NORTHERN CORRIDOR GREEN FREIGHT STRATEGY 2030

January 2023

Contents

List of Figures

List of Tables

Chapter 1: Introduction

1. The Northern Corridor is a critical linchpin in facilitating trade across East Africa. The Northern Corridor serves as a vital economic lifeline, connecting landlocked nations like Uganda, Rwanda, Burundi, South Sudan, and parts of the Democratic Republic of Congo (DRC) with the bustling Kenyan maritime seaport of Mombasa. Renowned as the busiest Port in East and Central Africa, the Port of Mombasa handled 33.75 million metric tons of total cargo throughput encompassing imports, exports, and transshipments in 2022. This Port stands as the gateway to the extensive Northern Corridor.
2. The corridor encompasses various modes of transportation, including road, rail, pipeline, and inland waterways, along with associated facilities integral to facilitating and clearing goods. These facilities include Inland Container Depots (ICDs), Weighbridges, and One-Stop Border Posts (OSBP), contributing significantly to trade efficiency and seamless clearance processes. Spanning a comprehensive infrastructure network, the Northern Corridor features about 12,700 kilometres of road infrastructure, incorporating around 2000 kilometres of arterial roads. The corridor facilitates a daily road freight movement of about 75,000 tons in about 2000-3000 trucks from Mombasa to the hinterlands of Kenya and East African Community (EAC) nations. Remarkably, 65% of the total traffic departing from Mombasa remains within the borders of Kenya.
3. In 2017, in collaboration with the Climate and Clean Air Coalition, United Nations Environment Programme (UNEP), and United Nations Conference on Trade and Development, NCTTCA developed a transformative Green Freight Programme (2017-2021) for the Northern Corridor aimed at reducing fuel consumption and carbon emissions across member states (Burundi, DR Congo, Kenya, Rwanda, South Sudan, and Uganda). The Green Freight