechanism

- Inadequate traffic signs and road markings.
- Lack of enforcement of laws and regulations.

- Gaps in traffic laws and regulations.

Issues related to road construction

- Not adhering to construction contracts.
- Deficiencies in construction contract documents.
- Problems in the preparation of Bill of Quantities and pricing.
- Issues in procurement procedures.
- Scarcity or no availability of construction materials.
- Problems in selection/application of technologies.
- Issues in identification of appropriate treatments or interventions.⁶⁴

However, there are funding constraints that make addressing some of these issues difficult. Inadequate attention to safety in road design and a lack of investment on improving safety standards has been cited in both the NRMP and 2030 Vision as being an issue. At the same time, even when roads are designed as per safety standards, fund limitations in implementation can compromise safety.⁶⁵ Meanwhile, the agencies responsible for road safety in Sri Lanka are noted to be inadequately empowered and resourced to deal with escalating danger on their roads. While a Road Safety Fund (RSF) was established in 2011 as per Section 213B of the Motor Traffic Act, the RSF is not spent on road safety improvements according to the paper *Delivering Road Safety in Sri Lanka*.⁶⁶

Aside from funding and resource allocation, creating a results-oriented strategy for road safety also requires the development of better crash and safety performance data. Poor crash fatality and injury data in Sri Lanka make pinpointing areas of higher safety risk more difficult. As a result, a pilot effort by the police to build a road crash database through the University of Moratuwa (supported by the World Health Organization [WHO]) has been mentioned as ongoing.⁶⁷

SDG 3.9: Deaths and Illnesses from Pollution



emissions will be discussed with SDG 11.6.

SDG 3.9 (through indicator 3.9.1) seeks to reduce the mortality rate attributed to household and ambient air pollution. Up-to-date figures on this SDG are hard to come by, but 2016 numbers place Sri Lanka's age-standardized mortality rate attributed to ambient air pollution at 24 deaths per 100,000 people. This is a much better figure than in other South Asian countries and developing countries in the ESCAP region.⁶⁸ However, this is a figure that Sri Lanka can still aspire to lower through a greener, cleaner freight transportation network. More on air quality and

SDG 7.3: Energy Efficiency



SDG indicator 7.3.1 measures progress in terms of energy intensity, which is the level of total energy supply (megajoules) per unit of GDP. While nuanced, energy intensity can be viewed as a measurement of an economy's overall energy efficiency. Following the global and regional trend, Sri Lanka has seen a gradual reduction in its energy intensity as technologies, practices, and policies continue to improve across the globe.

Energy efficiency has been made a priority in several of Sri Lanka's plans. For example, its Energy Sector Development Plan For A Knowledge-Based Economy (2015–2025) calls for a strategy to promote energy efficient modes of transport and set a target to “Reduce the petroleum fuel use in the transport sub-sector by 5% by introducing alternative strategies such as efficient modes of transport and electrification of transport by 2020.”⁶⁹ In addition, the National Policy on Sustainable Consumption and Production for Sri Lanka set the promotion of energy efficiency in transport modes as a policy goal.⁷⁰ The draft National Transport Policy has also adopted energy efficiency and environmental protection as one of its policy principles.⁷¹

In fact, Sri Lanka's transport sector emission intensity has dropped from 66 tonnes per US\$ 1 million of GDP in 1990 to 40 tonnes per US\$ 1 million of GDP in 2018 for a 39 per cent decrease. However, overall energy use, nonetheless, continues to rise and transport carbon dioxide (CO₂) emissions have reportedly quadrupled from 1990 to 2018.⁷² According to the 2020 Environmental Performance Index (EPI), out of all indicators, Sri Lanka's worst 10-year changes occurred in its CO₂ growth rate.⁷³ The “overall tendency is still towards a growing dependency on fossil-fuel mainly due to demand from the transport sector” according to Sri Lanka's 2018 VNR. Additionally, the 2018 VNR states that,

Various gaps have been identified in policy documents and by stakeholders as challenges against sustainable future in the energy sector [such as] ...challenges associated with energy use in households and key sectors such as transport and construction sectors that restrict improvements in efficient use of energy.⁷⁴

As such, there is room for continued improvement in the energy efficiency of Sri Lanka's freight transportation. This includes the use of better fuels, better vehicles, rail transport, etcetera—as well as addressing bottlenecks in logistics and achieving economies of scale. Accordingly, Sri Lanka has moved towards Euro IV emissions standards that can offer better fuel economy and reduce the energy intensity of road transport while reducing Sri Lanka's national fuel bill. For example, a diesel Ashok Leyland bus can travel 4.2 km per liter with Euro II, 5 km with Euro III, and 6.2 km with Euro IV.⁷⁵

Another issue on energy efficiency in the freight sector of developing countries is the prevalence of outdated trucks. Older vehicles tend to burn more fuel per ton-km, often as a result of improper maintenance and older designs. Accessing finance (especially for SMEs), justifying the investment, and high taxes may prohibit the purchase of newer trucks in many cases. Meanwhile, some reports suggest that import duties on new heavy vehicles be reduced and that the concessions on the import of newer trucks be tied to the scrapping of older vehicles in order to ensure that these vehicles are “retired.” Placing an age limit on imported trucks can help facilitate the retirement of outdated trucking fleets, but only if paired with measures that address the barriers to investing in a new truck. This too can be tied into fuel quality as shown in Figure 6 on fuel quality loops for cleaner and more efficient transport.

Table 5. Age Limit on Imported Trucks

| Vehicle Description | Specifications | Age Limit (Years) |
|------------------------------|-------------------|-------------------|
| Dual Purpose Vehicles (Vans) | - | 4 |
| Lorries/ Trucks | GVW Less than 5MT | 4 |
| Lorries/ Trucks | GVW Over 5MT | 10 |
| Refrigerated Trucks | GVW Less than 5MT | 4 |
| Refrigerated Trucks | GVW Over 5MT | 10 |
| Milk Tanker | GVW Less than 5MT | 5 |
| Milk Tanker | GVW Over 5MT | 10 |

Source: Sri Lanka Customs. Available at: <http://www.customs.gov.lk/declaration/mvu>

SDG 9.1: Quality, Reliable, and Resilient Infrastructure to Support Economic Development



A simple review of Sri Lanka's standing on SDG 9.1 can be achieved by looking at indicators 9.1.1 and 9.1.2. Indicator 9.1.1 is the proportion of the rural population that lives within 2 km of an all-season road, also known as the rural access index (RAI). Without easy access to all-season roads, many rural populations are deprived of vital services and cannot fully participate in the economy. The RAI is equally relevant to the freight sector. Without adequate road connectivity, rural communities cannot be full actors in or beneficiaries of freight transportation and can be left behind as the rest of society develops.

Given Sri Lanka's low urban population, its rural connectivity is made even more important to the country. However, Sri Lanka's rural connectivity is noted to be very high, and Sri Lanka has received an A for its rural access score by the advocacy group Sustainable Mobility for All (Sum4all).⁷⁶ According to its 2018 VNR, 95 per cent of Sri Lanka's population lives within 2 km of an all-season road, which is an achievement.⁷⁷ Although, that is not to say there are no gaps in rural connectivity as a high RAI score does not necessarily translate to good connectivity. For example, expressways do not service most of the country and most infrastructure improvements are mentioned to be focused on paved highways and major bridges rather than other public infrastructure in rural areas, such as feeder roads.⁷⁸

Moving on to indicator 9.1.2, this measures passenger and freight volumes by mode of transport. Sri Lanka's transportation system is dominated by the road. Rail is seldom used in the transportation of freight, and goods are not reported to be moved by inland waterways (of which Sri Lanka has few). While figures vary slightly, they are both reflective of this situation. At the time of the 2018 VNR, road transport contributed to 97 per cent of total freight transportation. Other figures from 2018 place the movement of goods by road, railway, and air at 10,009 million ton-km (~92 per cent), 466 million ton-km (~4 per cent), and 436 million ton-km (~4 per cent) respectively.⁷⁹ These figures point to a deficit in the quality or reliability of Sri Lanka's rail system for freight.

Road and Rail Overview

The national road network was first developed over a century ago and is neither safe nor expedient at this juncture in time. It consists primarily of local roads connected to a network of provincial roads, national highways, and—more recently—expressways. The NRMP cites the needs for improve road capacity as “road widening, resurfacing, improving bottlenecks, and improving road geometry so that higher design speeds can be achieved.” However, carrying out said improvements encounters obstacles. For example, the RDA has noted that,

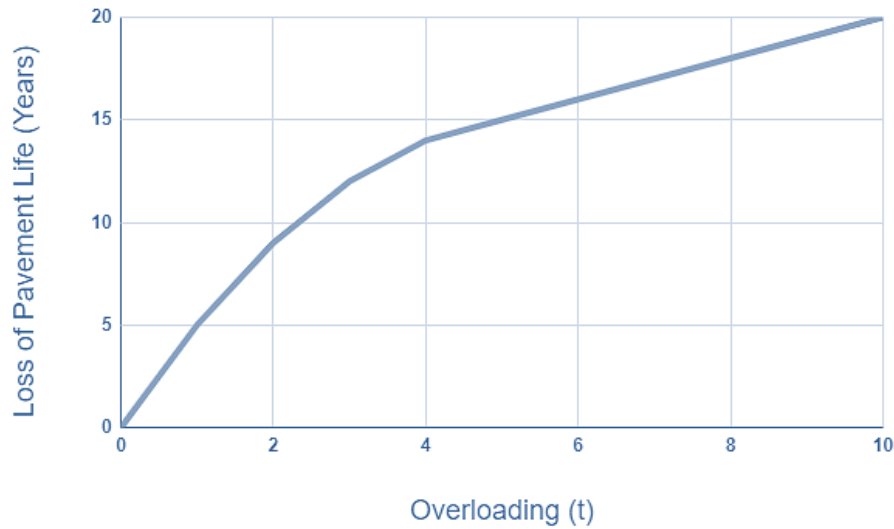
...rehabilitation of existing trunk route system to cope up with future traffic needs at a meaningful level of service is a daunting task mainly due to the inherent deficiencies in their alignment and widths that cannot be rectified without resorting to large scale acquisition and demolition of buildings and re-locating service utilities involving greater social and economic repercussions.⁸⁰

A review of its previous NRMP (2007-2017) found that out of 481 km of road sections identified for 4-lane improvement, only 55.5 km had been improved and 49.4 km were in the process of being improved. A further 83.2 km had been widened only to a 2-lane standard on account of the difficulty in getting the required land. In total, this left 293 km of roads remaining for improvement. However, the total length of 4-lane roads in 2017 was noted in the review to be at 257.3 km, against only 103.8 km in 2007. This means a further 98 km of 4-lane roads had to have been made outside of the identified list (i.e., in addition to the 55.5 km). Six-lane roads, on the other hand, had only increased from 15.4 km in 2007 to 29.2 km in 2017 while none of the 22.4 km planned in the NRMP 2007-2017 were improved or constructed. At the end of the day, acquiring the land to widen and improve roads is noted to hinder the potential “to cater for the increasing demand of road usage.”⁸¹

Current activities identified by the RDA for increasing the capacity of the road network include the continued rehabilitation of the existing network; planning of expressways and high standard major highways as an alternative or supplement to the trunk roads to cater to present and future demand for road transport; construction of a system of ring roads to cities and major towns; and improvements including realignment and deviations to existing trunk roads.⁸² Sri Lanka has made progress in the last decade in the construction of its budding system of expressways to bolster the economy and national transportation system. Of these large-scale projects, the ongoing Central Expressway is a high priority and will link Colombo and the Western Province to the Central Province through the Northwestern Province.

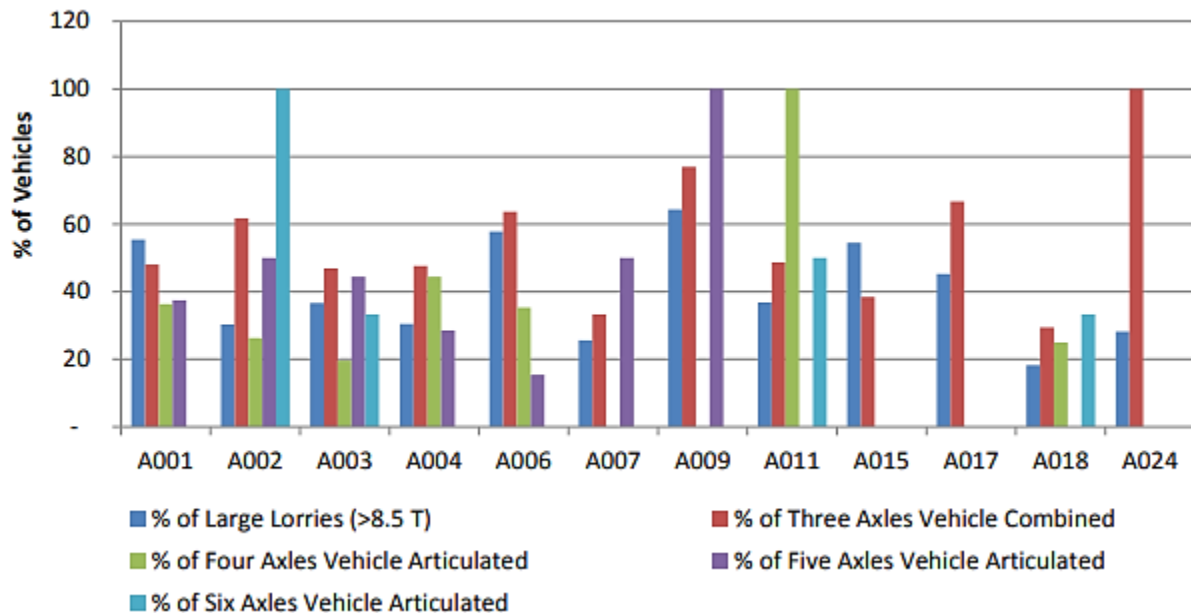
Finally, overloading of vehicles is a serious issue in many developing countries and a major challenge in Sri Lanka for maintaining a quality of road infrastructure, with spillover into road safety as well. Pavement loads are calculated based on legal axel load limits and form an important part of a road’s expected lifespan (see Figure 2). Axle loads in Sri Lanka are regulated by the Motor Traffic Act but are either overlooked or violated by operators, which can greatly accelerate the deterioration of roads. According to data collected as part of its regular surveys, the RDA has found a very high rate of overloaded vehicles (see Figure 3). Nonetheless, the quality of roads in Sri Lanka still surpasses the regional average and the average in Sri Lanka’s income group according to Sum4All.⁸³

Figure 2. Overloading vs. Loss of Pavement



Source: Author.

Figure 3. Percentage of Overloaded Vehicles by Category



Source: Road Development Authority.

Moving on to the railway system, time has not treated this mode kindly and its stagnating efficiency has seen its share of freight transport decrease from 80 per cent at its peak to anywhere from 0.7- 4 per cent depending on the source. Around 90 per cent of the country's railway network is single track, with all multiple

lines being in the Western Province.⁸⁴ Using numbers from Sri Lanka's 2016 domestic LPI, 62.5 per cent of surveyed logistics professionals found the quality of rail infrastructure to be low or very low, which was the highest percentage of any logistics infrastructure in the country (on the other hand, only 25 per cent of surveyees cited road quality as being low or very low). Nevertheless, only 12.5 per cent of surveyed logistics professionals found rail transport rates to be high or very high, against 22.2 per cent for road rates.⁸⁵ Lower prices can incentivize the shift to rail freight if its underlying issues are addressed.

Unlike its expressway network, Sri Lanka's rail system connects most of the country together and its railroad density (km of railroads per km²) is higher than both the regional average and the average in its income group.⁸⁶ However, the ongoing construction of the Matara-Kataragama railway line (an extension of the southern railway) is the first to take place since the country's independence; although the line to Talaimannar was also repaired and reopened following the Sri Lankan Civil War.

Like other transportation topics in Sri Lanka, discussions around railway upgrades seem to be heavily passenger oriented, particularly focused on the CMR. Sri Lanka Railways (SLR) was a freight carrier at its inception but is now more passenger oriented. However, a road to rail concept for freight transport is also being promoted.⁸⁷ Additionally, "there are several programmes in place to enhance the railway sector by means of increasing the operating speed," according to Sri Lanka's 2018 VNR. Other upgrades include improvement to rolling stock such as freezer trucks to transport bulk perishable produce by rail.⁸⁸ One existing example of use of the railway for bulk transport is on the Puttalam Line, used by Insee Cement to haul mined material. Bulk fertilizer imported at Trincomalee Port by railway is planned to be moved by train as well.

Rail electrification is also mentioned numerous in Sri Lanka's development plans such as, for example, the WRMDP, the National Policy on Sustainable Consumption and Production for Sri Lanka, the Clean Air Action Plan 2025, and the Road Map for Cleaner Fuels and Vehicles in Sri Lanka. The Road Map describes railway as "one of the most efficient modes of transport" and that "introduction of electrification could improve the services further." However, electrification plans seem to extend primarily to the CMR for commuter service and the implications for freight transport are not clear.

Finally, when considering the resilience component of SDG 9.1, it is important to look at transportation infrastructure and logistics networks; i.e., their ability to absorb and bounce back from shocks. This is particularly important in the context of climate change and pandemics such as the COVID-19 pandemic. For example, climate-induced disasters can cut off or damage transportation infrastructure in affected areas. On the other hand, the COVID-19 pandemic has brought to light the fragility of the global supply chain.

Sri Lanka's National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016–2025)—abbreviated as NAP-CC—proposes many actions that can be taken to improve the climate resilience of Sri Lanka's transportation systems and infrastructure. While mitigation is usually the subject of discussion with transportation and climate change, adaptation and resilience measures to cope with projected climate impacts are just as important. Some of the actions suggested in the NAP-CC include assessing the impacts of climate change on transport systems and road infrastructure and subsequently "climate-proofing" transport infrastructure.⁸⁹ However, this study has found little readily available evidence of climate-proofing taking place in Sri Lanka's transport networks.

Increasing the resilience of transport infrastructure to climate events can also translate into monetary savings down the road. For example, the maintenance of roadside drains has been cited by the RDA as problematic, with a partial reason being the lack of clear authority over drainage systems. Draining of storm water from the road surface and roadside is very important for retaining the strength of underlying road

layers to withstand the weight of moving loads. As a result of this improper maintenance of roadside drains, a “colossal sum of funds is utilized for the repair and maintenance of damaged roads.”⁹⁰ In fact, expenditures on the rehabilitation of roads affected by natural disasters have consistently exceeded planned expenditures for this purpose (see Table 9).

Ports and Maritime Trade

Container port throughput is increasing year by year in Sri Lanka (see Figure 4). In 2004, the Port of Colombo had crossed the 2.2 million TEUs (twenty-foot equivalent units) mark for the year.⁹¹ In 2015, it was at around 5.1 million TEUs of containerized cargo.⁹² In 2018, this reached 7 million TEUs.⁹³ By 2019, that number had risen to 7.23 million TEUs through 6,460 port calls.⁹⁴ Unsurprisingly, Sri Lanka has seen one of the highest increases in the Asia-Pacific region on the Liner Shipping Connectivity Index since 2006, which is generated based on deployed TEU capacity, scheduled ship calls, average vessel size, etcetera.⁹⁵ Below is a quick overview of the commercial ports operated under the Sri Lanka Ports Authority (SLPA).

Port of Colombo

Primarily a container port (although it can also handle dry and liquid bulk, RoRo [roll on/roll off] movements, and general cargo),⁹⁶ the Port of Colombo is the busiest in South Asia. Cargo originating from and destined to Europe, East and South Asia, the Persian Gulf, and East Africa can be conveniently connected through the Port of Colombo. There are currently five terminals at the port: Jaya Container Terminal, the East Container Terminal, the Unity Container Terminal, the South Asia Gateway Terminal, and the Colombo International Container Terminal (CICT).

In addition to the container terminals in the original port area, SLPA has planned to develop three terminals (each having capacity of 2.4 million TEU) in the south harbor. The first of these, the CICT, was built and is in operation on a build-operate-transfer basis by CICT Limited, a joint venture company of China Merchants Holding Co. Ltd and SLPA. The terminal is noted to have deep water facilities with no tidal restrictions and can service the largest container ships. The second and third of these terminals (the East and West Container Terminals) have been identified under both the WRMDP and President Gotabaya Rajapaksa’s vision document, entitled *Vistas of Prosperity and Splendour*, as national priorities.⁹⁷

Meanwhile, facilities at the Port of Colombo include, amongst others: electronic data interchange (EDI), bonded warehousing, and ship repairs. According to SLPA, the port also offers the lowest transshipment rates in the region and provides for LCL delivery operations. Once approval has been granted by Sri Lanka Customs, SLPA also provides warehousing facilities to handle MCC cargo.⁹⁸

Galle Port

A natural harbor, the port at Galle is one of the most active in the country. However, today it is primarily used as a harbor for recreational boating.⁹⁹ It is also used for the embarking and disembarking of sea marshals plying the east-west shipping route¹⁰⁰ and the provision of crew and services to ships passing on this route. There is also a major cement works in the port area that discharges cement products in bulk. Cargo is generally not loaded at the port.¹⁰¹

Trincomalee Port

Noted as an exceptional natural harbor, Trincomalee Port has 10 times the land and water availability of Colombo Port, according to the SLPA.¹⁰² It services the Sri Lankan Navy and the port has four multipurpose berths, over 1,750 meters of quay, and primarily handles dry bulk cargoes (ex. flour, cement, and fertilizers).

Its location, characteristics, and relatively low levels of congestion also make it attractive as a location for repairs and maintenance.¹⁰³ There is also a World War Two era fuel tank farm in the harbor.

Hambantota Port

The construction of Hambantota International Port was one of the largest development projects to be carried out by Sri Lanka in the 21st century. Its proximity (15 nautical miles) to the east-west shipping route seemed to place Hambantota Port in a position to capture some of this traffic, as well as to provide other services such as bunkering, water supply, crew changes, etcetera. In addition, it is well connected to the Southern Expressway and highway A2, all without the traffic of Colombo.

Hambantota Port was meant to supplement Colombo Port in Sri Lanka's drive to maximize its position as a shipping hub and has been identified in the Vistas of Prosperity and Splendour document as a "national asset" to be developed into an international industrial and services port.¹⁰⁴ In addition, the port is to figure prominently in the economic growth of the Southern Province, with industry also taking up shop in a Hambantota free trade zone and industrial park. Target industries include petroleum-based industries, fertilizers, glass, aluminum, resource recovery, food processing, power generation, value added logistics services, waste management, and warehousing.¹⁰⁵

However, despite high hopes, the port has not yet taken off. It is primarily being used for RoRo ships delivering both inbound and transshipment vehicles. Today, the port has 4,000 meters of quay and two dedicated oil berths. Its high availability of berths and low congestion make the port ideal for ship repairs and surveys.¹⁰⁶ Highlighting its intended versatility, Hambantota Port consists of a RoRo terminal, 2 oil terminals, a multipurpose terminal, and a container terminal, as well as a bunkering and oil tank farm facility to provide both in-port and offshore bunkering services.¹⁰⁷ At present, these facilities are mostly unused.

Oluvil Port

Primarily a harbor for commercial fishing, Oluvil Port was developed as part of the Government of Sri Lanka's economic development plan for the Eastern Province. The port is intended to form the southeastern link in Sri Lanka's developing chain of coastal harbors and will provide more convenient and cost-effective access to and from the southeastern region for goods and cargo originating on the west coast.¹⁰⁸

Kankesanthurai Port

In the far north, Kankesanthurai Port is the closest Sri Lankan port in proximity to India. However, during the civil war, the port was closed and neglected. In 2020, US\$ 45 million was obtained to restore the port. The first phase is intended to restore the port's breakwater.¹⁰⁹ Other activities include rehabilitating piers and roads, constructing a new pier, wreck removal, and dredging to increase the water's depth with the aim of developing the port to handle cargo uninterrupted at international levels.¹¹⁰

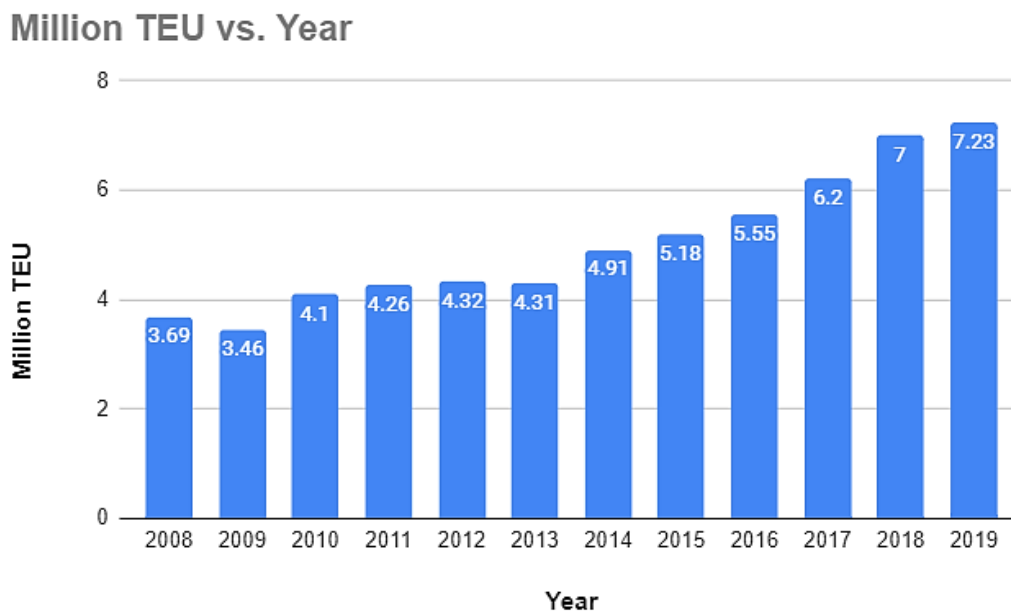
In order to accommodate for the ever-growing throughput, it has been suggested that the Port of Colombo continue strengthening its infrastructure, operational efficiency, and institutions. While new terminals are being developed and other improvements are being made in its operations, the Port of Colombo may still be constrained by its lack of available land, limited space within the breakwaters, and congestion.¹¹¹ In addition, developing new inland container depots (ICDs) can help handle the port's growth. Already, there are numerous ICDs around the CMR; some new locations identified for ICDs include Peliyagoda, Ratmalana, and Veyangoda that can be linked to the railway.¹¹² Expanding facilities to transport cargo by train to Colombo, Hambantota (through the line under construction), and Kankesanthurai has also been identified as a priority for port development.

In February 2019, it was announced that Sri Lanka was setting out to make the Port of Colombo a smart port. So-called “smart ports” are seen as the way to the future. A smart port is a port that uses technology and innovation to advance its performance, capacity, and connectivity. Plans called for IT upgrades to streamline terminal management and cargo systems. At the time, Southern Development Minister Sagala Ratnayaka stated that,

There are many technical aspects to this. For instance, the upgraded Terminal Management System will include gate automation, yard automation, quay side automation, prime route DGPS, business intelligence tools, web portals and simulation tools. In layman’s terms, this means Colombo Port will operate with greater efficiency and handle a greater volume of activities within a shorter period with the use of advanced IT and information systems.¹¹³

In October of 2020, SLPA Chairman Gen. Daya Ratnayake said that steps were underway to make the Port of Colombo a smart port. “We are very serious about bringing to reality the idea of a smart port. We have concentrated on creating a competitive edge by deploying innovative e-initiative and strategic IT systems to improve productivity and provide uninterrupted services to port users,” said Ratnayake. Sri Lanka was also in the process of implementing a single window concept that would allow parties involved in trade and transport to lodge standardized information and documents more easily.¹¹⁴ The SLPA is also noted to be increasing its worker productivity as part of its overall drive forward¹¹⁵ and the smart port concept has been extended to worker productivity as well. With the ADB, the SLPA has also worked to develop a comprehensive National Port Master Plan.¹¹⁶

Figure 4. Container Throughput, Sri Lanka



Source: UNCTAD. Chart by Author

Table 6. Components of Sustainable and Resilient Ports

| Port Sustainability | |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dimensions | Sub-Components |
| Environmental | <ul style="list-style-type: none"> • Noise and light pollution • Air quality • Energy consumption • Water quality • Waste management |
| Economic | <ul style="list-style-type: none"> • Port effectiveness • Added value of the port • Port investment |
| Social | <ul style="list-style-type: none"> • Employment contribution • Gender split • Contribution to knowledge development • Noise and light pollution • Livability of the area surrounding the port • Safety of port workers |
| Port Resilience | |
| Components | Sub-Components |
| Capacity to anticipate future demands | <ul style="list-style-type: none"> • Future-proof port planning • Future-proof infrastructure capacity • Future-proof human capital |
| Capacity to remain unaltered/recover quickly against forces of different nature | <ul style="list-style-type: none"> • Against climate change events • Against ICT challenges (ex. cybersecurity) • Against health disruptions (ex. pandemics) • Against social disruptions (ex. labor strikes) |

Source: PowerPoint Presentation, UNESCAP (2020). Available at:

https://www.unescap.org/sites/default/d8files/event-documents/5.%20Container%20throughputforecasting_ESCAP.pdf

SDG 11.2: Safe, Affordable, Accessible, and Sustainable Transport Systems



While SDG 11.2 primarily refers to public transportation and the movement of people rather than goods, the accessibility, safety, and sustainability of freight transport can be interpreted as a component of this SDG. To this end, more info can be found under the subsections on SDGs 3.6 and 9.1 above in terms of safety and accessibility.

In general, though, the focus of transport in Sri Lanka seems to fall more on the movement of people and on public transportation, particularly in the CMR. This too, however, can have positive spillovers into the freight sector. For example, diverting people from private to public modes of transportation can greatly reduce congestion and thus facilitate the movement of goods in a more economical and eco-friendly fashion. As such, SDG 11.2 can go hand in hand with freight transport.

SDG 11.6: Adverse Environmental Impacts of Cities (Special Attention to Air Quality)



While this SDG and its indicator 11.6.2 focus on pollution (specifically PM_{2.5} and PM₁₀) in cities, for the purpose of this study, it will explore air pollution across the country and not limited to PM. Timely numbers are hard to find, but available information would indicate that Sri Lanka's air quality is relatively good and that its age-standardized mortality rate attributed to ambient air pollution is, similarly, relatively low as mentioned under SDG 3.9. In the 2020 EPI, Sri Lanka ranked 91 out of 180 countries for air quality.¹¹⁷ Its PM_{2.5} per m³ in 2016 was listed as 15.25 micrograms, which can be compared favorably against the ESCAP average of 46.7

micrograms.¹¹⁸ Another source cites a value of PM_{2.5} per m³ as 11.1 micrograms in 2017.¹¹⁹

Nonetheless, these figures are still above the WHO's maximum safety level of 10 micrograms per cubic meter. However, from 2010-2017, the average level of the population's exposure to concentrations of suspended particles measuring less than 2.5 microns in Sri Lanka had reportedly improved considerably. In 2017, 45.5 per cent of the population was mentioned to be exposed to PM_{2.5} levels exceeding the WHO guideline value, which also stood favorably against a 98.5 per cent average in Sri Lanka's income group.¹²⁰ Sri Lanka has also phased out leaded gasoline.¹²¹

Officially, there exist several regulations on emission standards and fuel quality such as the Regulations on Air Emission, Fuel, and Vehicle Importation Standards (2003) and the National Environmental (Ambient Air Quality) Regulations.¹²² Furthermore, the Motor Traffic Act imposes a penalty for driving without an emission certificate. According to the Department of Motor Traffic, its vehicle emission standards tests check for carbon monoxide (CO) percentage per volume and unburnt hydrocarbons (HCs) in parts per million per volume for petrol vehicles and smoke opacity for diesel vehicles.¹²³ Approximately 75 per cent of HCs and CO originate from the transport sector.¹²⁴ See Appendix 4 for a list of common fuel pollutants. According to the 2020 EPI, out of all indicators, Sri Lanka's most positive 10-year change occurred in the reduction of sulfur dioxide emissions (SO₂) that are harmful to the lungs.

Sri Lanka is also improving its fuel quality standards to Euro IV in line with its Road Map for Cleaner Fuels and Vehicles in Sri Lanka. In June of 2018, it was announced that Sri Lanka's first order of Euro IV diesel and petrol was placed.¹²⁵ That August, India's first Euro IV commercial vehicle, the Tata Yodha, was

introduced in Sri Lanka, offering an 8-10 per cent fuel efficiency improvement compared to Euro III engines and an 80 per cent reduction in PM compared to previous drive lines (see Table 7 and Figure 5).¹²⁶ Introduction of cleaner fuels not only reduces emissions, leading to better air quality, but also improves the technical performances of vehicles including their fuel economy/efficiency.

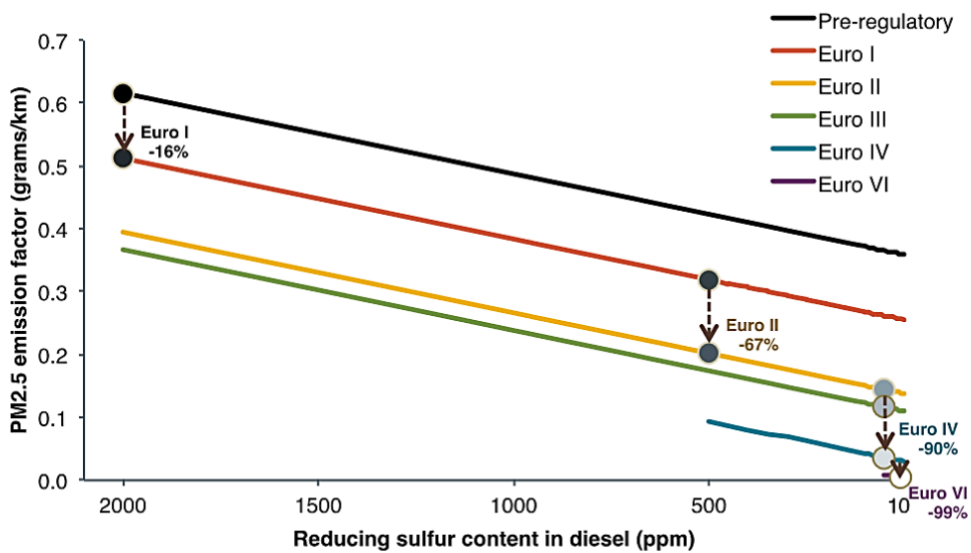
Table 7. Pollution Levels per European Emission Standards Stage

| Date | Stage | NMHC* | CO | NOX | PM |
|------|----------|-------|------|------|------|
| 2000 | Euro III | 0.78 | 5.45 | 5.00 | 0.16 |
| 2005 | Euro IV | 0.55 | 4.00 | 3.50 | 0.03 |
| 2009 | Euro V | 0.55 | 4.00 | 2.00 | 0.03 |
| 2015 | Euro VI | 0.16 | 4.00 | 0.46 | 0.01 |

Source: P. Apthorp, *Sustainable Freight Transport-Access to Finance*, GIZ/SWITCH-Asia (2018).

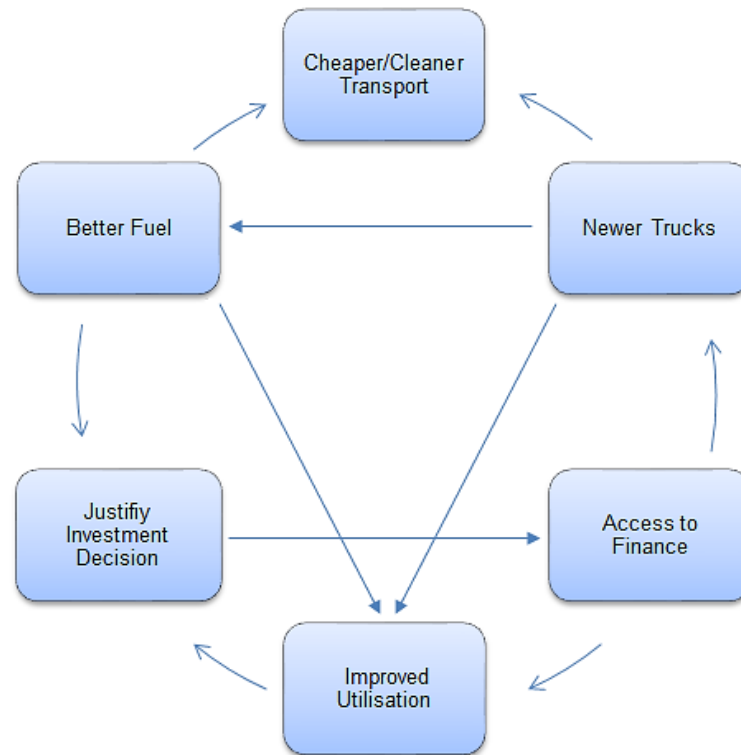
*Nonmethane Hydrocarbon.

Figure 5. PM2.5 Emissions and Sulfur Content per European Emission Standards Stage



Impact of fuel sulfur levels and emissions control standards on PM_{2.5} emissions from heavy-duty diesel vehicles (grams/km)
 Source: (Climate and Air Coalition, 2016)

Available at: <https://www.globalfueleconomy.org/media/412621/ccac-global-strategy-to-introduce-low-sulfur-fuels-and-cleaner-diesel-vehicles.pdf>

Figure 6. Fuel Quality Loops for Cleaner and More Efficient Transport

Source: P. Apthorp, *Sustainable Freight Transport-Access to Finance*, GIZ/SWITCH-Asia (2018).

Ensuring the quality of fuel at the point of distribution is also an important element, as pointed out in the Road Map for Cleaner Fuels and Vehicles. The Road Map lists the key factors necessary for a successful fuel quality monitoring system, which includes the founding of an independent fuel quality testing facility and the establishment of a fuel quality management committee in the Ministry of Mahaweli Development and Environment. The Clean Air Action Plan 2025 further recommends the establishment of laboratory facilities for testing fuels. However, there are various other components that affect pollution such as operational efficiency, distance covered, and modal split. See Appendix 5 for some of these components.

When discussing pollution and air quality, one cannot ignore shipping. In terms of environmental impact, shipping is the most energy efficient mode of mass transportation. On the other end of the spectrum, air transport consumes the most energy on a per-ton-km basis by far (see Figure 9) and thus cannot be considered as “green.” However, ships also emit more sulfur, PM, and black carbon per unit of fuel consumed on account of the quality of the bunker fuel used.¹²⁷

In addition, due to the sheer scale of the maritime transport sector, shipping accounts for up to 3 per cent of the world’s total CO₂ emissions and 15 per cent of nitrogen oxide (NO_x) emissions¹²⁸ that contribute to smog, acid rain, and ground-level ozone. It is also a major polluter of sulphur oxides (SO_x). While the

International Maritime Organization (IMO) has claimed that the global shipping industry was firmly on track to reduce its greenhouse gas emissions per ton-km by over 20 per cent by 2020, shipping emissions are still expected to nearly double by 2050, accompanied by related health and environmental consequences.¹²⁹

In terms of emission reductions in the maritime sector, the IMO set an absolute target for emissions reductions across the entire industry when it adopted its GHG Strategy in 2018 at the 72nd session of the Marine Environment Protection Committee (MEPC 72). The strategy has been referred to as the “Paris Agreement for shipping.” The strategy seeks to reduce GHG emissions by at least 50 per cent by 2050 compared to 2008 values, with the overall aim of phasing them out.¹³⁰

Measures for achieving this include the use of electric batteries, hydrogen fuel, LNG, and bioenergy. LNG, which is primarily methane, is becoming a popular transition fuel. While its energy density is less than that of conventional gasoline, its energy content by weight is greater than that of bunker fuel¹³¹ and, according to one article, LNG can reduce carbon emissions by 20 per cent compared to heavy fuel oil. Technology for using LNG in maritime transport is also mature enough for use, unlike the cases of hydrogen fuel or methanol.¹³²

However, there are those that contend that LNG is not an adequate transition technology as it is still far from being net zero and that the leakage of methane (the primary compound in LNG), which is a far more potent GHG than CO₂, during the extraction and production of LNG, nullifies the emission benefits of the fuel when considering life-cycle emissions.¹³³

Shipping giant Maersk is, for example, declining to invest in LNG vessels as a mid-term solution and has instead been directing money towards research and development of a dual-fueled vessel equipped to run on net-zero methanol and low-sulfur fuel oil.¹³⁴ Table 8 below presents a list of technologies for decarbonization maritime transport.

Cold ironing, also known as alternative maritime power, can be used for the reduction of pollutants at the port itself. By providing shore power to replace the energy produced by auxiliary engines (AEs) to power cargo handling equipment and other ship services while at port, cold ironing can effectively reduce hazardous emissions at port such as SO_x, NO_x, volatile organic compounds, PM, CO, N₂O, and CH₄. In addition, power supplied from the grid is generally subject to stricter emissions controls than power supplied from AEs and, in addition, produces less noise.¹³⁵

There are also management systems applicable to ports such as the International Organization for Standardization (ISO) standards 9001 (Quality Management Systems), 14001 (Environmental Management Systems), and 50001 (Energy Management System), as well as EMAS (Eco-Management and Audit Scheme) and PERS (Port Environmental Review System).¹³⁶

In addition, IMO regulations to reduce SO_x emissions from ships first came into force in 2005, under Annex VI of the International Convention for the Prevention of Pollution from Ships (known as the MARPOL Convention). Beginning January 2020, the limit for sulphur in fuel oil used on board ships operating outside designated emission control areas was reduced to 0.50% m/m (mass by mass).¹³⁷

Many bunker fuels contain sulphur that, following combustion, is emitted by the ship. SO_x are known to be harmful to both the environment (e.g. acid rain) and people’s health, causing respiratory symptoms and lung disease. According to a 2016 IMO report, “Delay in implementation of global sulphur limits from 2020 to 2025 would...contribute to more than 570,000 additional premature deaths compared to the implementation from 2020.”¹³⁸

Table 8. Decarbonizing Maritime Transport

| Select Innovation and Management Technologies Used to Decarbonize GHG in Maritime Transport |
|---------------------------------------------------------------------------------------------|
| 1. Ship Energy Efficiency Management Plan |
| 2. Modernizing propulsion system and hull design |
| 3. Carbon Capture, Utilization, and Storage |
| 4. Vessels powered by electricity |
| 5. Vessels powered by hydrogen |
| 6. Vessels powered by biomass |
| 7. Vessels powered by wind |
| 8. Vessels powered by LNG/LPG and methanol |
| 9. Berth priority for green transport unit |
| 10. Vessel sharing |
| 11. Supply and demand matching tool |

Source: PowerPoint Presentation, World Maritime University (2020). Available at: <https://bit.ly/3bOVXTB>;

The shipping industry, meanwhile, is presented with few options for compliance. These include switching to a compliant, low sulphur fuel; using alternative fuels such as LNG or methanol; or “cleaning” its exhaust with a scrubber technology to reduce the output of SO_x, which is becoming increasingly prevalent as ships retrofit their machinery with scrubber systems that reduce sulphur content from 3.5 per cent to 0.5 per cent.¹³⁹

During MEPC 75 in November 2020, the IMO also approved amendments to MARPOL Annex VI, introducing an Energy Efficiency Design Index for existing ships (EEXI). Adopted at MEPC 76 in June 2021, “the requirements will enter into force in 2023. The EEXI will be applicable for all vessels above 400 GT falling under MARPOL Annex VI.

Guidelines on calculations, surveys, and verification of the EEXI will follow and be finalized at MEPC 76.”¹⁴⁰ Meanwhile, ports themselves can play a big role in reducing pollution. In 2021, the Port of Long Beach (USA) approved changes to its Green Ship Incentive Program that will offer three incentive levels depending on the vessels Environmental Ship Index score. Under the program, vessels with main engines meeting the IMOs Tier III standard, which requires dedicated NO_x emission control technologies, are eligible for an additional US\$ 3,000 credit.¹⁴¹

This port is also part of a coalition of ports requesting an investment by the US state of California in emissions-free freight hauling, which includes financing for electric trucks and port charging stations and emissions-free cranes.¹⁴² Recently, Colombo International Container Terminals completed the conversion of its rubber-tired gantry cranes to electric power, reducing its onsite emissions by 40 per cent according to the company.¹⁴³

SDG 12.c: Rationalize Inefficient Fossil-Fuel Subsidies



Phasing out the market distortions of fossil fuel subsidies is the subject of SDG 12.c. Up-to-date information on fuel subsidies in Sri Lanka is hard to find however. Fossil fuel pre-tax subsidies in 2017 amounted to around .12 per cent of GDP, or around US\$ 4.95 per capita for US\$ 103 million in total.¹⁴⁴ This is down from a reported US\$ 300 million in 2013 according to figures provided by the UN.¹⁴⁵ In 2018, the first fuel price increase in Sri Lanka since 2015 occurred after austerity measures were imposed by the International Monetary Fund.¹⁴⁶ However, it was also mentioned that the import of Euro IV emissions standard fuel in 2018 was going to be released at subsidized prices on account of the higher import cost.¹⁴⁷ In 2019, a global decline in fossil fuel subsidies was noted to have occurred; however, Sri Lanka was only a handful of countries that supposedly did not have lower estimated subsidies.¹⁴⁸

SDG 13.1: Strengthen Resilience and Adaptive Capacity to Climate-Related Hazards



Climate-proofed transport infrastructure is future-proofed transport infrastructure. In other words, as global climatic conditions remain unstable and sea levels continue to rise for the foreseeable future, the functionality and continued development of coastal and other affected communities rests upon the resilience and adaptation of its infrastructure.

This is particularly pertinent to Sri Lanka as the country is very vulnerable to climate hazards and global warming. Sri Lanka was among the top 10 most affected countries in 2018 according to the Global Climate Risk Index 2020.¹⁴⁹ For one, Sri Lanka rests in the path of tropical cyclones that are common in the Bay of Bengal. According to the World Bank's Climate Change Knowledge Portal, "As with many island nations, storm surges and coastal erosion are a problem. Changes in the frequency and intensity of extreme climatic events, sea level rise, and storm surges are...major concerns for Sri Lanka."¹⁵⁰ In addition, as an island nation with around 33-50 per cent of its population in coastal areas—which also account for the highest concentration of economic activity—sea level rise is a mounting concern.¹⁵¹ One study found that the seasonally adjusted tidal gauge data of Colombo shows that the sea level has increased by a rate of 0.288 ± 0.118 mm/month.¹⁵²

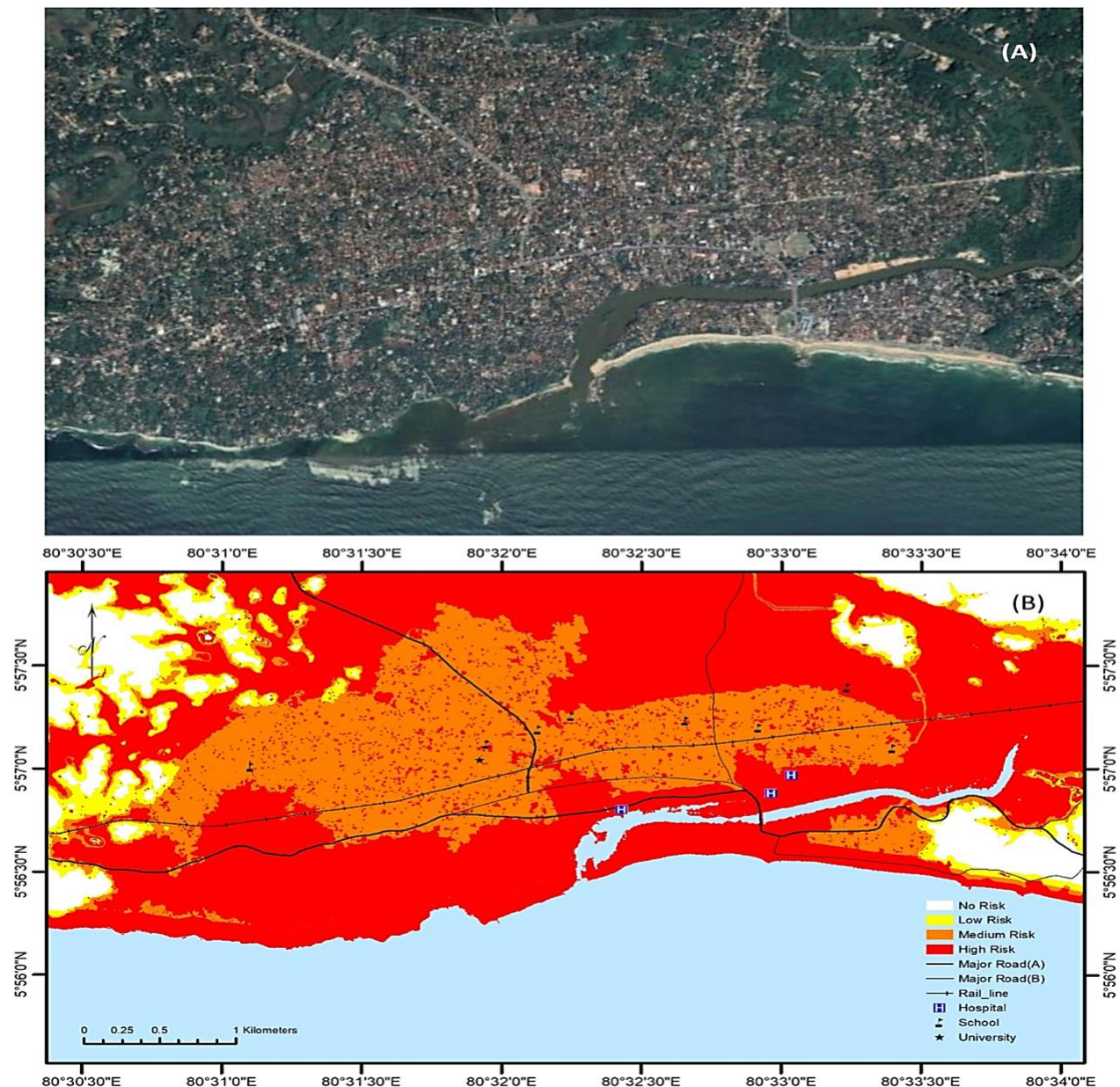
While not uniform, sea level rise carries the serious potential to inundate some coastal areas in the future, and this includes port areas and coastal roads, railways, and logistics facilities. Sea level rise can also amplify existing hazards from tsunamis and cyclones.¹⁵³ The Southern Expressway, SLR's Coastal Line, and numerous A and B class roads either follow or are near the coastline between Colombo and the major coastal cities and towns of the Western and Southern Provinces. Figure 7 below presents a risk assessment map for Matara. One can see that, in addition to dense human habitation, A (A2) and B class roads, the Coastal Line, and even hospitals are in a potentially high-risk zone. Meanwhile, Figure 8 shows that, in Galle, the A2 highway, the city harbor, and an Insee Cement plant are in potentially high-risk zones.

The NAP-CC confirms these dangers. According to the plan, the effects of climate change are frequency and severity of intense rainfall, floods, cyclones, high winds, and inundation of low-lying areas. The identified impacts are: disturbance to road, sea, and air transportation; increased congestion and travel time in transportation; damage to transport infrastructure in coastal areas; and damage to energy and industrial facilities, including in coastal areas.¹⁵⁴ However, this study has found little readily available information to suggest that Sri Lanka has made progress on climate-proofing its infrastructure or that the

relevant portions of its national strategies have been implemented. Data on climate change adaptation measures are also not noted to be collected by the government.¹⁵⁵

According to the ND-GAIN Country Index, which summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience, Sri Lanka ranked 103/181 countries in 2018. It was assessed to be 92nd least ready country but the 60th most vulnerable on the index. Adaptation needs and the urgency to act were noted to be greater.¹⁵⁶ Retaining its forest ecosystems seems to be one adaptation and mitigation priority for Sri Lanka.

Figure 7. Sea Level Inundation and Coastal Erosion Risk Assessment Map of Matara



Source: Palamakumbure, L., Ratnayake, A.S., Premasiri, H.M.R. *et al.* Sea-level inundation and risk assessment along the south and southwest coasts of Sri Lanka. *Geoenviron Disasters* 7, 17 (2020). Available at: <https://doi.org/10.1186/s40677-020-00154-y>

Figure 8. Sea Level Inundation and Coastal Erosion Risk Assessment Map of Galle

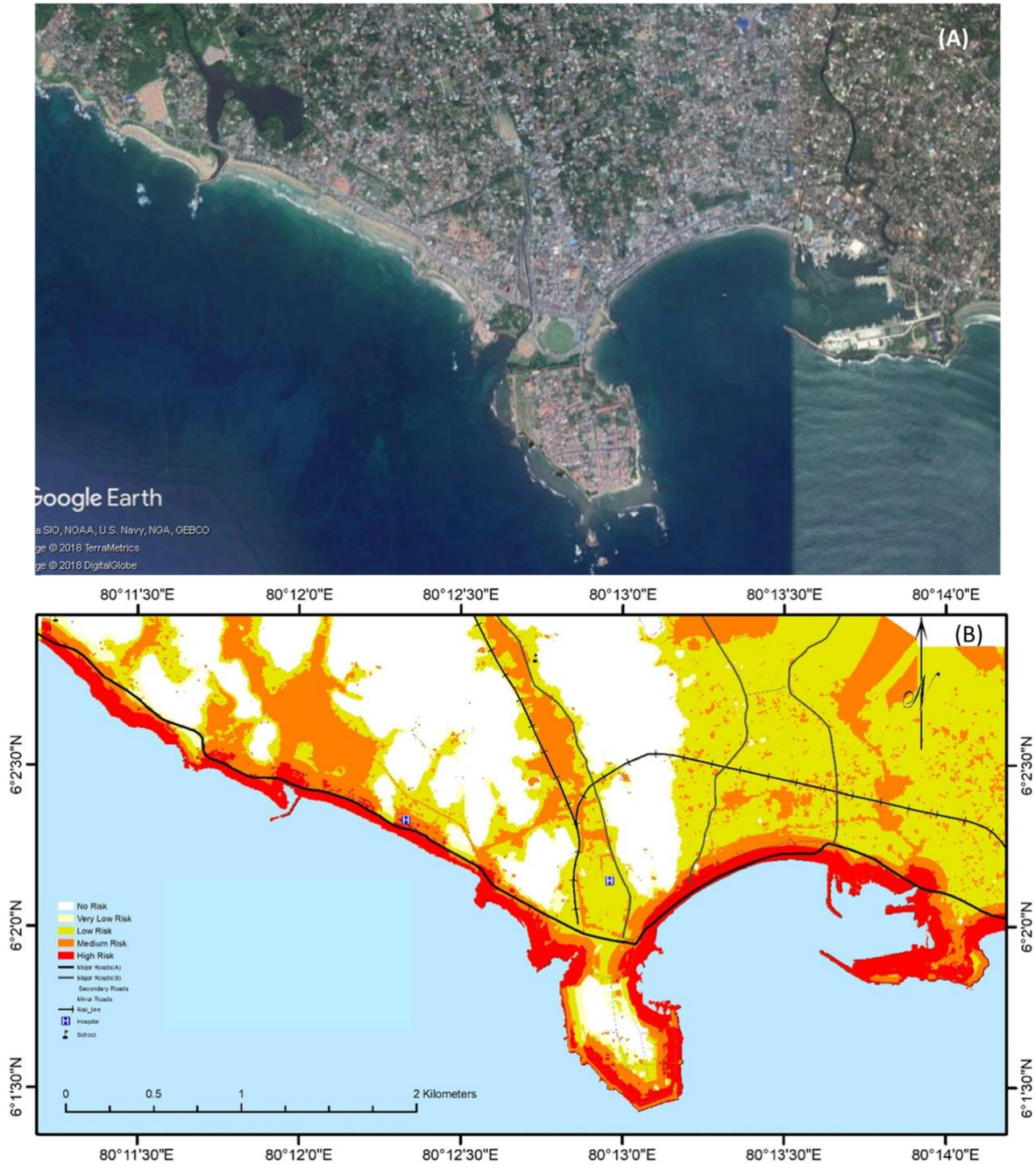


Table 9. Planned vs. Actual Expenditures for Natural Disaster Affected Road Rehabilitation

| Million Sri Lankan Rupees | Year | | | | | | | | | | |
|---------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Planned Expenditure | 15.21 | 17.17 | 17.32 | 13.63 | 17.00 | 21.29 | 21.76 | 21.68 | 25.66 | 27.09 | 17.22 |
| Actual Expenditure | 15.52 | 20.60 | 26.99 | 32.86 | 41.01 | 66.31 | 49.17 | 64.28 | 72.61 | 43.65 | 67.77 |

Source: Road Development Authority

SDG 13.2: Integrate Climate Change Measures into National Policies, Strategies, and Plans



An important component to combating climate change is integrating measures into national policies, strategies, and plans, as well as having an overarching one dedicated to combatting climate change. Doing so can help bring climate change to the forefront and account for the impacts that it may have across other policies, strategies, and plans. Integration can further streamline the fight against climate change, including across the government and stakeholders.

Sri Lanka has no shortage of references to climate change and emissions reduction in its existing policies, strategies, and plans. These include direct linkages to transportation. Some notable ones include the NAP-CC and Sri Lanka's Nationally Determined Contribution (NDC) to the Paris Agreement. As mentioned under the subsection on SDG 9.1, the NAP-CC includes a whole host of actions intended to enhance the resilience of the transport sector. Its NDC, meanwhile, commits Sri Lanka to reduce 10 per cent of its greenhouse gas (GHG) emissions from the transport sector.¹⁵⁷ However, it is acknowledged that, globally, current NDCs are not sufficient to meet the goals of the Paris Agreement and require adjustment. See Appendix 6 for a visualization of emissions gap under the Paris Agreement.

Means of Implementation

The MoI form thematic work streams that help to integrate, implement, and review the SDGs. Key MoI include data, statistics, and monitoring; policy and institutional coherence; trade; science, technology, and innovation (STI); and financing for development. Many of the MoI fall under SDG 17 on Partnerships for the Goals. A review of several key MoI can help assess Sri Lanka's ability to achieve the SDGs and the goals and targets relevant to freight transport. For this, data and statistics, technology and innovation, policy coherence, and financing for development will be explored. For more on trade, see Section 4.4.

Source: Palamakumbure, L., Ratnayake, A.S., Premasiri, H.M.R. *et al.* Sea-level inundation and risk assessment along the south and southwest coasts of Sri Lanka. *Geoenviron Disasters* 7, 17 (2020).

Available at: <https://doi.org/10.1186/s40677-020-00154-y>

Maintaining statistics based on timely, reliable, and disaggregated data is important. Such statistics enable better, more-targeted decisions to be made for the SDGs, for sustainable freight transport, and in other areas. For example, monitoring, reporting, and verification (MRV) of emissions and emissions reductions is critical to help countries understand GHG sources and trends in order to design effective mitigation strategies. In addition, quality data and information can enable sound road and fleet investment and policy planning.

However, quality/availability of data remains a perennial issue in developing countries. Nonetheless, Sri Lanka's 2019 statistical capacity score, as measured by the World Bank, is relatively strong, standing at 81 out of 100. This is against a South Asian average of 69 that same year.¹⁵⁸ This is not to say that there are no gaps though. For example, the Government of Sri Lanka does not collect data related to sustainable freight transportation policies; although, there are supposedly upcoming plans to collect such data.¹⁵⁹

It has been mentioned that a national MRV system is being developed to track the effectiveness of transport sector emission mitigation and adaptation measures; although another source from 2020 notes that Sri Lanka had already designed a national MRV system for the transport sector and NDC reporting.¹⁶⁰

Internally, the Ministry of Transport is planning to develop data in collaboration with government and other agencies such as Department of Census and Statistics, the private sector, and The Chartered Institute of Logistics and Transport. The Department of Census and Statistics; the Ministry of Power, Energy and Business Development; Sri Lanka Ports Authority; SLR; the National Transport Commission; and the Sri Lanka Transport Board all collect statistics on an annual and ad hoc basis.¹⁶¹ An effort to establish a road crash database is also reportedly underway with support from the WHO. At present, poor quality crash fatality and injury data make it difficult to distinguish between road and other safety risks in Sri Lanka.¹⁶²

Table 10 below, meanwhile, highlights the gaps in sustainable freight transport data collection. This table indicates major gaps in the collection of sustainable freight transport data across the three dimensions of sustainable development and, particularly, in the economic dimension.

Table 10. Sustainable Freight Transport Data Collection (blue=collected, red=not collected)

| Basic Freight Transport Data | Environment Sustainability | Social Sustainability | Economic Sustainability |
|----------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------|
| Total inland freight transport (ton-km) | Fuel efficiency of existing fleet | Number of freight transport Accidents per year | Freight transport costs |
| Road freight transport (ton-km) | Fuel quality and standards, including emission norms | Number of accidents in total per year | Logistics costs |
| Rail freight transport (ton-km) | Total fuel use by freight transport by mode | Number of injuries and fatalities | Delivery and transit time |
| Average ton-km travelled per vehicle | Use of renewable/ alternative fuels | Number of commercial vehicle safety violations | Transport time delay |
| Average load factor (all modes) | Carbon dioxide (CO ₂) emissions from freight transport | Expenditure on freight transport security | Transport charges (e.g. cargo charges, tolls, licensing fees) |
| Empty returns (all modes) | Local air pollution emissions from freight transport | Measures on increasing freight transport safety and security | Repair and maintenance costs of infrastructure |
| Average age of the fleet | Water and soil contamination caused by freight transport activity | Working hours of employees | Share of employment in the freight transport sector |
| Rail freight loading capacity | Noise and vibration impact | Working environments and safety | Share of employment by gender |
| Number of container terminals, including dry ports | Number of disrupted habitats caused by transport infrastructure | Employees' income and compensation packages | Use of ICT and Intelligent Transport Systems |
| | Costs and negative impacts of biodiversity loss | Road-side clinics, rest areas and wellness centres for truckers | Import restrictions on old vehicles -if any |
| | Measures on preventing or reducing biodiversity destruction | Training/ educational programmes for employees (e.g. drivers) | |
| | Impact of climate change on freight transport infrastructure, services and operations | Medical costs due to air pollution related illness | |
| | Number of climate change adaptation measures | Stress caused by heavy traffic and congestion | |
| | Costs of climate change adaptation and resilience measures for freight transport | Number of measures to reduce the health related impacts of freight transport | |
| | Integration of transport and land use planning | | |

Source: Questionnaire, ESCAP (2021)

Science, Technology, and Innovation

Science, technology, and innovation (STI) is extremely important as a driver and accelerator of positive change. It can enable higher efficiency in economies, better governance, and greatly reduce the environmental impacts of development. For example, using the simple formula $I=PAT$ to understand human impact on the environment—where I is impact, P is population, A is affluence (i.e., consumption), and T is technology—technology is the only variable that can offset the adverse environmental impacts if both population growth and greater per capita consumption were to take place. This would be achieved through efficiency and or alternatives and is, therefore, essential to minimizing negative environmental impacts in the face of consumption-based development and population growth.

All things considered, STI does not play a large role in the current economy of Sri Lanka in terms of the country's products (as compared to many high-income countries for example), as touched upon in Section 1.A. In addition, the railways and trucks in Sri Lanka are outdated and not necessarily reflective of the latest technologies. However, the taxation on hybrid and electric cars was noted to be low as a matter of policy in Sri Lanka's VNR and the promotion of hybrid and electric vehicles was recommended in the Road Map for Cleaner Fuels and Vehicles in Sri Lanka. In addition, Sri Lanka has placed emphasis on the importation and refinement of higher quality, cleaner fuels and has indicated an interest in exploring alternative fuels.

Meanwhile, the prevalence of internet usage in Sri Lanka is still relatively low, estimated by the World Bank to be at 34 per cent of the population in 2017.¹⁶³ However, internet usage is growing, with another source citing the penetration at 47 per cent in January 2020 with an increase of 399,000 users between 2019 and 2020 alone.¹⁶⁴ Furthermore, Sri Lanka has a relatively mature IT industry, despite the nascent growth in internet penetration. Greater digital literacy, higher internet penetration, mobile applications, and use of software can all aid in the development or use of new, innovative technology platforms. In India for instance, the technology company BlackBuck, which focuses on business-to-business logistics solutions for long-haul trucking, facilitates the booking of freight for inter-city transportation between shippers and truckers and is thus helping to maximize efficiency while minimizing downtime for trucks, all of which can reduce GHG emissions among other pollutants.¹⁶⁵

Moving on, intelligent transportation systems (ITS) are advanced applications that provide innovative services relating to different modes of transport and traffic management. They enable users to be better informed and make safer, more coordinated, and "smarter" use of transportation networks. In the past, Sri Lanka had launched an ITS pilot project on inter-provincial bus services¹⁶⁶ and also one for the island's expressways in 2015.¹⁶⁷ Other management systems have been used as well. According to the journal article *Towards the Development Of Intelligent Transportation Systems In Sri Lanka*,

In the current era to maintain the traffic problem the following system were used by the government of Sri Lanka Advanced Traveler Information System (ATIS), Advanced Traffic Management System (ATMS), Advanced Public Transportation System (APTS), Emergency Management System (EMS), Transit Management Systems (TMS), Freight Management and Incident Management Systems.¹⁶⁸

Electronic toll collection (ETC) systems are also one means of improving the flow of traffic and reducing or eliminating delays. At present, ETC is only available on the Colombo-Katunayake Expressway (E03).¹⁶⁹ Fully developing the Port of Colombo into a smart port would help to ensure its functionality and competitiveness in the modern era, and thus the crucial role it plays in the economy and future of Sri Lanka.

Policy Coherence and Capacity Development

Policy coherence can be defined as a systematic promotion of mutually reinforcing policy actions across the government in order to create synergies towards achieving an objective, hence being “coherent.” This often entails collaboration and cooperation across the government and stakeholders, use of institutional mechanisms, harmonizing actions, and reconciling competing policy objectives. In terms of policy coherence and the SDGs, this continues to be challenging for many countries. The Organisation for Economic Co-operation and Development provides a good summary of the issue,

Implementing the Sustainable Development Goals (SDGs) as an integrated and coherent set represents a major challenge to all countries. Addressing interactions between economic, social and environmental goals in a balanced manner, while avoiding negative effects on the wellbeing of people here and now, elsewhere and later, has been recognized by many countries as one of the most difficult challenges to implementing the SDGs.¹⁷⁰

Fortunately, in the case of Sri Lanka, there is no shortage of national policies, strategies, visions, or plans that integrate various components of sustainable development. In fact, they form a relatively clear guide for sustainable freight transportation development across the three dimensions when individual components are isolated and brought together (see Appendix 10). In fact, the 2030 Vision has already mentioned collating “all available transport sector plans and studies into a 10 year national multimodal transport strategic plan.” Intergovernmental coordination is, however, a noted issue in Sri Lanka.

According to an ESCAP questionnaire, Sri Lanka always considers sustainable development in its policy making and the government often takes measures to ensure sustainability driven decision making in freight transport policy. Table 11 below provides an overview of sustainability considerations for freight transport infrastructure.

Table 11.

| Is sustainability considered at any stage of the freight transport infrastructure lifecycle? | |
|-----------------------------------------------------------------------------------------------------|-----|
| Yes | |
| At what phases? | |
| Planning | Yes |
| Design | Yes |
| Finance | No |
| Construction | Yes |
| Operation and maintenance | Yes |
| Disposal | No |
| At what levels? | |
| National | Yes |
| Municipal | Yes |
| Local | Yes |

Source: Questionnaire, ESCAP (2021).

Within the Ministry of Transport, there are implementing and regulatory departments responsible for sustainable freight transport policies. For implementation, this includes SLR and, for regulation, the Department of Motor Traffic. The Ministry of Transport also coordinates with other ministries in freight transport decision making. For example, inter-ministerial committees are held, such as one regarding moving bulk fertilizer imported at Trincomalee “via proper channels,” like rail. This involved the Ministry of Transport in discussion with those managing warehouse facilities, port facilities, fertilizer supply, and chemical regulations. Meanwhile, horizontal cooperation is noted to exist across different transport modes, and this extends to plans to develop container yards with rail connections to ports and collaborative actions to be taken with the Ministry of Ports and Shipping, private freight forwarders associations, and other stakeholders.¹⁷¹

However, there are gaps that prevent cooperation among policymakers across different transport modes such as a need to strengthen existing mechanisms to ensure conformity between policy directions and practices and a need to improve inter-ministerial dialogue on cross-cutting issues. Existing institutional mechanisms for vertical cooperation for freight transport policies include local councils imposing tariff/charges and licensing under existing provisions and provincial councils providing space in their charter to include relevant development activities.

Table 12. National, Provincial, and Local Stakeholders

| | |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| National | Ministry of Transportation, Department of Motor Traffic, SLR, Sri Lanka Police, National Council for Road Safety, Chartered Institute of Transport and Logistics, RDA, and universities |
| Provincial | Provincial transport ministries, regional SLR offices, provincial RDA, and police stations |
| Local | Private producers; end users; cooperative societies; vehicle owners; State Ministry of Container Warehouse Facilities, Container Yards; Port Supply Facilities and Boats and Shipping Industry Development; SLPA; Chartered Institute of Transport and Logistics; and University of Moratuwa |

Source: Questionnaire, ESCAP (2021).

Developing capacity is meanwhile important for effective implementation yet remains a challenge for many countries as well. As such, exchange of best practices and the training of competent administrators and logistics professionals in this context are important. The Government of Sri Lanka was noted to provide training programs on sustainable freight transport policies at the national level, including awareness trainings.¹⁷² The SLPA meanwhile runs the Mahapola Ports and Maritime Academy as a feeding system in to the SLPA workforce. The academy, recognized by the UN and the shipping industry, focuses on maritime seamanship, technical safety, port operation, management, equipment handling, and information systems.¹⁷³

The Sri Lanka Logistics and Freight Forwarders Association (SLFFA) had also launched a training arm in 2006: the Academy of International Trade and Transport. This academy is endorsed by ESCAP, the International Federation of Freight Forwarders Associations (FIATA), and is an accredited training school of the International Air Transport Association. The curriculum of its training course is based on those supported by ESCAP and FIATA.¹⁷⁴ The University of Moratuwa is also known to be involved in efforts to improve transportation and runs a Department of Transport and Logistics Management.¹⁷⁵ However, whether these programs explicitly tie sustainability and its various considerations into their curriculums may be worth looking into.

Financing for Development

Developing and improving transport infrastructure and logistics facilities, investing in new technologies, training professionals, and climate-proofing existing infrastructure all come with a hefty price tag. Financing for development extends to national governments at the top, all the way down to SMEs at the bottom. At the same time, sustainability is increasingly being tied into finance as an integral, rather than secondary, component. Financing for sustainable development, however, remains a fundamental challenge for many countries.

Sri Lanka has fiscal challenges and has run into balance of payment crises in the past. Identified structural issues include the contraction of trade as a percentage of GDP, low levels of FDI, declining tax revenues, and limited export diversity and destinations. Sri Lanka has low tax revenues as a percentage of GDP and lacks alternative revenue generation such as, for example, oil and gas money as seen in other economies with low tax revenue like the Russian Federation, Saudi Arabia, the United Arab Emirates, etcetera. Sri Lanka's tax revenue has also been steadily declining. The World Bank listed Sri Lanka's tax revenue in 1990 as 19 per cent of GDP; by 2019, it had fallen to 11.55 per cent.¹⁷⁶ The Government of Sri Lanka also had, at the time of this writing, one of the highest percentages of debt in terms of GDP. Furthermore, government revenue as a percentage of GDP was anticipated to be at around 11.4 per cent in 2021, with government spending being higher at 20.4 per cent.¹⁷⁷ Complicating this, the COVID-19 pandemic has had a major impact on the economy and budget.

Meanwhile, major sources of funding and finance for freight transport infrastructure are government public investment, domestic capital, external loans/grants, and private investment.¹⁷⁸ One of the primary focuses of public investment has been ensuring connectivity, which includes rural and urban roads and expressways.¹⁷⁹ According to the Ministry of Transportation, financing for the transport sector (including freight) is available through agencies such as the ADB, the South Asia Subregional Economic Cooperation, and the Global Green Growth Institute. When looking at the cumulative lending, grant, and technical assistance commitments from the ADB to Sri Lanka, transport-related projects commitments are the most numerous. Public-Private Partnerships are also an available means of financing transport infrastructure as discussed in Section 2.D.

In the "Budget Speech 2021," measures to ease financial burdens on freight-related investments were proposed. This includes exempting investments in bonded and other warehouses for Colombo and Hambantota Ports from taxes. Concessions on customs duties and support for extension of credit facilities for cold storage of fruits and vegetables were also proposed in the speech, as well as long-term credit facilities and tax breaks to promote domestic shipbuilding activities. Increasing cargo facilities for the exportation of fish is also mentioned. The speech also highlights a need for finance sector and taxation reforms. For instance, this includes simplified and consistent tax policies and improvements to the efficiency of tax collection (e.g. online systems).¹⁸⁰

While finance is necessary for sustainable development, not all finance is directed towards sustainable endeavors. Incorporating sustainability into finance is therefore important. This is true for banks and other lending institutions and Sri Lanka has taken some steps in this direction. According to the Central Bank of Sri Lanka, "The importance of initiating Sustainable Finance in Sri Lanka has been widely discussed among the stakeholders of the financial sector." In 2016, the Central Bank joined the International Finance Corporation (IFC) supported Sustainable Banking Network, which represents 86 per cent of banking assets in emerging markets. It had also helped develop the Roadmap for Sustainable Finance that was launched in 2019¹⁸¹ to provide guidance and support to financial institutions to effectively manage environmental, social, and governance risks associated with projects they finance and increase support to businesses that are greener, more climate-friendly, and socially inclusive.¹⁸²

The Sri Lankan Banking Association had also launched its Sustainable Banking Initiative in 2015 as a platform to enhance understanding on responsible banking practices. According to the Central Bank, many Sri Lankan licensed banks have already set up sustainable finance banking units and initiatives focusing on renewable energy, entrepreneurship development, environmental protection, and women's empowerment for example. Many have also been reporting on sustainability in their annual reports. However, the Central Bank also noted several challenges, such as an inability among regulators to compute riskiness based on improper expertise and experience on assessing the viability of projects based on their underlying "green" or "brown" assets. As such, further capacity building efforts and technical guidance may be needed.¹⁸³

In the context of sustainable finance, it is worth mentioning that climate and green bonds are seeing a surge in issuance worldwide. While popular primarily in China and the EU, green bonds have the potential to take off elsewhere and can be used to finance "green" infrastructure. In 2020, the Pan Asia Bank became the first Sri Lankan bank to receive green bond issuance.¹⁸⁴ Sri Lanka has also founded the Sri Lanka Carbon Crediting Scheme to support local clean energy projects benefit from climate finance for GHG emission reduction.¹⁸⁵ Additionally, the Sri Lanka Climate Fund, under the Ministry of Mahaweli Development and Environment, helps to enhance access to climate finance to provide fundraising services to firms working on climate change mitigation and adaptation projects.¹⁸⁶

In Sri Lanka, there is also the issue of limited access to finance for SMEs. SMEs form the base of the economy and, therefore, their ability to access finance to invest in newer, more efficient technologies and more sustainable assets plays a big role in sustainable development. The major factors contributing to credit constraints of the SME sector in Sri Lanka have been identified by the ADB as:

- Limitations within financial institutions, such as a risk-averse banking culture and heavy reliance on collateral;
- Limitations within the market infrastructure, including insufficient mechanisms to overcome information asymmetries; and
- Limitations within SMEs, for example, poor financial literacy, lack of market knowledge, and lack of transparency.¹⁸⁷

There are also reportedly no dedicated funds for private sector investment in sustainable freight transport technologies in Sri Lanka.¹⁸⁸

2. Avoid-Shift-Improve Framework

The avoid-shift-improve framework is a commonly applied framework in sustainable transportation. It provides a framework for achieving GHG emission and other pollutant reduction in the transport sector by consuming less energy through avoidance, shifting, and improvement.

Avoid: "passenger trips and freight movement or reduce travel distance by motorised modes of transport through regional and urban development policies, integrated transport and spatial planning, logistics optimization and travel demand management."

Shift: "passenger and freight travel to more environmentally—and socially—sustainable modes, such as public transport, walking and cycling (in the case of passenger transport), and railways or inland waterways (in the case of freight transport)."

Improve: “the energy efficiency of transport modes through low carbon fuel and vehicle technologies, increased vehicle load factors, and better managed transport networks, with non-petroleum, low carbon fuels playing a more significant role, particularly before 2030.”¹⁸⁹

Table 13 below shows the components to GHG mitigation that can be interpreted through the avoid-shift-improve framework and presents a formula to conceptualize emissions using fuel carbon intensity (improve), energy intensity (shift), and activity (avoid).

Table 13. Components to GHG Mitigation

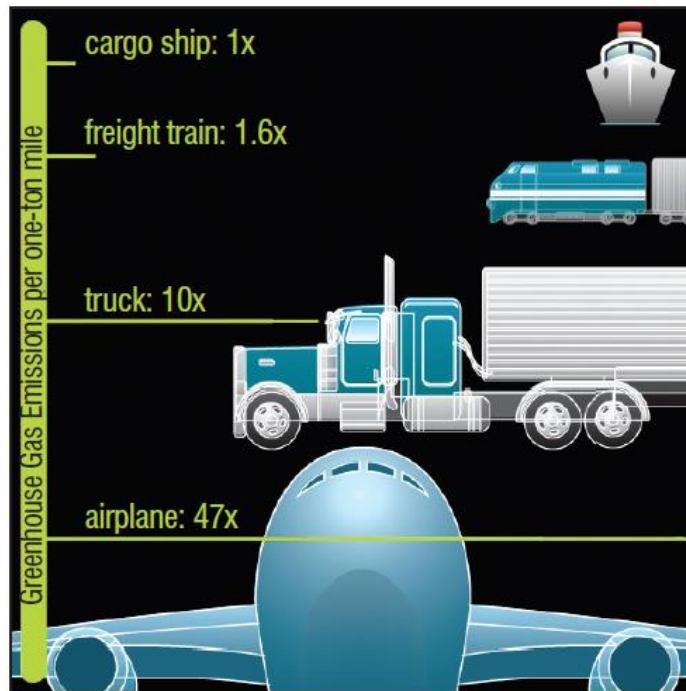
| Total GHG Emissions | | | |
|--------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| | Fuel Carbon Intensity | Modal Energy Intensity | Activity |
| Factors | Diesel; Gasoline; CNG/LPG; Biofuels; Electricity; Hydrogen; Others. | Light duty vehicles; Heavy duty vehicles; Trains; Aircraft; Ships; Others. | Number of journeys; Journey distance; Journey avoidance; Congestion; Idle time. |
| Units | tCO ₂ equivalent / MJ | MJ / ton-km | ton-km total |
| Total GHG Emissions= Fuel Carbon Intensity · Modal Energy Intensity · Activity | | | |

Source: Derived from: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, page 607. Available at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter8.pdf

Note: CNG = compressed natural gas; LPG = liquid petroleum gas.

Optimizing logistics (e.g. better connectivity, less empty returns, etcetera) and achieving economies of scale in the transport of goods can result in the **avoidance** of unnecessary trips or distance traveled. **Improvements** in vehicle technology, fuel quality, fuel types, and load factors for example can lend to higher energy efficiency and lower pollution in the transport of freight. Meanwhile, **shifting** towards less energy-intensive modes of freight transport can result in major emission reductions and is especially important as the total ton-km of freight only continues to rise. So-called “modal shift” (i.e., replacing one means of transport [mode] with another mode) is particularly relevant as a topic of discussion in Sri Lanka given the total dominance of freight transport by road. Trucks emit far more GHG per ton-km than trains or ships. Airplanes though emit, by far, the most GHG and cannot be considered green as such. See Figure 9 below.

Figure 9. Greenhouse Gas Emissions by Mode



Christine Daniloff/MIT News

At present, modal shift in Sri Lanka encounters obstacles. For one, the quality of Sri Lanka's rail lines and rolling stock are no longer suited for freight transport. Inland waterways, meanwhile, do not appear to be used for freight transport and the country has few major natural waterways that can be used for freight transport. However, it is part of Sri Lanka Railways' mission to provide rail freight services and numerous guiding plans such as the Clean Air Action Plan 2025, the 2030 Vision, the National Transport Policy, Vistas of Prosperity and Splendour, and Sri Lanka's Nationally Determined Contributions all call for expanding the use of the railways for freight transport.

Modal shift to rail would also be in line with Sri Lanka's expressed interest in reducing the energy intensity of transport. Increasing volumes of freight transport has also been proposed as a means of improving the financial performance and revenue streams for SLR.¹⁹⁰ There are a few initiatives underway to encourage modal shift such as rolling stock for freight transport improvements (e.g. freezer trucks to transport bulk perishable produce by rail) and a move to transport dry bulk via railways (e.g. fertilizer, cement, sand, etcetera).¹⁹¹ Rail is also suitable for the transport of hazardous goods off of the roads, as mentioned in the National Policy on Transport.¹⁹²

Given the good connectivity of the railway network in Sri Lanka and the competitive advantage (pricewise) of a well-functioning railway system over long distances, SLR can theoretically become a bigger player in the transport of freight. At present, material is moved, for example, by rail on the Puttalam Line to produce cement and one of the largest users of rail freight services in Sri Lanka is GTV Express, moving parcels across the country as a courier service. Particularly, there is greater potential to utilize the railways in conjunction with ports and ICDs. Expanding facilities required to transport cargo via trains to Colombo,

Hambantota, Trincomalee, and Kankasanthurai ports has been mentioned¹⁹³ and diverting containers to and from the Port of Colombo by railway can help reduce traffic around the port.

However, in general, the railways do not seem to be used for containerized transport. Containerization is an important component to modal shift as it can enable more efficient intermodal transport and thus promote modal shift. Intermodal transportation entails using two or more modes (carriers) to transport freight from the shipper to the consignee through, for example, the use of special standardized shipping containers that can easily be moved from one mode of transport to the other. This is facilitated by intermodal facilities that efficiently move the goods or containers from one mode to the other. Not only does this increase the overall efficiency of freight transport but maximizes the potential for modal shift and, therefore, reduces carbon footprint.

Dry ports are one such intermodal facility. Dry ports act as inland terminals connected to a seaport that provide services for the handling and temporary storage of containers, general, and/or bulk cargoes that enter or leave the facility by any mode of transport such as road, railways, inland waterways, or air. They can act as customs clearance facilities for import-export formalities close to production and consumption centers, storage areas to reduce congestion and pollution at sea ports, consolidation points, points of access to the hinterland, enablers for the use of containers, and can reduce the pressure on road transport.¹⁹⁴ The term dry port is often interchangeable with ICDs or container freight stations (CFSs); however, unlike ICDs and CFSs, dry ports are not limited to the handling of containers. Sri Lanka has several privately operated ICDs within fair proximity to the Port of Colombo. However, they do not appear to accept containers via rail.

Three locations for new dry ports have been identified as Peliyagoda, Ratmalana, and Veyangoda,¹⁹⁵ all of which have rail connection. Under the 2013 Intergovernmental Agreement on Dry Ports, Sri Lanka had also committed to establishing two dry ports, one of them being in Peliyagoda.¹⁹⁶ Some proposed plans to expand the Mirigama EPZ have also included the potential for a container yard, intermodal transfer and container handling facilities, warehousing, and rail connectivity for cargo.¹⁹⁷ Supposedly, construction of a new ICD at Kerawalapitiya is already in progress with legal arrangements for container movements via the. The feasibility study for a multimodal hub at Veyangoda is also reportedly underway, with the site undergoing preparation.¹⁹⁸

B. Government

As will be listed in Section 3, there are a host of existing national policies, plans, visions, and strategies from both the previous and current administrations that all incorporate elements of sustainable freight transportation in one way or another (directly or indirectly) through the economic, environmental, and social dimensions. There is also a strong acknowledgement of the role that a well-functioning port and logistics network play in optimizing Sri Lanka's position as a shipping hub and in diversifying its exports. In general, there seems to be a strong sense of self-awareness in government documents of the deficits in the country's transport network for both passengers and freight. In addition, Sri Lanka has worked with its development partners—mainly the ADB, World Bank, and regional countries—to fund the construction of numerous transport projects that can contribute towards a better (and potentially more sustainable) freight transportation system in Sri Lanka.

As mentioned in the subsection on policy coherence and capacity development under Section 2.A.1 (under Means of Implementation), Sri Lanka considers sustainable development in its policy making and the government often takes measures to ensure sustainability driven decision making in freight transport policy, according to an ESCAP survey. Among the government's major ongoing transport drives are the

continued expansion of the expressway and railway network. Another major initiative, under the Ministry of Transport, is the National Council for Road Safety that consists of 16 government institutions and a representative of a non-state body headed by the Chairman of the council.

However, conformity between policy directions and practices and interministerial dialogue on cross-cutting issues has been cited as an issue.¹⁹⁹ Enforcement on road safety and overloading also appear to be problematic. In addition, the fiscal climate can hinder the government's ability to fund sustainable transport developments.

Recent Transportation Projects

- Climate Resilience Multi-Phase Programmatic Approach
- Transport Connectivity and Asset Management Project
- North East Local Services Improvement Project
- Integrated Road Investment Program
- Sri Lanka: Railway Efficiency Improvement Project
- South Asia Subregional Economic Cooperation Port Access Elevated Highway Project
- National Port Master Plan
- Railway Master Plan
- Central Expressway
- Ruwanpura Expressway
- Southern Railway Extension Project

Environmental Impact Assessments

While transport infrastructure is important for economic and social development, to be truly sustainable, large development projects must be as environmentally friendly and impact conscientious as possible. To these ends, genuine environmental impact assessments (EIAs) should be a prerequisite to any major transportation development project with the potential for serious environmental implications; in the case of social implications, social impact assessments (SIAs) are also merited. According to the NRMP, "It is important that an EIA is not merely a part of the approval process but, a tool aims[ed] at facilitating sustainable development."

An EIA framework exists in Sri Lanka that is, on paper, relatively comprehensive. The Environmental Impact Assessment Unit, under the Central Environmental Authority, is responsible for implementation of EIA procedures under the National Environmental Act. EIAs are a mandatory requirement for all "prescribed" development projects under the act. Only large-scale development projects that are likely to have significant impacts on environment are listed as prescribed projects. Approval for prescribed projects must be granted by any of 23 government agencies designated as a Project Approving Agency that will also be responsible for administering the EIA process for the project. However, if the environmental impacts of the project are not deemed to be very significant, then an Initial Environmental Examination (IEE), which is a relatively short and simple study, may be required in place of a full EIA. However, if the potential impacts are deemed to be more significant, an EIA is to be conducted, which is a more detailed and comprehensive study.

A list of prescribed projects requiring an IEE/EIA for transportation systems include:

- Construction of national and provincial highway involving a length exceeding 10 kilometers;
- Construction of railway lines;
- Construction of airports;
- Construction of airstrips;
- Expansion of airports or airstrips that increase capacity by 50 per cent or more;
- Construction of ports;
- Construction of harbors;
- Port expansion involving an annual increase of 50 per cent or more in handling capacity per annum.²⁰⁰

However, the National Policy on SCP mentions reviewing, strengthening, and empowering existing legal instruments such as EIAs and, according to the 2020 Environmental Performance Index, Sri Lanka still ranks among the bottom half of countries. While not directly related to EIAs, this ranking provides an overview of the country's overall environmental performance.

C. Private Sector

Alongside the government, the private sector is perhaps the most important stakeholder in freight transportation as they are the primary operators in freight transportation. Without their buy-in and participation, an effective transition to sustainable freight transport will likely not be achieved. In addition, the private sector, when properly engaged, empowered, and regulated can be drivers of innovation and efficiency with the potential to create positive environmental, economic, and social impacts. For example, it is in their long-term interest to maximize efficiency, to consume less and better fuel, to use cheaper rail freight services, to develop ICDs and transport infrastructure (such as ports, roads, and rail), to diversify exports, to employ skilled workers and offer gainful employment, and to mitigate/adapt to climate change among other things.

Already, many private companies are involved in freight transport in Sri Lanka. However, it has been acknowledged that suitable mechanisms should be developed to increase the involvement of the private sector in freight transport.²⁰¹ In the Vision 2025 document, integrating SMEs—which comprise the bulk of truck operators—into the formal financial sector to access credit and new markets have also been mentioned. There is also some evidence to suggest that private sector services have improved. When surveyed in 2016, 87.5 per cent of logistics professionals found that private logistics services had improved or much improved since 2013.²⁰²

Meanwhile, the need to further develop logistical capacity also opens opportunities for the private sector. For example, the report *Climate Investment Opportunities in South Asia: An IFC Analysis* mentions consolidated freight centers as key to attracting private investment, and while a dearth of such centers can inhibit growth in the private sector, the private sector can also step in and provide such facilities. Developing dry ports linked to road and rail at Peliyagoda, Veyangoda, and Ratmalana with the participation of the private sector has been identified as one of the “special priorities” of the government.²⁰³ There are already several companies that provide a variety of logistics services in Sri Lanka from ICDs, to transport (including trailers), to freight forwarding, to MCC, to terminal operation, and more. Some notable ones are below:

| Company | Services Provided | Website |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expolanka Freight Ltd (EFL) | Distribution center management, transport, freeport, clearance, and value addition. | https://www.efl3pl.lk/ |
| ABC Group | Air and sea freight forwarding, ICD, and container leasing and repair. | https://abcgroup.lk/ |
| 20Cube | Warehouse management, digital solutions, MCC, and LCL and full container load (FCL) connections for sea freight. | https://www.20cube.com/freight-forwarder-in-srilanka/index.html?#services |
| Trico Logistics Ltd | LCL and FCL storage, wharf clerks, yard fumigation, examination, and etcetera. | https://tricologi.net/ |
| Logistics International Ltd (LIL) | Container repair, ICD, tank container cleaning. | https://www.logisticsinternational.lk/ |
| Bureau Veritas | Testing, inspection, verification, and certification. | https://www.bureauveritas.lk/ |
| Colombo Logistics | Truck and trailer fleet, inter-terminal transport, CFS, customs house brokerage, integrated logistics services. | https://www.colombologistics.com/ |
| John Keells Logistics | Truck fleet, temperature controlled transport solutions, warehouse management (multi-user warehouse complexes), and value addition. | https://www.keellslogistics.com/ |
| Advantis | Warehouse management; MCC; bunkering; value addition; third party logistics; project logistics and heavy cargo transportation; and marine security, supplies and other services. | https://advantis.world/srilanka/ |
| Rank Container Terminals (RCT) | Dry port near the Port of Colombo. | http://rank.lk/rank-container-terminals |
| South Asia Gateway Terminals Ltd | Container terminal (Port of Colombo). | https://www.sagt.com.lk/ |
| Colombo International Container Terminals Ltd | Container terminal (Port of Colombo). | https://www.cict.lk/ |
| Aitken Spence | Third party logistics, ICD, CFS, container repair, EPZ operations, transportation, and weighbridge facilities (the IMO's International Convention for the Safety of Life at Sea requires that containers have a verified weight). | https://www.aitkenspencelogistics.com/ |

Note: References to companies in this study does not imply endorsement of those companies or their activities. Their inclusion in this paper serves only as examples of what private actors exist in the sector and what they are doing.

Many freight forwarding and logistics companies are also members of the Sri Lanka Logistics and Freight Forwarders Association. At present, the SLFFA “has over 115 leading freight forwarding and logistics companies in its membership.” The aim of the SLFFA is to institutionalize and professionalize the industry and to exploit “the maximum potential of Sri Lanka’s strategic geographical location” through, for example, policy, vocational training, and reducing inconsistencies. According to the association, “It has identified the need for greater investment for the development of Air and Sea freight facilities, infrastructure and in the development of human resources to sustain the fruition of Sri Lanka becoming the hub port in the region.”

²⁰⁴

The private sector can play other roles as well. Sustainability demands accurate and honest monitoring and reporting from the public and private sectors. However, according to a presentation delivered for ESCAP, “There is a tendency though [in the Asia-Pacific region] to see sustainability reporting and efforts as something ‘that needs to be done’,” that “It seems that port stakeholders [for example] often do not yet see the merit of enhanced sustainability efforts,” and that “The benefits of sustainable port development are frequently not adequately explained.”²⁰⁵ In this context, foreign direct investment and other private investment have been cited as a catalyst for better reporting and enhanced policies. In 2020, South Asia Gateway Terminals Ltd became the first terminal in the Port of Colombo to report on sustainability.

The company’s sustainability strategy was initiated in 2018 and is informed by corporate governance; environmental stewardship; social responsibility; and safety, security, and health. Meanwhile, according to the company, they track 21 sustainability Key Performance Indicators (KPIs) based on Global Reporting Initiative standards.²⁰⁶ Additionally, within the sustainability report, activities are aligned with SDGs 5, 6, 7, 8, 10, 12, 13, and 15. Aitken Spence’s integrated policy report also mentions alignment to SDGs 4, 5, 6, 8, 9, 12, 14 in maritime and freight logistics, as well as other achievements such as emission reductions through investing in renewable energy and purchasing carbon credits.²⁰⁷ However, it is worth cautioning that sustainability reporting can carry the potential of being misleading or otherwise disingenuous, being used as a marketing tool not unlike “greenwashing.” It is also important that sustainability reporting be treated as an evolving learning process. South Asia Gateway Terminals Ltd’s sustainability report mentions, for example, that its sustainability management framework is “intended to be a dynamic process that will be continuously improved with sensitivity to emerging global and industry trends.”²⁰⁸

In addition to sustainability reporting, having a more advanced, forward thinking, and—in some cases—internationalized private sector can increase the utilization of green freight tools and frameworks such as the Global Logistics Emissions Council (GLEC) Framework and programs of Green Freight Asia (GFA) such as eco-driving and labeling and certification. EFL for one has adopted the GLEC Framework and is a GFA member (the first Sri Lankan company to acquire membership)²⁰⁹ according to a report from its parent company Expolanka. The report further notes that,

A strong contribution by the global freight and logistics sector to the Paris Climate Agreement goals is critical. Pressure from customers, governments and investors on businesses to take action will continue to grow. Consequently, logistics businesses are now looking to optimize operational efficiency and minimize their carbon footprint at the same time.²¹⁰

There also seems to be a drive in Sri Lanka to increase self-reliance and opportunities in its transport sector through domestic enterprises. As mentioned before, this includes a desire to pursue domestic shipbuilding and rolling stock productions. There was also the recent decision to develop the Ruwanpura Expressway with local construction companies.

D. Public-Private Partnerships

Between the government and private sector are Public-Private Partnerships (PPPs). PPPs are a cooperative arrangement between two or more public (government) and private (for profit) entities that can be used to finance, design, build, and operate public projects, often under long term arrangements (25-30 years). Projects in PPPs are often transport-related and can involve a variety of different PPP models such as, for example, a build-own-operate-transfer model. There are potential risks involved for both parties however, but a well-implemented PPP project should ideally balance the risks between the public and private sectors and utilize the technology, innovation, and financial resources of the private sector while keeping the project schedule and services accountable to the public.

PPPs are often touted as a way for indebted or poorly resourced governments to construct infrastructure. In fact, according to one source, there have been over 1,600 transport PPPs around the globe since 1990, amounting to over US\$ 470 billion in private investment in developing countries.²¹¹ Sri Lanka, however, has relied primarily on public funds for most of its infrastructure development that has come via borrowing on concessional and non-concessional terms.²¹² Nonetheless, PPPs have been utilized in the past, primarily in the energy sector.

According to the PPP Knowledge Lab, there are 86 total PPP projects in Sri Lanka that have reached financial closure since 1990, with US\$ 3.175 billion invested in that time. Some notable PPPs in the context of this paper include the South Asia Gateway Terminals at Colombo Port (commencing operations in 1999) and the LAUGFS Gas liquefied petroleum gas terminal at Hambantota Port (reaching financial closure in 2017). Investment amounted to US\$ 500 and US\$ 240 million respectively.²¹³ The LAUGFS Terminals facility reportedly serviced its 100th ship after 14 months of operation, commencing in July 2019.²¹⁴

Further utilization of PPPs has been a subject of discussion. As part of its Vision 2025, the government expressed its support for PPPs as a means of reducing reliance on loan agreements in the provision of public services, with potential for expansion at ports and in aviation. The document also encourages PPPs that incorporate “state-of-the-art solutions” for storage and transportation in agricultural logistics. According to a 2017 International Finance Corporation analysis,

Given the success of PPPs in the implementation of the government’s vehicle emissions testing program, the plan [Clean Air Action Plan] signals further opportunities for private participation and PPPs in developing environmentally friendly public and freight transport systems and introducing cleaner fuels and transport technologies.²¹⁵

When thematically scored by the World Bank, Sri Lanka received a 22/100 for preparation of PPPs, a 54/100 for procurement of PPPs, and a 57/100 for contract management. Given these scores, there is some indication that the ability to prepare, procure, and manage PPPs in Sri Lanka is also subject to some improvement going forward.²¹⁶ Strengthening PPPs has also been mentioned as a strategy for logistics in Sri Lanka.²¹⁷

E. Gaps

Using the material covered in this study so far an aspirational future for the freight sector can be ascertained. The covered material can also be used to ascertain the current baseline that, when compared to the aspirational future, numerous gaps can be identified. Some (loosely formulated) gaps will be put forward in this subsection. They are not intended to be definitive—or even authoritative—but are more for consideration and conversation going forward. After identifying potential gaps, targeted and coherent actions can be taken to steer a country towards a desired future, making continued adjustments and measurable improvements along the way to bridging the gaps.

Gaps Matrix

| Ambition | Current State/Developments | Gaps |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Sourcing the Requisite Finance for Sustainable Development</p> | <ul style="list-style-type: none"> • The COVID-19 pandemic has had a major impact on the economy and budget; • Sources of finance for freight transport infrastructure are government public investment, domestic capital, external loans/grants, and private investment; • Infrastructure development has come primarily via borrowing; • Budget deficits and balance of payment issues are problematic; • Sri Lanka's tax revenue as a percentage of GDP is low; • Government debt remains one of the highest amongst emerging markets; • Limited access to finance for SMEs; • Sri Lanka has founded the Sri Lanka Carbon Crediting Scheme and Sri Lanka Climate Fund; • The Sri Lankan Banking Association launched its Sustainable Banking Initiative in 2015; • The Pan Asia Bank became the first Sri Lankan bank to receive green bond issuance; • There are over 80 total PPP projects in Sri Lanka that have reached financial closure since 1990; | <ul style="list-style-type: none"> • Sri Lanka must recover from the economic impacts of the COVID-19 pandemic; • There is a need to shore up the balance of payments and budget deficit; • Tax revenues are low; • FDI and private investment are limited and application of PPPs is limited; • World Bank rankings suggest that the ability to prepare, procure, and manage PPPs in Sri Lanka is subject improvement; • Risk-averse banking culture; • Poor financial literacy among some SMEs; • Public debt needs to be reduced to meet medium term fiscal priorities; • Inability among regulators to compute riskiness of sustainable projects based on inexperience differentiating between "green" and "brown" assets. |

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| | <ul style="list-style-type: none"> The Central Bank joined the IFC supported Sustainable Banking Network in 2016 and launched the Roadmap for Sustainable Finance in 2019. | |
| <p>Policy Coherence and Capacity Development</p> | <ul style="list-style-type: none"> There is a wealth of existing national policies, plans, visions, and strategies that incorporate elements of sustainable freight transportation (see Section 3); Sri Lanka considers sustainable development in its policy making and often takes measures to ensure sustainability driven decision making in freight transport policy; Vertical and horizontal cooperation is noted to take place; Academia is included as an active stakeholder; SLPA runs the Mahapola Ports and Maritime Academy; SLFAA provides some training; Limited interministerial coordination. | <ul style="list-style-type: none"> There is a noted need to strengthen existing mechanisms to ensure conformity between policy directions and practices; There is a noted need to improve inter-ministerial dialogue on cross-cutting issues; Sustainability considerations are missing at some stages of the freight transport infrastructure lifecycle (see Table 11); Persisting inadequate logistics management capacity (such as qualified professionals on boards of management); Sustainable freight elements of national policies, plans, visions, and strategies are not collated into a single multimodal plan. |
| <p>Quality Data and Statistics for Sound Sustainable Freight Transport Investment and Policy</p> | <ul style="list-style-type: none"> Sri Lanka's statistical capacity is relatively strong according to a 2019 World Bank ranking; The Department of Census and Statistics; the Ministry of Power, Energy and Business Development; Sri Lanka Ports Authority; SLR; the National Transport Commission; and the Sri Lanka Transport Board collect statistics on an annual and ad hoc basis; A national MRV system is reportedly in place; An effort to establish a road crash database is underway; | <ul style="list-style-type: none"> Sri Lanka reportedly does not collect data related to sustainable freight transportation policies; Other sizeable gaps in data collection exist (see Table 10) that should be bridged; Poor quality crash fatality and injury data. |

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| | <ul style="list-style-type: none"> • Some sustainable freight transport data is collected (see Table 10); • Sri Lanka does not collect data related to sustainable freight transportation policies; although, there are supposedly upcoming plans to collect data. | |
| Application of STI | <ul style="list-style-type: none"> • Outdated trucks and railway systems; • Sri Lanka has placed emphasis on the importation and refinement of higher quality, cleaner fuels and has indicated an interest in exploring alternative fuels; • Sri Lanka has a relatively mature IT industry; • Internet usage remains relatively low, albeit growing quickly; • Sri Lanka is also improving its fuel quality standards to Euro IV; • Some ITS and ETC systems have been introduced; • Steps are reportedly underway to make the Port of Colombo a smart port; • Sri Lanka's economic complexity remains relatively low. | <ul style="list-style-type: none"> • Trucks and rail transport are aged; • There is a lack of cold storage and cold chain technologies in Sri Lanka; • Lack of ITS and limited use of ETC; • Sri Lanka's logistical shortcomings and business environment can prohibit the development of new, more complex industries; • The World Bank states that achieving an export-oriented growth model will likely require "establishing the necessary conditions for a thriving knowledge economy."²¹⁸ |
| Meaningful EIAs | <ul style="list-style-type: none"> • A relatively comprehensive EIA framework is in place; • Prescribed projects extend to a variety of transport and freight-related infrastructure. | <ul style="list-style-type: none"> • The National Policy on SCP mentions reviewing, strengthening, and empowering existing legal instruments such as EIAs. |
| Low GHG Emissions | <ul style="list-style-type: none"> • Sri Lanka's total transport CO₂ emissions have reportedly quadrupled from 1990 to 2018, despite reductions in its overall energy intensity; • Growing number of port calls and container throughput; • Little to no net-zero freight transport in service; growing dependency on fossil-fuels mainly due to demand from the transport sector; | <ul style="list-style-type: none"> • Rising transport-related CO₂ emissions; • No widely used net-zero alternative fuels; • Congestion within the CMR and around the Port of Colombo; • Old trucks and poor logistics management; • Limited use of freight trains and limited |

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| | <ul style="list-style-type: none"> • The transport sector factors into Sri Lanka's NDC; • 40 per cent of electricity is derived from hydropower. | <ul style="list-style-type: none"> • penetration of expressways; • NDC ambition low. |
| High Air Quality | <ul style="list-style-type: none"> • Air quality compares favorably against other countries in the region and in its income group; however, PM2.5 levels still exceed WHO's maximum safety level; • Mortality rate attributed to ambient air pollution: 24 deaths per 100,000 people; • Large reduction in SO₂ emissions; • Emission standards and fuel quality are regulated; • CO and unburnt HC emissions are tested; • Sri Lanka is also improving its fuel quality standards to Euro IV. | <ul style="list-style-type: none"> • Transition towards a higher Euro emission standard; • High congestion and relatively inefficient logistics; • PM2.5 levels—while relatively good—can be lower in line with WHO standards; • Ports do not offer incentives for calls made by “green” ships; • Founding of an independent fuel quality testing facility fuel quality management committee. |
| Efficient, Sustainable, and Resilient Ports | <ul style="list-style-type: none"> • Port of Colombo is the busiest in South Asia and among the world's busiest; • Container throughput increasing by the year; • East and West Container Terminal under development; • Oluvil and Kankesanthurai Port undergoing development; • Port of Colombo transitioning to a “smart port;” • Hambantota Port not attracting traffic; • South Asia Gateway Terminals reports on sustainability; • A National Port Master Plan is/was being developed. | <ul style="list-style-type: none"> • Transition to smart port still underway; • Incentivizing green ships; • Hambantota Port underutilized; • Other ports (e.g. Galle, Kankesanthurai, and Trincomalee) below regional requirements and national economic needs; • Sea level rise potentially threatens port and other coastal infrastructure and may require protective measures. |
| Quality and Efficient Road Infrastructure | <ul style="list-style-type: none"> • High RAI score; • Central and Ruwanpura Expressways under development; • Rehabilitation of existing network ongoing; | <ul style="list-style-type: none"> • Road network remains, in general, limited in width. Road widening encounters obstacles in land acquisition; • Country-wide penetration of |

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| | <ul style="list-style-type: none"> Existing network contains bottlenecks and often lacks multiple lanes; Expenditures on road damages from natural disaster is higher than planned for. | <p>expressways is still limited;</p> <ul style="list-style-type: none"> Overloading is reportedly an issue; Climate-proofing of transport infrastructure appears to be lacking. |
| <p>Quality and Efficient Rail Infrastructure for Freight</p> | <ul style="list-style-type: none"> Current network is badly outdated and almost unused for freight transport; High railroad density; Ongoing construction of the Matara-Kataragama railway line; SLR’s mission includes safe, reliable, and punctual rail transport service freight traffic; There are/were several program in place to increasing the operating speed of the railways; Other upgrades include improvement to rolling stock such as freezer trucks to transport bulk perishable produce by rail; Rail electrification (particularly suburban) has been variously mentioned for improving railway services; Rail appears unused in the movement of freight to and from ICDs and other intermodal facilities; The private sector is encouraged to be involved in domestic rolling stock production and renovation. | <ul style="list-style-type: none"> Railways require modernization and freight optimization; Moving goods from rail to ICDs does not appear to be in place; Rail linkages to ports are underutilized; Some lines may fall in high risk zones when concerning climate change. |
| <p>Effective Logistics Facilities</p> | <ul style="list-style-type: none"> Sri Lanka has a number of dry ports and ICDs; Development of a new ICD at Kerawalapitiya and Veyangoda in progress; Involvement of the private sector; Limited cold chain. | <ul style="list-style-type: none"> The NES mentions long handling and de-stuffing times for LCL and a lack of good MCC, bonded logistics, and fresh produce multi-user storage facilities; Exempting investments in bonded and other warehouses for Colombo and Hambantota Ports from taxes; concessions on customs duties and |

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| | | <p>support for extension of credit facilities for cold storage of fruits and vegetables</p> <ul style="list-style-type: none"> • Rail linkages to ICDs are underutilized. |
| Climate Resilient and Adaptive Transport Infrastructure | <ul style="list-style-type: none"> • Sri Lanka was among the top 10 most affected countries in 2018 according to the Global Climate Risk Index 2020; • Critical transport infrastructure may be threatened by sea level inundation and coastal erosion; • NAP-CC includes a whole host of actions intended to enhance the resilience of the transport sector; • Maintenance of roadside drains has been cited by the RDA as problematic. | <ul style="list-style-type: none"> • This study has not found significant evidence of the NAP-CC being implemented in the transport sector; • Cited lack of clear authority over drainage systems. |
| Safe Roads | <ul style="list-style-type: none"> • An average 38,000 crashes result in around 3,000 fatalities and 8,000 serious injuries annually; • Driver attitudes are a noted issue; • Railway level crossings are a noted safety concern; • Numerous laws and regulations govern factors in road safety; • Roads are relatively unsafe. | <ul style="list-style-type: none"> • Road design and engineering has some safety concerns (see Table 4); • Congestion contributes to unsafe conditions; • Lack of flyovers or underpasses at railway crossings; • There are gaps in numerous road safety measures (see Appendix 9); • Crash data is subject to improvement. |
| Formalized and Sustainable E-Commerce | <ul style="list-style-type: none"> • E-commerce is rising; • However, the COVID-19 pandemic has stalled growth, despite opposite trends in other countries; • E-commerce readiness is low; • Last mile deliveries can contribute to urban congestion. | <ul style="list-style-type: none"> • There are almost no set government policies or regulations that the firms are required to follow. |

3. RATIONALE

There is a wealth of existing national and international policies, plans, visions, agreements, and strategies that all incorporate elements of sustainable freight transportation in one way or another (directly or indirectly) through the economic, environmental, and social dimensions. Together, they form a clear rationale for a transition to sustainable freight transport. Carrying these out can address many of the points brought up in this study and bringing these various portions together can aid in harmonizing action across various implementing entities towards the goal of sustainable freight transportation in Sri Lanka.

A. National Plans

Relevant documents include those listed below. For a synopsis of the portions most relevant to sustainable freight transport, see Appendix 10.

- National Transport Policy
- National Road Development Master Plan (2018-2027)
- Road Safety Action Plan
- A Road Map for Cleaner Fuels and Vehicles in Sri Lanka (2014)
- Clean Air Action Plan 2025
- National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016-2025)
- Western Region Megapolis Master Plan
- Sri Lanka Energy Sector Development Plan for a Knowledge-Based Economy (2015-2025)
- National Policy on Sustainable Consumption and Production (2019)
- Vision 2025
- Sustainable Sri Lanka 2030 Vision and Strategic Path
- Reconstructed Country with a Future Vistas of Prosperity and Splendour
- National Port Master Plan
- Railway Master Plan
- A Roadmap to Improve the Investment Climate in Sri Lanka
- National Export Strategy (2018-2022)

B. International Commitments

Intergovernmental Agreement on Dry Ports (2013)

Open for signature in Bangkok in 2013 and entering into force in 2016, ESCAP's Intergovernmental Agreement on Dry Ports is designed to develop an international, integrated intermodal transport and logistics system in Asia that can accommodate for the increase in international goods transport in an efficient and cost-effective manner. Sri Lanka became a signatory in 2014 and had committed to establishing two new dry ports.²¹⁹

Sustainable Development Goals

The SDGs provide abundant linkages to sustainable freight transport and the two are not divisible wholes. Sri Lanka has an obligation to strive towards the Goals by 2030 and thus, by default, has an obligation to implement sustainable freight transportation.

The relevant SDGs and means of implementation are already covered at length in Section 2. Consult Section 2.A for more details on the applicability of the SDGs to sustainable freight transportation, including their status, progress made, and issues present in Sri Lanka.

Paris Agreement

Overview

Central to climate action is the Paris Agreement. The year 2015 was historic for global climate efforts with the adoption of the Paris Agreement by 196 Parties to the UNFCCC at COP (Conference of the Parties) 21 in Paris. The agreement entered into force in 2016 with the ambition of limiting global warming to 1.5 to 2° C above pre-industrial levels. The Paris Agreement builds off of the UNFCCC and, for the first time, brings all nations together into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects. Meanwhile, at the heart of the Paris Agreement are the Nationally Determined Contributions (NDCs) that embody efforts by each country to reduce national emissions and adapt to the impacts of climate change.

The Paris Agreement requests each country to outline and communicate their post-2020 climate actions, known as their NDCs. Together, these climate actions determine whether the world achieves the long-term goals of the Paris Agreement, reaches global peak GHG emissions as soon as possible, and undertakes rapid reductions thereafter in accordance with best available science to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century.

Starting in 2023 and then every five years, governments will take stock of the implementation of the Agreement to assess the collective progress towards achieving the purpose of the Agreement and its long-term goals. The outcome of the global stock take (GST) will inform the preparation of subsequent NDCs, to allow for increased ambition and climate action to achieve the purpose of the Paris Agreement and its long-term goals.

Given the fact that transportation may result in ~23+ per cent of total energy-related CO₂ emissions, targeting the transportation sector in the NDCs will be important.²²⁰ However, there is a noted need for

greater climate ambition and revised NDCs reflective of this as current NDCs and trends are not deemed sufficient to meet the goals of the Paris Agreement (see Appendix 6).

Sri Lanka signed and ratified the Paris Agreement in April and September 2016 respectively.²²¹ Sri Lanka then submitted its first NDCs in September of that year, comprising of four areas: mitigation, adaptation, loss, and damage from extreme weather events, and means of implementation. Within this, its NDC for mitigation intends to reduce the GHG emissions against the business-as-usual scenario by 20 per cent in the energy sector (4 per cent unconditionally and 16 per cent conditionally) and by 10 per cent in other sectors (transport, industry, forests, and waste) by 3 per cent unconditionally and 7 per cent conditionally by 2030.²²²

Methods for reducing GHG emissions in the transport sector are identified in the NDC as avoiding and reducing journeys, modal shift, improved energy efficiency of transport modes, and improved fuel quality. Some key activities with some relevance to freight transport mentioned in the NDC include:

- Upgrade fuel quality standards
- Introduce new emission standards to reduce GHG emissions
- Reduce unproductive transport systems from current use
- Reduce GHG emissions in the maritime sector
- Implement international laws and regulations on maritime safety and security related to climate change
- Maintain international standards related to climate change in maritime transportation
- Improve vehicle emission testing program and spot testing for all vehicles
- Introduce a heavy smoke vehicles spotter program
- Introduce a roadside vehicle emission testing program
- Inspect and monitor vehicle emission testing centers
- Reduce traffic congestion to reduce GHG emission
- Introduce centralized traffic management systems
- Establish highways
- Transport heavy loads by railway
- Purchase new rolling stock for Sri Lanka Railway
- Establish a database management system for monitoring NDCs of transport sector
- Establish a separate unit for the implementation of NDCs.²²³

UNDP Sri Lanka has also been supporting the Government of Sri Lanka to upgrade the country's NDC. The revision includes climate change mitigation and adaptation with a focus on known and predicted climate risks and policy integration (such as interlinking proposed NDCs into existing national and sectoral policies and strategies). This 2020 revision will quantify mitigation actions and introduce new NDCs focusing on energy, *transport*, industry, waste, forestry, and agriculture according to UNDP. Meanwhile, the adaptation focuses are on the agriculture, water, biodiversity, marine, tourism, urban, and health sectors. Other priorities include strengthening current frameworks in Sri Lanka with a scientific approach to link the losses and damages from extreme weather events to climate change. A 10-year NDC implementation and monitoring plan is also under consideration according to UNDP.²²⁴

4. KEY PILLARS AND PERFORMANCE INDICATORS

A. Pillars of Sustainable Freight Transport

The concept of sustainable development was first introduced in the 1987 Brundtland Report, which defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”²²⁵ This definition, which includes a balance of economic growth, social equity, and environmental protection, has since served as a guiding principle in subsequent iterations of the concept, as well as further definitions pertaining to specific sectors.

Although several definitions of sustainable freight transport exist for both urban and non-urban freight, for the purpose of this study, it generally relies on the definition provided in the United Nations Conference on Trade and Development (UNCTAD) SFT Framework that broadly defines sustainable freight systems as those that capture the linkages and intersection of the **economic, environment, and social dimensions** of sustainable development. These three dimensions serve as the pillars for sustainable freight transportation. Accordingly, such systems aim to provide freight transport that is (a) safe and accessible (social), (b) efficient, reliable and resilient (economic), and (c) reduce GHG emissions, pollution, and climate related disruptions (environmental).

1. Economic:

- Efficiency and productivity
- Energy efficiency
- Employment and revenue generation
- Access, connectivity, and trade competitiveness
- Infrastructure development/congestion



2. Environmental:

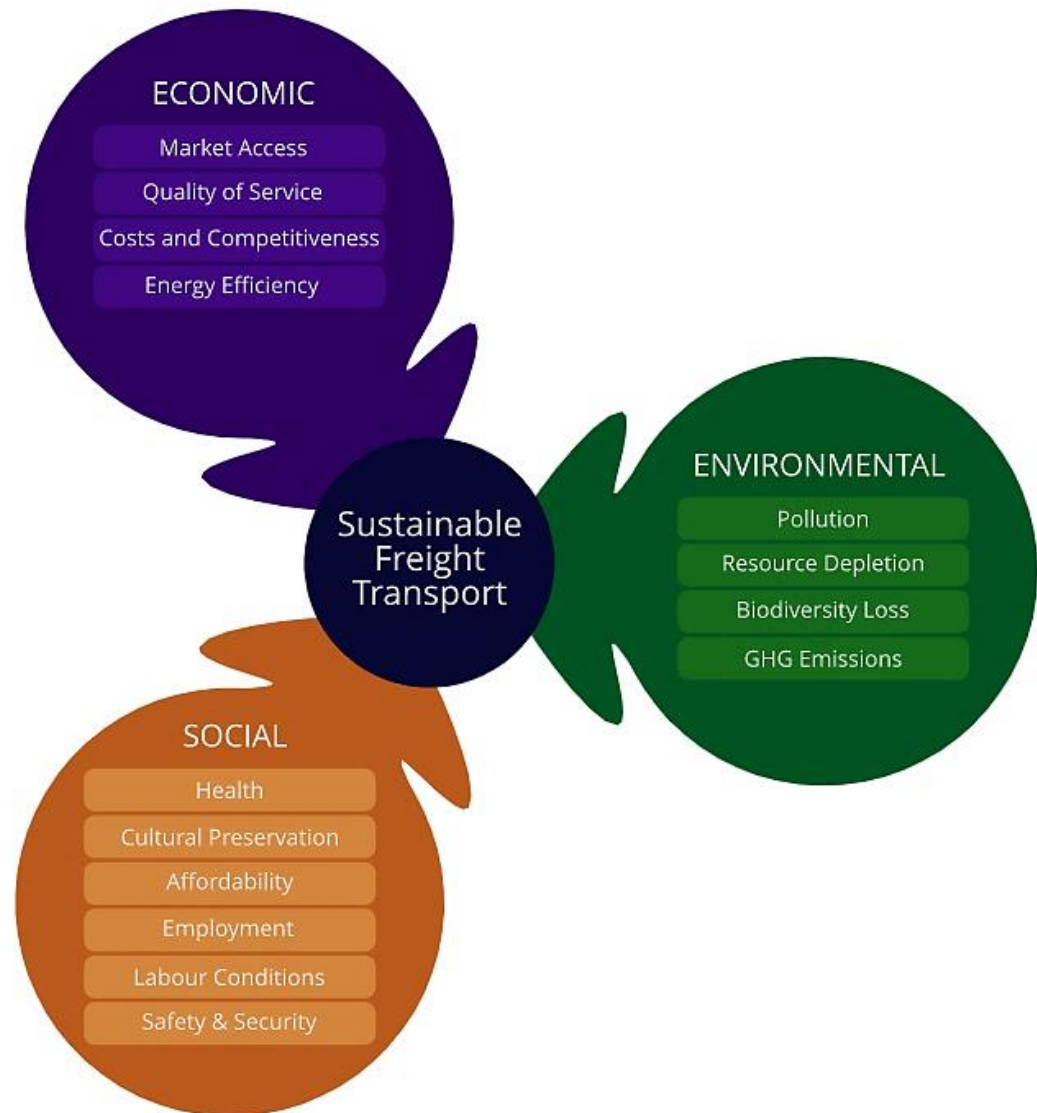
- Marine, air, and soil pollution
- Noise, vibration, and biodiversity
- Air emissions/GHG
- Climate change impacts/resilience
- Resource depletion
- Land use



3. Social:

- Equity and fairness,
- Social inclusiveness and value
- Community involvement
- Health
- Safety
- Labour conditions



Figure 10. Sustainable Freight Transport and the Triple Bottom Line

Source: Source: UNCTAD Framework for Sustainable Freight Transport. Available at: <https://www.sft-framework.org/framework/about>

Like the SDGs, sustainable freight transport must consider these three dimensions in order to balance between competing futures, mitigate potential trade-offs, and advance development that enhances the well-being of people, planet, and prosperity simultaneously.

B. Performance Indicators

A comprehensive list of key sustainable freight transport performance indicators (the KPIs) can be derived from the UNCTAD SFT Framework. Furthermore, the SDG indicators contain some measurements for sustainable freight transport as well. Taking these indicators and the material discussed in this study into account, it suggests some of the following (unrefined) performance indicators for consideration that cut across first the SDG Means of Implementation and then the three pillars:

Means of Implementation

1. Finance

| Indicators | Pillar(s) / Mol |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 1.1 Increase in government revenue (SDG 17.1.1) | Finance, Policy |
| 1.2 Increase in Foreign Direct Investment (per cent of GDP [SDG 17.3.1]) | Economic; Finance |
| 1.3 Number of new PPPs in freight transport | Economic; Finance, Policy |
| 1.4 Number of new green bonds or other sustainable transport infrastructure bonds | Economic, Environmental; Finance |
| 1.5 Percentage of SMEs reporting an ability to borrow money for transport assets | Economic, Social; Finance |
| 1.6 Operational efficiency of transport state owned enterprises | Economic; Finance |
| 1.7 Sufficient allocation of finance (per cent of target) for sustainable freight transport needs, including through official international support (SDG 9.a.1) | Finance |

2. Policy, Statistics, and Monitoring

| Indicators | Pillar(s) / Mol |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| 2.1 Adoption of a national sustainable freight transportation strategy | Economic, Environmental, Social; Finance, Policy, STI |
| 2.2 Establishment of a strategy steering committee (advisory body) to a national task force comprised of focal points | Policy |

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| | |
| 2.3 Designation of focal points across relevant ministries and stakeholders | Social; Policy |
| 2.4 Strategy results framework developed | Monitoring |
| 2.5 Number of relevant SDG indicators measurable via timely, reliable, and disaggregated official statistics | Statistics, Monitoring |
| 2.6 Number of strategy outcomes measurable via timely reliable, and disaggregated official statistics | Statistics, Monitoring |
| 2.7 Obligatory stock take of progress on the implementation of the NDCs with special attention to the transport sector | Environmental; Statistics, Monitoring |
| 2.8 Submission of a new VNR at the High-level Political Forum that includes a review of progress on sustainable freight transportation | Economic, Environmental, Social; Policy, Statistics, Monitoring |
| 2.9 Percentage of new infrastructure projects adhering to a meaningful IEE/EIA and SIA process | Environmental, Social; Policy, Monitoring |
| 2.10 Review of existing laws covering environmental management in the transport sector, updating them as relevant against the national sustainable freight strategy and other commitments | Environmental; Policy |

3. Science, Technology, and Innovation (STI)

| Indicators | Pillar(s) / Mol |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| 3.1 Dedicated funds for private sector investment in sustainable freight transport technologies | Economic, Environmental, Social; Finance, STI |
| 3.2 Number of private sector operators using green freight/logistics software or other similar technologies | Economic, Environmental; STI |
| 3.3 Number of SMEs reporting ease of access to vehicular upgrades | Economic, Environmental; STI |
| 3.4 Percentage of upgraded railway and rolling stock (sub-indicators: e.g. per cent of rail track with track speeds >40 km/h, containerized rail capacity, locomotive fuel efficiency) | Economic, Environmental; STI |

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|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 3.5 Percentage of international trade conducted via e-customs systems, electronic cargo tracking systems, etcetera | Economic; STI |
| 3.6 Development of a green freight and logistics database | Economic, Environmental, Social; Statistics, Monitoring, STI |
| 3.7 Number of researchers focusing on innovation in the sector | Economic, Environmental; STI, Capacity Building |

4. Capacity Building

| Indicators | Pillar(s) / Mol |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| 4.1 Number of logistics/transport professionals in leadership roles in transport firms and relevant government entities | Economic; Capacity Building |
| 4.2 Number of people in leadership roles in transport firms and relevant government entities trained in sustainability | Economic, Environmental, Social; Capacity Building |
| 4.3 Number of new logistics management trainings conducted among relevant stakeholders | Capacity Building |
| 4.4. Percentage of mechanics qualified to operate on more advanced trucks, drivers qualified to drive heavy vehicles, and operators qualified to handle heavy equipment | Economic, Environmental, Social; Capacity Building |

Sustainable Freight Pillars

5. Emissions

| Indicators | Pillar(s) / Mol |
|--------------------------------------------------------------------------------|---------------------------------------|
| 5.1 Average age of the trucking fleet | Economic, Environmental; STI, Finance |
| 5.2 Fuel consumption by mode (sub-indicators: e.g. road, rail, boat, airplane) | Economic, Environmental; STI |
| 5.3 Percentage of freight moved by rail (SDG 9.1.2) | Economic, Environmental |

| | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| 5.4 Percentage of freight moved via inland waterways (SDG 9.1.2) | Economic, Environmental |
| 5.5 Percentage of vehicles and energy providers adhering to established fuel and emission standards (sub-indicator: e.g. Euro V fuel standard, etcetera) | Environmental; STI |
| 5.6 Proportion of vehicle and merchant fleet by alternative fuel type | Environmental; STI |
| 5.7 Air pollution (sub-indicators: e.g. nitrogen oxides, sulphur oxides, carbon monoxide, PM 2.5 and PM 10 [SDG 11.6.2], etcetera) | Environmental, Social |
| 5.8 Percentage of freight transport firms and drivers trained on eco-driving and fuel efficiency | Economic, Environmental; Capacity Building |
| 5.9 Percentage of freight transport firms applying the GLEC Framework, GFA Label Criteria, and other similar methodologies and certifications | Economic, Environmental; STI |
| 5.10 GHG emissions per year and status of emission targets | Environmental; Statistics, Monitoring |
| 5.11 Energy intensity (SDG 7.3.1) | Economic, Environmental; STI |

6. Climate Adaptation/Resilience

| Indicators | Pillar(s) / Mol |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 6.1 Percentage of infrastructure (new and old) “climate-proofed” (sub-indicators: e.g. port facilities, roads, railways, bridges) | Economic, Environmental, Social; Finance |
| 6.2 Review of progress on the NAP-CC | Economic, Environmental, Social; Policy, Statistics, Monitoring |
| 6.3 Position on the <i>Global Climate Risk Index</i> or similar (in the long term) | Monitoring |

7. Inclusion

| Indicators | Pillar(s) / Mol |
|--------------------------------------------------------------------------------------------------------|---------------------------|
| 7.1 Percentage of rural population with access to all-season roads (RAI [SDG 9.1.1]) | Economic, Social; Finance |
| 7.2 Percentage of women employed in the freight sector, including in decision making roles (SDG 5.5.2) | Economic, Social |
| 7.3 Percentage of disabled persons employed in the freight sector (SDG 8.5.2) | Economic, Social |

8. Work Environment

| Indicators | Pillar(s) / Mol |
|--------------------------------------------------------------------|------------------|
| 8.1 Employee income and benefits | Economic, Social |
| 8.2 Number of firms adhering to ILO international labour standards | Economic, Social |

9. Health and Safety

| Indicators | Pillar(s) / Mol |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| 9.1 Accident-related deaths per 100,000 (SDG 3.6.1) | Social |
| 9.2 Accident-related injuries per 100,000 (SDG 3.9.1) | Social |
| 9.3 Deaths per 100,000 associated with air pollution | Social, Environmental |
| 9.4 Medical expenditures related to air pollution | Social, Environmental, Economic |
| 9.5 Number of deaths, missing persons, and persons affected by disaster per 100,000 (SDG 13.1.1) | Social, Environmental, Economic |
| 9.6 Number of adequately enforced laws relating to road safety (e.g.. number of hours operators can drive per week, drug driving laws, overloading, chemical transportation, etcetera) | Economic, Environmental, Social; Policy, STI, Finance |

| | |
|--------------------------------------------------------------------------------------|-------------------------------------------|
| 9.7 Number of rest stops for drivers | Social |
| 9.8 Resourcing for enforcement | Economic, Social; Finance |
| 9.9 Enforcement shifts to key risk factors | Policy, Capacity Building, Finance |
| 9.10 Number of new driver safety training programs conducted among freight operators | Social; Capacity Building |

10. Economy

| Indicators | Pillar(s) / Mol |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| 10.1 LPI rank | Economic; Finance |
| 10.2 Percentage share of the transport sector to the economy | Economic |
| 10.3 Total cross-border trade (US\$ [export, import, and in transit goods]) | Economic; Finance |
| 10.4 Number of employees in freight transport | Economic, Social |
| 10.5 Freight transport costs | Economic |
| 10.6 Transport charges (sub-indicators: ex. cargo charges, tolls, licensing fees) | Economic |
| 10.7 Efficiency (sub-indicators: ex. number of container terminals and dry ports, average load factor, percentage of empty returns, litres of fuel burned per ton-km year by mode, etcetera) | Economic, Environmental |
| 10.8 Percentage of on time deliveries | Economic |
| 10.9 Percentage of deliveries delivered in agreed condition | Economic, Social |
| 10.10 Average fuel cost savings | Economic, Environmental |

11. Others

| Indicators | Pillar(s) / Mol |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| 11.1 Corruption Perceptions Index rank | Economic, Environmental, Social; Finance, Policy |
| 11.2 Percentage decrease in estimated illicit freight transport | Economic, Social; Policy, Monitoring |
| 11.3 Change in biodiversity (e.g. species richness, Simpson Index, Biodiversity Intactness Index, etcetera) | Environmental |
| 11.4 Water quality (sub-indicators: e.g. presence of toxic compounds, particulate matter/sediment [SDG 6.3.2]) | Environmental, Social |
| 11.5 Soil quality (sub-indicator: e.g. presence of toxic compounds) | Environmental, Social |

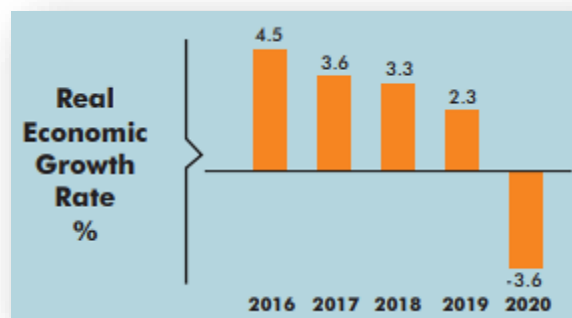
5. IMPACTS OF COVID-19

As of June 24, 2021, Sri Lanka had recorded 74,000 cases of COVID-19, with fewer than 1,400 resulting deaths.²²⁶ While it has escaped the high cumulative death toll seen in other countries, Sri Lanka has still been profoundly impacted by the pandemic's disruptions to the global economy, with the country seeing lower export volumes and hits to key industries. As such, Sri Lanka's economy contracted by 3.6 per cent in 2020, the worst growth performance on record (See Figure 11).²²⁷ Tourism and apparel both form large components of the Sri Lankan economy and both industries have been disproportionately hit by the pandemic relative to others. Health concerns have also forced the closure of some garment factories. However, the impacts have been felt across sectors. Research conducted on 15 leading companies employing 140,000 people in Sri Lanka across sectors revealed that one-third of employees experienced salary reductions and 40 per cent had their benefits reduced.²²⁸

With such disruption to economic activity, incomes, and export volumes, the effects are also felt by freight operators who would, normally, be moving the goods associated with economic activity and production. Container throughput had also declined from 7.2 million TEUs in 2019 to 6.8 in 2020.²²⁹ With the clearance of containers dropping (and priority given to the clearance of items listed as essential), revenues were adversely impacted as Sri Lankan Customs had been, up to that point, collecting around 57 per cent of state tax revenues. Tax revenue had also fallen to 8.5 per cent of GDP in 2020 according to the Ministry of Finance and with tourism, worker remittances, and exports taking hits, foreign reserves have reportedly fallen amid high debt obligations in 2021.²³⁰ However, inversely, imports had also declined and 2020 saw a US\$ ~2 billion drop in the trade deficit.²³¹

The pandemic has also had the positive effect of accelerating paperless customs processes that had already existed in some form or another prior to the pandemic. Customs has also reportedly been holding regular meetings with private sector stakeholders in order to help them navigate the changes brought about during the pandemic. This includes cooperation with dry port and ICD administrators to facilitate the clearance of goods.²³²

Figure 11.



Source: Central Bank of Sri Lanka

6. CHALLENGES TO SUSTAINABLE FREIGHT TRANSPORT IN SRI LANKA

As in most other countries, the restrictions caused by the COVID-19 pandemic of 2020/2021 have compounded the sustainability challenges that already existed in Sri Lanka. Therefore, this review of challenges is written for when a level of normality can return to Sri Lanka and its economic/social development. The challenges that Sri Lanka faces under normal circumstances are not dissimilar from those found in other developing countries of the region and can be simplified as being based on costs and acceptance of the need to make changes. However, there are more factors at play.

The Major Challenges to Sustainable Freight Transportation in Sri Lanka Include:

A. Costs

The cost challenge ranges from the cost of buying new transportation technology (e.g. heavy goods vehicles and rolling stock), to the cost of infrastructure development, and the cost of lost revenue for the government. Import duties placed on new trucks, for example, are acting as a preventative measure rather than as a revenue raiser and there is relatively little revenue being raised through the importation of new trucks.

However, the challenge remains convincing the government that there would not be a substantial loss of revenue or an “excessive” level of importation that could affect the balance of payments. There are other challenges mentioned here that make this unlikely, such as access to finance for replacing old trucks. A 33 per cent saving in fuel burn would be achieved if old trucks averaging 2 km/litre were replaced with new ones averaging 3 km/litre. These issues together also highlight the challenge of conveying the hidden or collateral costs of certain policy decisions.

The challenge of financing infrastructure meanwhile is not specific to sustainable development. This report already highlights the need for significant transport infrastructure developments and upgrades, including climate-proofing considerations among others. These will be very costly. It is often the cost factor that is missing from the discussion on multi-modal transport and modal shift to rail for example. This requires port facilities and terminals and, in the case of Sri Lanka, sizeable upgrades to the routes themselves. Short distance trucking is also needed to ferry cargo to and from the port and terminals and this can add vehicles and costs, especially if the trucking fleet remains outdated.

At the same time, Sri Lanka’s fiscal climate presents its own challenges in form of low tax revenue, budget deficits, and debt obligations. As such, supplementing public spending with private investment (including PPPs) can help diversify funding sources and drive development. However, this would need to be paired with incentives and a business environment favourable to the private sector.

B. Access to Finance

Trucking moves over 90 per cent of freight in Sri Lanka and the industry is dominated by SME operators. Many of these companies do not keep proper records, manage asset depreciation, or produce accounts. Therefore, they are unable to provide banks with the supporting documentation needed to secure loans to upgrade their fleets. This problem is not specific to Sri Lanka. The rates being charged by banks range from 9 to 12 per cent even when operators can produce the business plans and accounts. However, as many of

the SMEs are solo operators without collateral to offer as surety, they tend to borrow from family, friends, and informal lenders. Again, this is not specific to Sri Lanka; freight transport works on the edges of the formal economy in most developing countries and formalizing the borrowings supported by business plans is a challenge across these countries. Therefore, even if the finance can be secured for widespread fleet renewals, the uptake can be much lower than the desired level as many operators are not able to meet the required criteria in terms of plans or security.

C. System Upgrades

1. Intermodal Network

Any move towards modal shift, including the development of an intermodal network, will carry a significant price tag as well as due consideration for the context-specific practicalities of doing so. In most cases, they will require the construction of intermodal terminals and feeder roads. While these are obvious costs, there are also other issues that present major challenges to making modal shift feasible and attractive to the private sector, who will be the customers of this service. These involve bringing an acceptable measure of certainty to operating schedules and transit times so that the private sector will use the service instead of opting with the more relatively time-definite road transport.

2. Railways

Most of Sri Lanka's rail lines were established 100 to 150 years ago. For rail to become a significant player in domestic freight movements, transit times must be guaranteed and, in some way, comparable to road transit times. If the transit time is longer, then the cost must be comparatively less than road transport. The transport of goods is largely about time. Someone has bought the cargo and needs to turn that cargo into money. Therefore, they want to expedite the delivery. If the cost is less, they may make a trade-off for a longer delivery time, but they still need to know when it will arrive.

Another challenge for rail is how to move individual containers by rail under bond. Customs is a challenge for rail. Moving by bonded block trains is relatively straight forward as all the cargo moves under customs bond together where the bond is discharged at the dry port. However, a bonded transfer for one or two containers moved on a mixed train is a challenge that must be addressed for rail to be widely used in international movements. For rail to play a significant role in the day-to-day movement of international containers, the customs challenge must be solved along with transit times.

3. Rural Roads

Although 95 per cent of Sri Lanka's population lives within 2 km of an all-season road, there are still gaps in rural connectivity. Expressways do not service most of the country and most infrastructure improvements seem focused on paved highways and major bridges rather than other public infrastructure in rural areas, such as feeder roads. Equitable connectivity stands as one the biggest development challenges. Without adequate road access, millions of rural inhabitants—who comprise the majority of the island's population—will not be able to fully participate as actors in and beneficiaries of the freight sector and enjoy the same quality of development. In addition, delivering goods to rural villages is complicated by this infrastructure

deficit. Funding and maintaining improved, all-season roads across the country will cost a lot of money and require finance.

4. Port of Colombo

With 7.5 million TEUs per year, the Port of Colombo is ranked 17th on the Container Port Performance Index 2020 by the World Bank from a statistical perspective. Using an administrative approach however, which considers vessel turnaround times, Port of Colombo ranks 33rd.²³³ Unlike other ports of similar size, Colombo has a large transshipment element to its operations and aspires to be the primary transshipment hub in the region. As such, the administrative position is especially important. Delays at any of the scheduled ports of call along the route served by the vessel would have to be resolved before the vessel arrives at the next port of call, in order to avoid an adverse impact on the efficiency of service operations. As such, port efficiency and port turnaround time on a vessel's scheduled voyage at all ports of call are important for operators. For every unplanned additional hour in port or at anchorage, the ships will need to increase speed to maintain the schedule, resulting in increased fuel consumption, increased costs, and increased emissions.

Therefore, capacity at its container terminals, expedient customs clearance, adequate MCC facilities, and efficient port operations across the board will be important for the Port of Colombo's continued and expanded role as a shipping hub. Furthermore, when looking to develop Colombo as a smart port and considering the use of incentives for cleaner fuels and other measures as deterrents, the SLPA will always have one eye on its core transshipment business. However, this is all easier said than done as ports are both expensive and highly complicated facilities. Many vessels only call at Colombo for transshipment and, therefore, it is direct competition with other major regional ports such as the Port of Singapore and Port Klang for this traffic and economic benefit.

D. E-commerce

The pandemic has seen exponential growth in online shopping in some countries. However, the growth in Sri Lanka has not been as high as in pre-pandemic times due to the shortage of air freight capacity. Normally though, extra shipments mean extra last mile deliveries and extra returns. The rate of return for online shopping in developed economies, for example, is around 30 per cent. When added to failed deliveries because the customer is not at home, e-commerce is thought to create at least 50 per cent more last mile journeys than conventional shopping and thus creates a lot of extra emissions.²³⁴ The challenge is how to minimize the impact of the growth of failed deliveries and returns, especially in urban areas where there is already heavy traffic.

In order to reduce unnecessary last mile journeys in developed economies, courier companies and local authorities have, for example, been installing pick up and drop off (PUDO) boxes at railway stations and bus terminals, and even at local petrol stations. Here, the courier or post office can drop off and pick up parcels and the customers can open the secure lockers using a code sent via SMS. They are very popular in cities like Tokyo and Hong Kong where the customer is at work and cannot sign for the delivery, so they use a PUDO box and collect the parcel on the way home.

A 2020 survey on the e-commerce readiness of Sri Lanka found that e-commerce logistics service firms on average employed two trucks, ten vans, and six motorbikes for the transportation of goods. Twenty-five per cent of the firms do not have any material handling equipment, being logistics support service firms. Most of the firms interviewed reported a non-existence of any set policies, except for the service-level

agreements that they have with their customers. There are apparently no set government policies or regulations that the firms are required to follow with regard to their operations other than the general commercial and tax laws of the country. Early regulation of e-commerce last mile deliveries will help to reduce their impact while the delivery companies are still building capacity.²³⁵

E. Technology Platforms

Software that matches goods vehicles to available loads have become more prominent in developing countries. However, to be successful, they have had to develop a major customer service operation in support of the platform. SME operators and owner drivers also come in various shapes and sizes. There are often issues with quality standards goods in transit insurance, and maybe not even a licensed driver. Levels of time keeping are often very low and the conditions of trucks vary considerably, accompanied by a lack of qualified mechanics to work on newer trucks. As such, there is a high level of manual intervention needed to meet customer expectation.

Shippers are, meanwhile, reluctant to use allocation software as they want to know who is picking up their cargo. They have a schedule to meet and customers to satisfy. Successful platform operators have found that the level of intervention is far higher than originally envisaged and that they can only use the software in support of load allocation. The level of driver discipline also does not lend itself to a highly automated system. Drivers may disappear en route and fail to show up as booked. In addition, they need cash advances to buy fuel, and many do not have bank accounts and, thus, demand cash on arrival. These are not normal issues in developed economies where SME operators have bank accounts and insurance.

F. Replacing the Aging Rigid Trucking Fleet

For decades, Sri Lanka has relied on secondhand trucks as the mainstay of the domestic trucking fleet. They are rigid trucks brought in second hand at 5 to 10 years old after a working life in Japan, India, or Europe. As mentioned previously, these trucks have a higher fuel burn than a newer semi-trailer and this worsens as they get older, partially due to a lack of proper maintenance. Some are over 20 years old but have not been properly depreciated by their owners as most SME operators do not depreciate their vehicles. Now, these vehicles still stand as expensive assets, and their resale value is far less than their market value. The major challenge is what to do with these old trucks if the transport fleet is to modernize?

The capacity needs to be taken out of the market. Otherwise, it will just be sold on to other operators and freight rates will be diluted due to overcapacity. Unless the capacity is scrapped, it will continue to operate in new ownership and continue to burn excess fuel with higher emissions than new trucks.

G. Scrapping Older Vehicles

The challenge of how to dispose of older vehicles is always a problem in developing economies. The lack of proper depreciation and accounting means they still have a significant value to the owners. One approach is to consider a “Cash for Clunkers” style scrapping system whereby owners could get an exemption from import tax, ports and airports levy (PAL), and registration if they scrapped a vehicle of similar size through a recognized and participating scrap yard. The certificate could be sold or traded to other operators if the operator retiring the truck wanted to leave the industry or downsize. The idea is to exempt the new replacement truck from tax on import and thus encourage the older ones to be taken out of service.

These trucks will not go anywhere until they either die or can be turned into some form or value. So, until some action is taken on the aging fleet, they will remain in service and achieve only 2 to 2.2 kilometres per litre of fuel while new semi-trailers achieve up to 3.5 for double the payload for example.

H. Operator Resistance

The domestic transport market is dominated by SME operators, often with one to five trucks. These are usually 6, 10, or 12-wheeler rigids as they have a large body size and up to a 15-ton capacity. The owners are legacy operators who are not keen to change or modernize. They are often unable to compete with new market entrants using more modern semi-trailer equipment with lower running costs per unit. The challenge here is to get legacy operators to accept that their older fleets need replacing. Most legacy operators have not depreciated their trucks properly, so they have a perceived asset value that is considerably higher than their true value or market value. Like this, they have stuck with trucks that are expensive to run and they are not making enough profits to justify investing in replacements, perpetuating an unproductive cycle.

I. Customs

Customs regulations are at the heart of international trade and are, therefore, fundamental to international transport. Cargo cannot be moved out of the port (or airport) until it is customs cleared or bonded forward to an ICD. Therefore, the flow of trucks and containers through the port or border and the space they need are, to a large extent, determined by the speed of clearance, and this includes physical inspections.

Bonded transport is the movement of cargo to or from a port, airport, or dry port that has not been customs cleared. It requires customs approval and a guarantee as to who will pay taxes and duties on the cargo that are due to customs in the event of it failing to arrive for clearance at the designated point. Though not a sustainable transportation issue in and of itself, it has a significant bearing on the flow of cargo and the use of transport (including shifting modes) and thus the utilization of transport assets. This in turn can affect investment decisions. For example, it can affect whether a company invests in better, newer, and cleaner trucks. If the truck is not running, stuck in a customs queue, or it is otherwise not earning, why would an owner invest in a new truck that burns less fuel with fewer emissions? Instead, they will keep their old truck as it is not journeying the requisite kilometres on account of it not being to turn around fast enough.

Customs regulations are very much interrelated with other issues that need to be addressed. Bonded transport requires a guarantee to Customs.

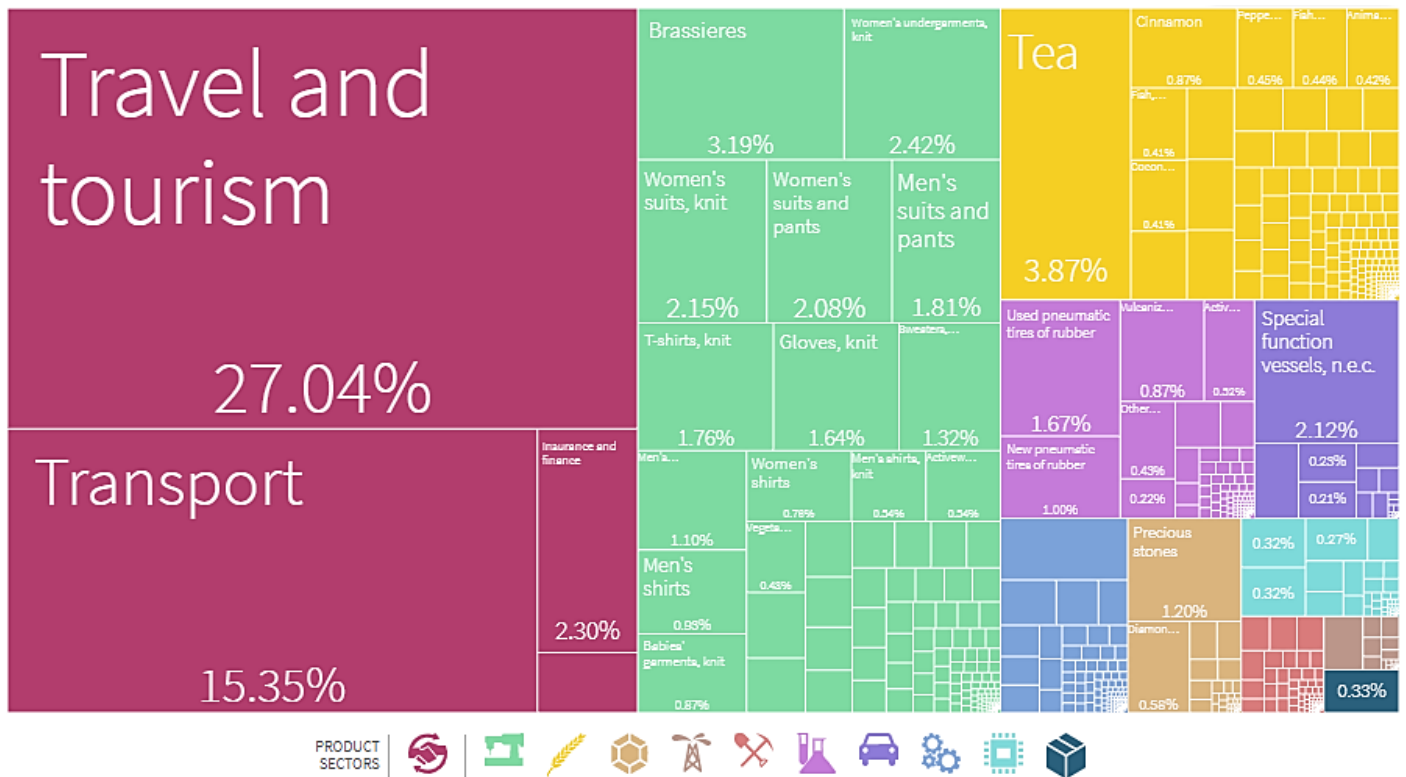
- A key component of the guarantee is recognizing Authorized Economic Operators so that they can provide a transit guarantee.
- Bonded transport is needed for transfer of containers by rail.
- Individual containers need to be separately bonded if they are to move on mixed trains.
- Bonded transport is essential to move consolidated loads away from ports for the clearance of multiple consignments on one truck or air shipment. This is essential for growth in e-commerce.

The affect that customs have on international movements cannot be overstated. Nothing can move internationally without customs approval, and this can have a considerable effect on vehicle utilization and fuel burn.

APPENDICES

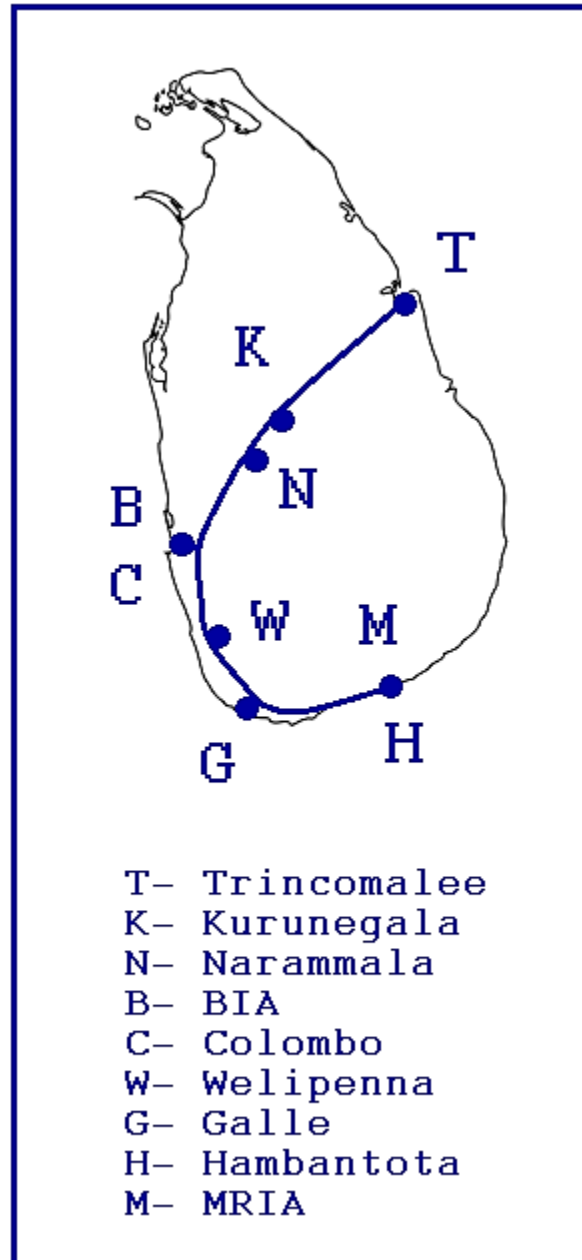
Figures

Appendix 1. Export Mix, 2018



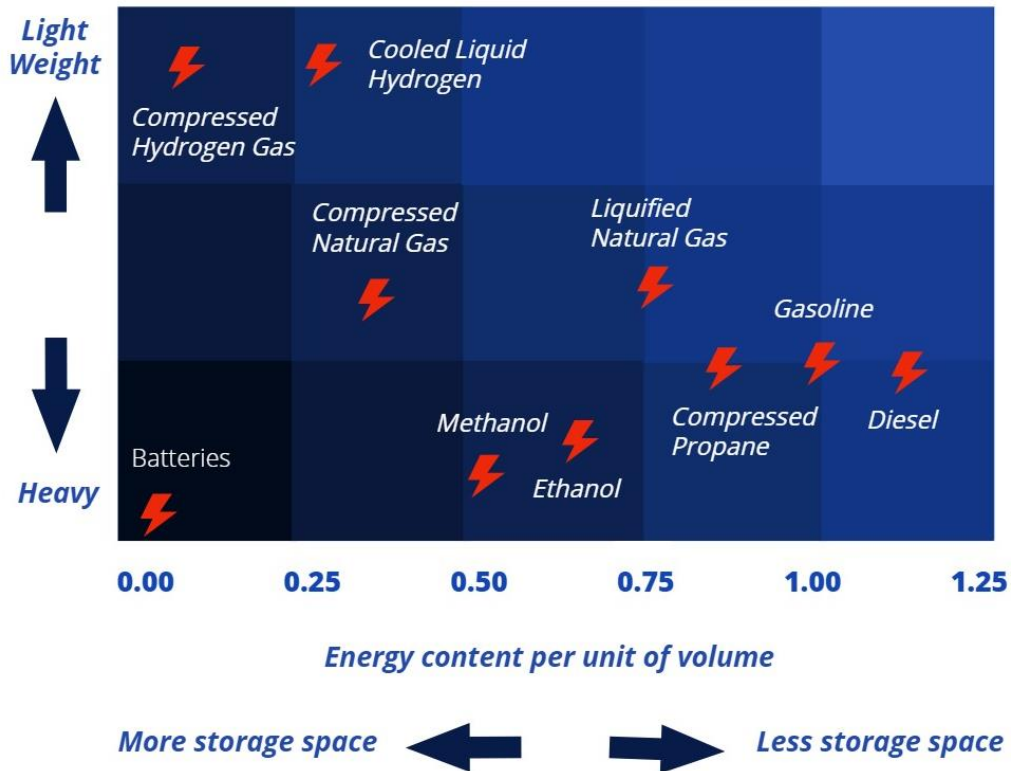
Source: The Growth Lab at Harvard University. The Atlas of Economic Complexity. Available at: <http://www.atlas.cid.harvard.edu>.

Appendix 2. "C-Type" Logistics Corridor



Source: D.D. Matharaarachchi, PowerPoint Presentation, "Sustainable Freight Transport in Sri Lanka," State Ministry of Warehouse Facilities, Container Yards, Port Supply Facilities and Boats and Shipping Industry Development.

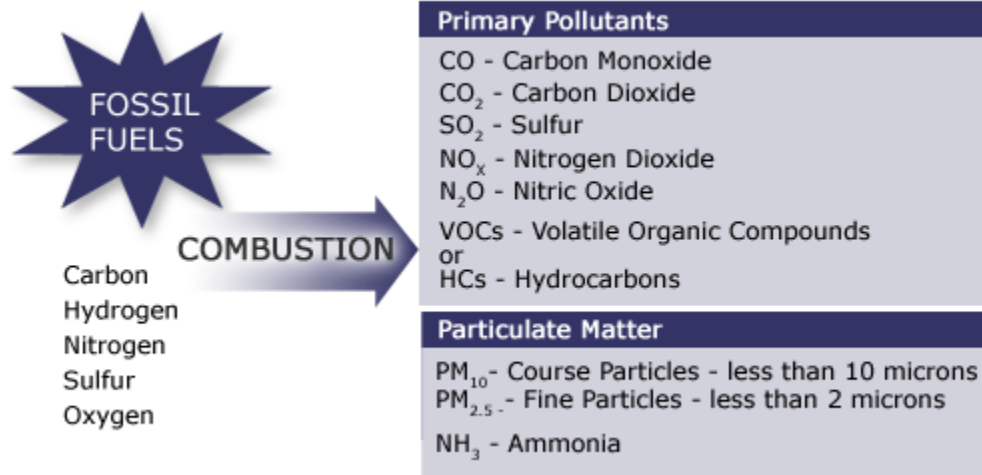
Appendix 3. Energy Density of Transport Fuels*



Source: U.S. Energy Information Administration (2013). Available at: <https://www.eia.gov/todayinenergy/detail.php?id=9991>; Visual by the Author.

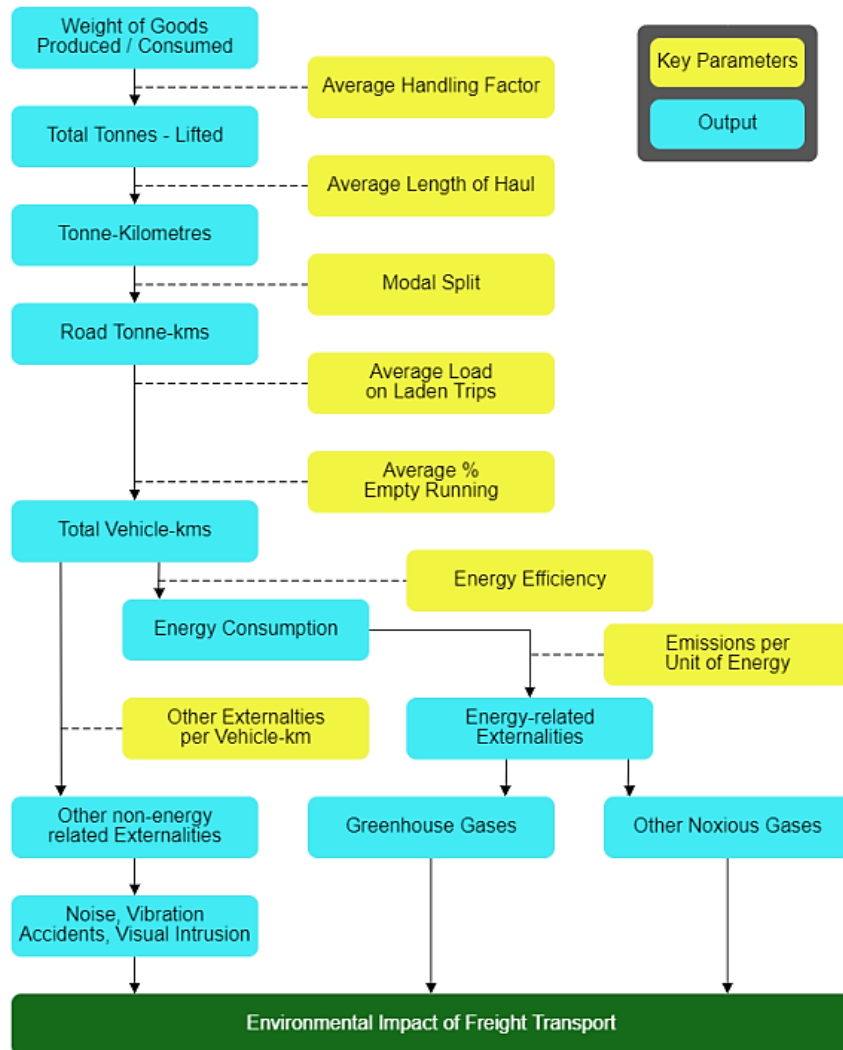
*Indexed to gasoline=1

Appendix 4. Common Fuel Pollutants



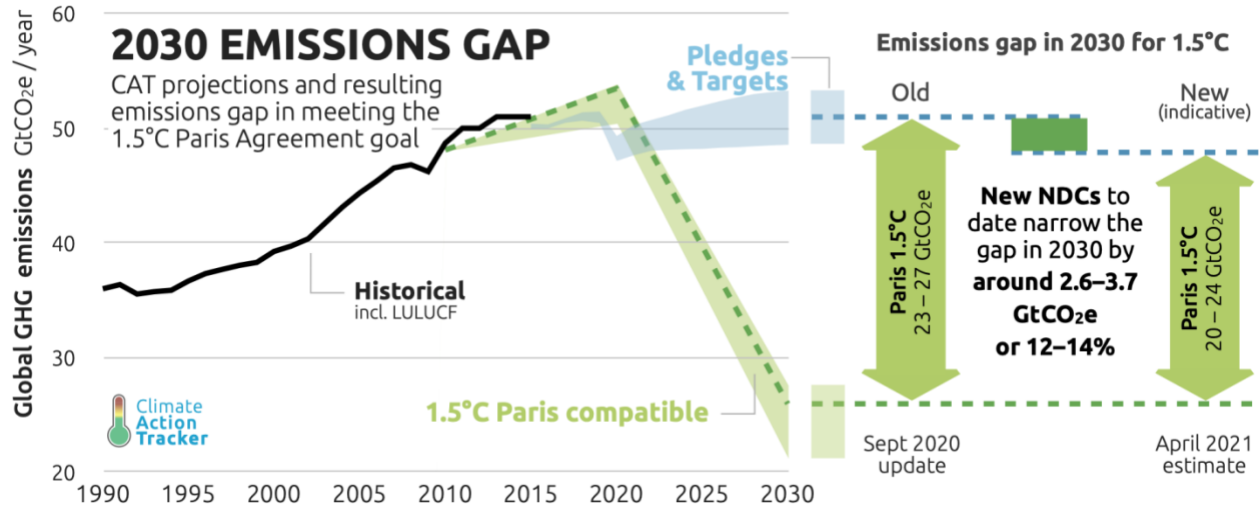
Source: Pennsylvania State University. Available at: <https://www.e-education.psu.edu/egee102/node/1951>

Appendix 5. Green Logistics Framework



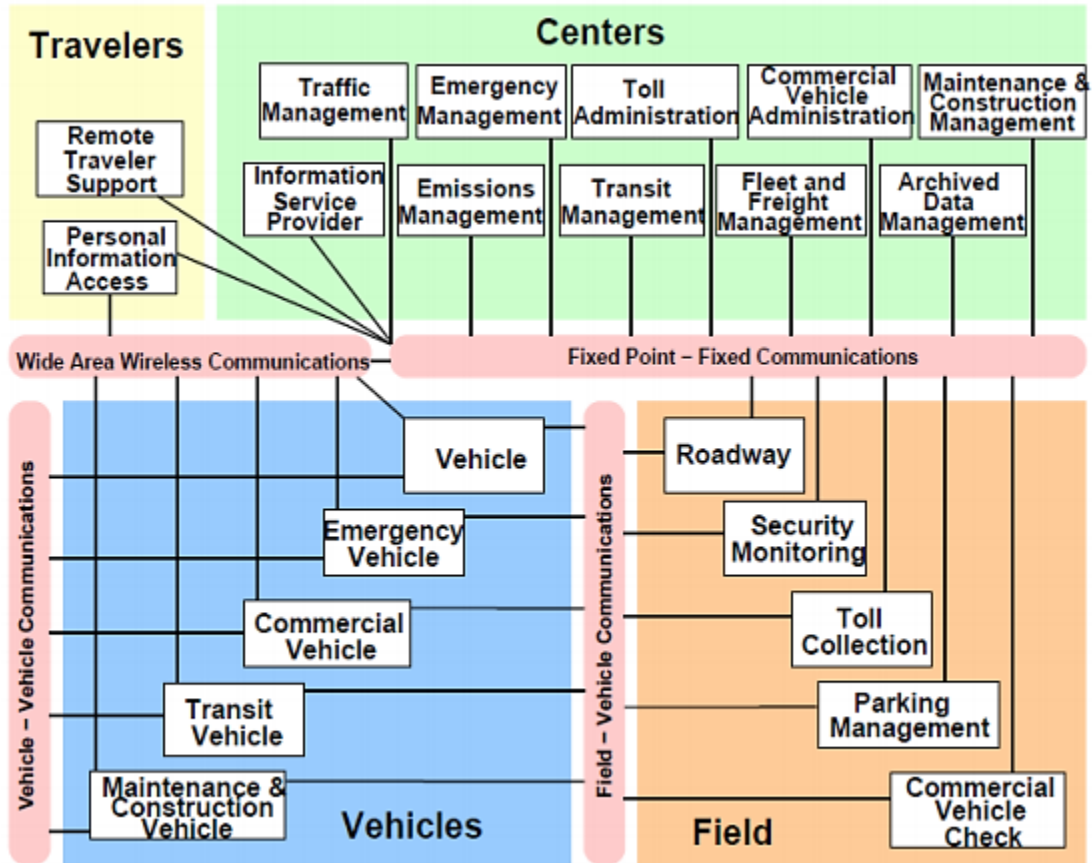
Source: UNCTAD Sustainable Freight Transport Framework. Available at: <https://www.sft-framework.org/>

Appendix 6. Emissions Gaps under the Paris Agreement



Source: Climate Action Tracker. Available at: <https://climateactiontracker.org/global/cat-emissions-gaps/>

Appendix 7. ITS Physical Architecture: Subsystems and Communications



Source: Nithiyananthan, Nishanthan, Kanagasabai, Thiruthanigesan, and Georgakis, Panos. (2017). Towards The Development Of Intelligent Transportation Systems In Sri Lanka. International Journal of Scientific and Technology Research. 6.

Tables

Appendix 8. Role of Ports in the NES' Focus Sectors

| Focus Sector | Industry | Growth Trend | Involvement of Ports |
|--------------------------------------|---------------------------|--------------|---------------------------------|
| IT-BMP | Services | Mature | High (container traffic) |
| Tourism | Services | Emerging | Medium (cruise) |
| Spices | Agriculture | Mature | High (air and shipping traffic) |
| Boating | Manufacturing | Visionary | High (marinas) |
| Processed foods and beverages | Agriculture/manufacturing | Emerging | High (container traffic) |
| Electrical and electronic components | Manufacturing | Visionary | High (container traffic) |

Source: *National Port Master Plan*, ADB (2020). Available at: <https://www.adb.org/projects/50184-001/main#project-documents-collapse>

Appendix 9. Road Safety Measures*

| UN Global Plan Pillars | Yes | No | Partial |
|---------------------------------------------------------|-----|----|---------|
| Pillar 1: Road Safety Management | | | |
| Designated lead agency | | | |
| Funded in national budget | | | |
| National road safety Strategy | | | |
| Funding to implement strategy | | | |
| Fatality reduction target | | | |
| Pillar 2: Safer Roads and Mobility | | | |
| Audit/star rating required for new road infrastructure | | | |
| Design standards for the safety of pedestrians/cyclists | | | |
| Inspection/star ratings of existing roads | | | |
| Investments to upgrade high-risk locations | | | |
| Policies promoting walking and cycling | | | |
| Policies and investment in urban public transport | | | |
| Pillar 3: Safer Vehicles | | | |
| Seat belt standards | | | |
| Seat belt anchorage standards | | | |
| Child restraint standards | | | |
| Frontal impact standards | | | |
| Electronic stability control standards | | | |
| Pedestrian protection standards | | | |
| Motorcycles anti-locking braking system standards | | | |
| Pillar 4: Safer Road Users | | | |
| National speed limit law | | | |
| Maximum urban speed limit | | | |
| Maximum rural speed limit | | | |
| Maximum motorway speed limit | | | |
| National drink-driving law | | | |
| BAC limit—general population | | | |
| BAC limit—young or novice drivers | | | |

| | | | |
|-------------------------------------------------------|--|--|--|
| BAC limit— professional/commercial drivers | | | |
| Random breath testing carried out | | | |
| National drug driving law | | | |
| National motorcycle helmet law | | | |
| Helmet law applies to drivers and passengers | | | |
| Law requires helmet to be fastened | | | |
| Law refers to helmet standard | | | |
| National seat belt law | | | |
| Law applies to front and rear seat occupants | | | |
| National child restraint law | | | |
| Restrictions on children sitting in the front seat | | | |
| National law on mobile phone use while driving | | | |
| Law prohibits handheld mobile phone use | | | |
| Law also applies to hands- free mobile phones | | | |
| Pillar 5: Post-Crash Response | | | |
| National emergency care access number | | | |
| Trauma registry | | | |
| Formal certification for prehospital providers | | | |
| National assessment of emergency care systems | | | |

Source: *Delivering Road Safety in Sri Lanka*, World Bank (2020). Available at: <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/976361582088610795/delivering-road-safety-in-sri-lanka-leadership-priorities-and-initiatives-to-2030>.

Notes: *Data presented is from 2018; Grey highlights are for measures that are more relevant to freight transport.

Appendix 10. Portions of National Development Documents Relevant to Sustainable Freight Transport

National Transport Policy

According to Sri Lanka's 2018 VNR, the draft National Transport Policy of January 2018 is in line with SDG 11.2 and further takes into account the climate and disaster resilience aspects of transport sector developments. Another draft version was said to have been submitted in January 2020 that promotes the efficient movement of people and goods in support of sustainable economic development and social inclusion via "a safe and secure transport system which minimises damage, injuries and loss of life and to protect environment sustainability and ensure optimum use of existing resources in terms of transport infrastructure equipment across all networks, modes and users."²³⁶

However, during the course this study's research, only the text for the Ministry of Transport's 2009 Draft National Policy on Transport was found. This policy incorporates various aspects of sustainable transport in its policy principles as seen below:

State Railway Operations

"The government will explicitly seek shift of passengers and goods transport from road to rail, by making rail transport attractive, comfortable, faster and affordable."

Logistics

"Considering the potential of Sri Lanka as a global and regional hub in the supply chain, every endeavor will be taken to support the efficient functioning of the logistics industry by connecting the ports, airports, markets, consumers and producers."

"Special emphasis will be given to ensuring multi modal access to all seaports, airports and dry ports. The Government will introduce regulation to ensure the safety and system efficiency of freight movements with respect to National Transport."

Environmental Principles

"The Government will pay particular attention to the alarming deterioration of the quality of our environment caused by transport activity. It will take steps to minimize the damage to the environment especially with respect to air quality, noise and impacts to the flora and fauna."

Steps include: annual emissions tests for vehicles, revised vehicle tax structures to encourage vehicle imports that are less polluting, and adaptation of EURO II standards from 2010 (since replaced by EURO IV).

Energy

"It is the priority of the Government to take steps to reduce the dependency on petroleum fuels for its mobility requirements. This would be in the form of actively promoting the use of less energy consuming modes of transport."

The government will “Ensure that the pricing of fuels is such that it discourages unwarranted use especially when reasonable options of a more energy efficient nature are available. As such to ensure that economic costs including pollution costs are always recovered.” It will also “Provide incentive for new technologies such as hybrid vehicles and new source of fuel such as bio fuel.”

Use of Technology and Research for Modernization

“The Government will encourage innovation and modernization of the transport sector... This would include improvements to standards of vehicles...Special and urgent attention would be given to the development of ICT based solutions.”

Safety

Goods Transport and Logistics

“The Government’s role in goods transport and logistics will be that of a facilitator. Its primary function in the regards will be:

- Ensuring that taxes, licensing fees etc are computed on the basis of actual costs and that external costs are considered in effecting incentives to particular modes of transport such as railway for heavy goods movements.
- That all motorized goods vehicles be subjected to a Goods Vehicle Conformity Certificate which will have to be renewed every 3 years.
- Undertake modernization of technology used in the goods and logistics sector such as for packaging, handling, warehousing and e-commerce through continuous funding for research and development.
- Undertake joint ventures and other private investment for utilization of railway resources and capacity for increasing the carriage of goods by railway, especially to and from the ports, airports and industrial zones.
- To mandate the National Transport Commission to maintain a database of planning and operational information on supply chain movements and logistics for the sector and to engage in the development of strategic plans to improve the efficiency of the sector.
- To stipulate and control the axle loads of freight vehicles on roads to prevent damage of roads due to over loading.
- To provide tax incentives for modern vehicles and equipment that will improve the performance of the industry and bring it on par with international standards.
- To assist in developing several rail based Logistics Centers or Villages in close proximity to the port and the airport so that they can function as Inland Container Depots as well as logistics centers.
- To take urgent steps to facilitate the development of a sea-air hub for freight transport with good land transport connections using both rail and road.
- Regulating the handling and carriage of hazardous goods.
- Regulating and monitoring of driver work and rest hours for goods vehicles drivers.”²³⁷

National Road Development Master Plan (2018-2027)

Prepared by the Planning Division of the Road Development Authority, this comprehensive plan seeks to guide the country in meeting its demand for road transport and respond to the economic and social needs of the its macroeconomic environment. The NRMP identifies investment priorities in the road sector over a ten year period while keeping in line with other national sustainability objectives that comply with the SDGs.

Existing problems identified in the NRMP include: roadside drainage systems, overloading, operational problems on highways, road safety, and traffic management. To mitigate these problems, the NRMP mentions preparing plans for roadside drainage, reducing congestion on highways, a 3E approach to road safety (see below), and improving traffic management through higher numbers of access roads and pedestrian facilities, driver training programs, better road conditions, and enhanced enforcement mechanisms (ex. proper road markings and traffic sign installation, advanced traffic management systems, driver merit system, and higher penalties).

Education: Education of all potential road users; Campaigns.

Engineering: Vehicle safety; Road infrastructure safety; Road geometric design.

Enforcement: Enforcement of traffic rules (i.e., discipline of drivers that violate these rules).

Other suggestion in the NRMP include: prioritization of flyovers for railway level crossings at A and B grade roads, alleviating traffic congestion within the CMR, transport demand management, and rural connectivity improvement.²³⁸

Road Safety Action Plan

A Road Safety Action Plan to 2020 was in place that addressed the five pillars of the United Nations Global Plan for the Decade of Action for Road Safety 2011–2020. The plan comprised of strategies, detailed actions, outputs, and key performance indicators for each stakeholder department. However, the plan reputedly gained little traction on account of poor interagency coordination and related resource and capacity restraints.²³⁹

A Road Map for Cleaner Fuels and Vehicles in Sri Lanka (2014)

The roadmap was designed to provide “to provide decision makers with up-to-date information on how to clean up fuels in Sri Lanka by implementing a set of activities with time-bound targets giving due consideration for regional and international trends in the subject, while addressing the local concerns.” It also discusses the interaction between fuels and vehicle technologies and the approaches that existing refinery can take to produce cleaner fuels.

Recommendations:

- Introduction of low sulfur diesel through importation of high quality refined fuels, unless the expansion/modification project of the local refinery is implemented.
- Develop a fuel quality road map including use of renewable energy sources and alternative fuels for transport.
- Promotion of electric and hybrid vehicles.

- Railway electrification.
- Explore the possibilities of introducing LNG as a source of energy in transport.
- Harmonize fuel quality standards with emission and ambient air quality standards.
- Establish an independent fuel quality testing laboratory in the Central Environmental Authority and University of Moratuwa to monitor the quality of fuels distributed at sales outlets and elsewhere.
- Import Euro IV standard fuels to meet the above recommendations considering the socio-economic and environment benefits until implementation of the refinery expansion and modernization project is complete in consultation with the Ministry of Petroleum Industries and Ceylon Petroleum Corporation.
- Establish a Fuel Quality Management Committee in the Ministry of Environment.²⁴⁰

Clean Air Action Plan 2025

With the mission of maintaining air quality at desirable levels by minimizing “the emission of harmful air pollutants resulting from all human activities through an effective stakeholder participatory mechanism,” the action plan’s objectives include:

- Developing and establishing a national multi-stakeholder platform for formulating and coordinating air quality improvement and management programs.
- Ensuring source identification, quantification, monitoring and reduction of harmful air pollutants through the implementation of identified programs in association with all stakeholders.
- Formulating, strengthening, and implementing an appropriate regulatory framework for ensuring effective air quality management.
- Undertaking research, development, capacity building programs for air quality management.
- Establishing linkages with subregional, regional, and global air quality management initiatives.
- Creating public awareness on air pollution and its health and other impacts.
- Ensuring adequate financial resources through formal and innovative financing mechanisms for air quality management.

The plan’s key components include:

- Provision of cleaner fuel for vehicles in parallel with Euro standards.
- Promotion of alternative fuel/biofuels for transport.
- Modernization of the existing oil refinery and or development of state of the art new oil refinery.
- Establishment of laboratory facilities for the testing of fuels.
- Electrification of railways.

As part of its strategy to establish a **green freight transport system**, the plan also calls for the use of trains for freight with an improvement to the quality and efficiency of the railways and the relocation of freight and container yards closer to expressway entry points and railways (including moving freight from ports to yard by train). Other recommendations include (among others) construction of flyovers and underground tunnels to reduce congestions and the promotion of good driving habits.²⁴¹

National Adaptation Plan for Climate Change Impacts in Sri Lanka (2016-2025)

While mitigation is usually the subject of discussion when talking about climate change and transport (i.e. reducing GHG emissions), adaptation measures for transport infrastructure and facilities are required to cope with projected climate impacts in order to retain the vital services that they provide. Extreme weather events and rising sea levels have the real potential to affect transportation. As mentioned previously under Section 2.1.1, the NAP-CC identifies the effects of climate change as: frequency and severity of intense rainfall, floods, cyclones, high winds, and inundation of low-lying areas. The identified impacts of these on transportation are: disturbance to road, sea, and air transportation; increased congestion and travel time in transportation; damage to transport infrastructure in coastal areas; and damage to energy and industrial facilities, including in coastal areas.

Some relevant actions proposed by the NAP-CC in its Industry, Energy, and Transportation Sector Action Plan include:

- Assessing the impacts of climate change on transport systems and road infrastructure.
- Assessing the impacts of projected changes and extreme weather scenarios on transportation systems.
- Assessing vulnerable and hazard prone areas/roads and prepare maps accordingly.
- Identification of climate resilient improvements in:
 - Transport planning;
 - Infrastructure development; and
 - Implementation of plans.
- Developing guidelines for improving the resilience of transportation systems against extreme weather situations.
- Creating awareness on climate risks in transportation for commuters, drivers, and transport operators.
- Establishing an early warning and hazard communication systems for commuters and drivers (focus: mobile phones, navigation systems, and radio channels).
- Promoting climate-proof infrastructure.
- Identifying vulnerable areas for climate-induced disaster risks on energy, transportation, and industrial facilities.
- Establishing an early warning system for disasters to energy, transport, and industry managers.²⁴²

Western Region Megapolis Master Plan

Colombo is a clear example of a primate city, or, in other words, one without rival in terms of its population size and influence in the country. As such, the Western Province also accounts for an outsized portion of the country's economic activity. However, turning Colombo from a metropolis into the center of a megapolis extending from Negombo to Beruwela is the subject of the ambitious Western Region Megapolis Master Plan, which was reinvented in 2015. The plan aims to develop the Western Province into a modern megapolis to rival economic hubs such as Dubai or Singapore by, for example, promoting industry and other economic activity, alleviating traffic congestion, improving public transportation, addressing environmental issues, and reforming city planning and social welfare.

One source claims that the WRMPD consists of 150 different projects. One of the main projects includes the proposed development of a controversial Colombo Port City business district.²⁴³ Further development of the Horana and Mirigama EPZs has also been cited as other projects under the WRMDP. Road widening,

expansion of road capacity, and bridge construction also figure into the plan. More on the environmental side, declaring ecozones, demarcating mixed conservation buffers, and developing and implementing environmental standards have also been mentioned as proposed policies.²⁴⁴

Sri Lanka Energy Sector Development Plan for a Knowledge-Based Economy (2015-2025)

This plan aims to guide Sri Lanka in its provision of quality, reliable, sustainable, and affordable energy. It recognizes the transport sector as an important pillar of the economy and its role in contributing “towards better socio-economic development by increasing rural connectivity and sustaining an efficient and clean urban environment.” Some relevant strategies include:

- Promoting a shift in preferred fuel choice for transport from petroleum to LNG and electricity.
- Promote energy efficient modes of transport.
- Pursuing transport energy diversity through electrification of both rail and road transport.²⁴⁵

National Policy on Sustainable Consumption and Production (2019)

According to the policy,

Economic development in Sri Lanka in the last few decades has helped the nation to reach middle-income status while eradicating absolute poverty. However, it has also been accompanied by raising income inequalities, social problems and disproportionate increase in consumption of natural resources, and having negative environmental impacts. The latter is aggravated by population growth and rapid urbanization resulting in a decreasing amount of natural resources potentially available per person.

Sustainable Consumption and Production (SCP) aims at improving economic development and social welfare while protecting the environment and managing natural resources sustainably. Promoting Sustainable Production (SP) is an essential ingredient of sustainable development, which depends on achieving long-term economic growth that is consistent with environmental and social needs. Promoting Sustainable Consumption (SC) is equally important to limit negative environmental and social externalities as well as to provide markets for sustainable products and services.

With identified linkages to 27 SDG targets, including the transport-related targets 3.9, 7.3, and 13.2, the National Policy on SCP responds to a need for an overarching SCP policy in Sri Lanka that is coherent and integrated with related sectoral policies. It provides “an effective framework and the necessary impetus to enhance the sustainability of the country’s economic development drives through efficient and effective utilization of its natural resources.”

The policy is relevant to sustainable freight transport through the following policy statements and goals:

Statement:

“Develop freight transportation systems by integrating most appropriate nodes to have an efficient supply chain system.”

- **Goals:**
 - Energy efficiency promoted in transport modes.
 - Railway electrification introduced.

Statement:

“Introduce emission reduction and pollution control measures for all economic activities, e.g. building and construction, transport, industry, energy generation, land use, agriculture, livestock, waste and households (indoor air pollution).”

- **Goals:**
 - Air quality standards with related health indicators adopted.
 - Stringent standards for vehicle emissions introduced and testing and monitoring infrastructure upgraded.

Statement:

“Review, strengthen and empower existing legal instruments, such as Environmental Impact Assessment (EIA).”

Statement:

“Promote disaster and climate resilient buildings and constructions.”²⁴⁶

Vision 2025

. At the heart of this vision is to transform Sri Lanka into an export-oriented hub through a knowledge-based, highly competitive, and social-market economy, making it the hub of the Indian Ocean. Some relevant actions include:

- The establishment of economic corridors.
- Fast tracking the long-term transport master plan in line with the WRMDP. This includes developing the East and West Terminals at the Port of Colombo, railway electrification and modernization (including double-tracking the Kelani Valley railway), flood mitigation projects, and modernization of the Bandaranaike International Airport.
- Increasing investment in logistics, with a focus on infrastructure (ex. upgrading and constructing more than 70 bridges and modernizing and expanding the rail system).
- Developing a more environment-friendly transport sector (ex. more energy efficient vehicles and reduced fuel consumption).
- Expanding port infrastructure and related services through PPPs, including the East and the West Terminals at the Port of Colombo.²⁴⁷

Sustainable Sri Lanka 2030 Vision and Strategic Path

Published in 2019, the 2030 Vision and Strategic Path reiterates Sri Lanka's aspiration to become the hub of the Indian Ocean, following a middle path based on balanced, inclusive green growth. The report identifies some of the critical issues in Sri Lanka as:

Poor Freight Logistics and Supply Chain Management

The document elaborates below,

The supply chain management of all movement of consumer goods as well as export produce follows traditional and manual methods leading to waste, delays and lost opportunities. Such deficiencies impact especially the rural economies severely by making agriculture, small industries and fisheries unprofitable and unsustainable as a livelihood. There are no logistics centres with modern amenities for storage, packing, value addition and distribution. The railway has been isolated from goods transport. In international logistics, where a higher level of operations exists, several port related bottlenecks makes the cost and time for exports unsustainable.

Road Accidents

The document elaborates below,

While poor road discipline is often cited as a cause, there are many poor policies that do little to arrest this situation that is estimated to cost the economy over 3,000 lives and at least Rs 40 billion per year both of which are unsustainable for economic and social development. The high vehicle taxes that prevent people from being able to buy safer vehicles, allowing import of vehicles of poor safety standard, inadequate attention on safety in road design and lack of investment on improving safety underline the status quo.

Fulfilling and Productive Employment

The document elaborates below,

Transport sector provides direct employment to at least one million people. Most of them have informal jobs as drivers, loaders, cleaners, mechanics, conductors, labour etc. Their working conditions are poor and they are often without due social safeguards required by law such as EPF/ETF and gratuity. Productivity is also low. The physical environments are also often not conducive to work and vulnerability to safety hazards are high. The government has to take steps to formalize such employment and to create decent work conditions including automation of unsafe and risky activities to ensure occupational safety for all employees in the transport sector by 2030. Steps should also be taken by 2020 to develop the transport sector as a driver of the economy pursued through strategies encouraging transport-related domestic value addition instead of being heavily import intensive.

Optimizing the Railways

The document elaborates below,

"The development of the railways is considered a viable long-term transport solution for Sri Lanka given its higher capacity, and lower external and environmental impacts.

- Pursue the systematic development of the national railway network to position it as a competitive modern-day transport option by the year 2030 for both passenger and freight transport.

- Strategically focus into competitive niche areas for rail transport such as (a) urban passenger, (b) long-distance express passenger and (c) bulk and long-distance freight transport markets.
- Allocate funds for 2020 with emphasis on (a) expanding railway network to cover the entire island as an alternate mode of transport to serve the long term mobility requirements including a new rail access to Kandy extendable to Uva and Eastern Province as well as to Sabaragamuwa, (b) improving reliability and speed of travel through electrification and other infrastructure improvements (c) modernize customer services through electronic ticketing, air conditioning, improved stations, integrated access by buses and three wheelers, park and ride facilities etc., (d) improved freight transport especially large volume- long distance haulages.”

Some key action recommendations from the document include:

- Take early action to prevent air pollution due to heavy traffic congestion in major cities and introduce smart and sustainable transportation systems including non-motorized transport, electric vehicles and electrically operated public transport systems.
- Implement urgent short, medium and long-term measures to reduce vulnerability to disasters (eg. droughts, floods, landslides) and adapt to climate change.
- Maximise Sri Lanka’s geostrategic potential to serve as an emerging transshipment and logistics hub as well as a commercial hub connecting different regions.²⁴⁸

Reconstructed Country with a Future Vistas of Prosperity and Splendour

This document includes introducing “New secure railway coaches...to expand the role of the railways in goods transport. Corresponding improvements to railway infrastructure will be carried out.” The paper also assigns high priority to the road network and ensuring that all road networks that remain unfinished will be completed and would be connected to their respective economic corridors.

Ports are also given priority. Expanding facilities required to transport cargo via trains to Colombo, Hambantota, Trincomalee, and Kankasanthurai ports is mentioned, along with the further development of the Port of Colombo and Hambantota Port. Revisiting the lease deal with China over Hambantota Port is mentioned as well. Finally, three new ICDs at Peliyagoda, Veyangoda and Ratmalana are targeted with the participation of the private sector and the Mattala Rajapaksa International Airport facilities are marked for upgrade, adding a new taxiway and cargo terminal.²⁴⁹

National Port Master Plan

With the ADB, the SLPA has worked to develop a National Port Master Plan. The ADB project, now closed, had two outputs: (i) national port master plan and (ii) technical review of the final design of the port access elevated highway. The plan was aligned with the country’s development needs and priorities to improve the port sector and the restructuring of the SLPA was also mentioned as a component of the plan. Technical assistance was provided through a large number of consultant reports.²⁵⁰

Railway Master Plan

This technical assistance project from the ADB aims to prepare a strategy for the strategic development of the railway transport sector and the multimodal integration of railway transport. Among the project rationale and linkages was the Government of Sri Lanka's target of moving 5 per cent of freight by rail by 2020 in its Public Investment Programme 2017-2020.²⁵¹

A Roadmap to Improve the Investment Climate in Sri Lanka

This roadmap was developed in response to a policy commitment made in October 2016 to improve Sri Lanka's investment climate and reach a top 70 ranking on the World Bank's Ease of Doing Business Index by 2020.

Priorities identified under the action plan for improving Sri Lanka's regulatory environment in trading across borders include:

- Establishing a single window.
- Developing a trade information portal.
- Establishing a risk management policy.
- Establish storage facilities for perishable shipments pending their release.
- And others.²⁵²

National Export Strategy (2018-2022)

Developed with the International Trade Centre, this strategy seeks to be the catalyst that drives the economy of Sri Lanka, stimulates growth, and creates jobs by improving the ability of firms to export and compete in foreign markets. It contains a sub-strategy on logistics that covers a wide range of activities. These include:

- Upgrading and investing in new infrastructure for MCC/LCL.
- Changing the current port structure by establishing an independent regulator (maritime and port authority).
- Paperless transactions and interface for customs services.
- Enabling institutions to use integrated electronic solutions through the regulator (e-payment, e-signature, e-documents, tracking).
- Creating an ecosystem to attract FDI.
- Ratifying conventions that Sri Lanka has already committed to in relation to the International Maritime Organization and other transport conventions.
- Removing existing barriers to private sector investments and operations in railway networks and encourage PPPs in rail master plan design and implementation of programs for improved rail transportation (network expansion, maintenance, and management).
- Attracting skilled labor to satisfy growing industry needs.
- Enabling areas within international airports and ports authorized by Sri Lanka Customs to receive/hold/deliver/ import cargo to be allowed to carry out Entrepot related activities.
- Carrying out a feasibility study (private sector experts and University of Moratuwa) on the necessity of installing multi-user facilities to provide temperature-controlled storage (bonded logistics centres).

- Attract investment to increase a rail network between ports, airports and commercial hub zones to facilitate fast transfer of sea/air cargo and establish an integrated multi modal connectivity network.
- Diversifying shipping beyond containerized cargo to increase activity of non-containerized cargo in Sri Lankan ports.
- And others...²⁵³

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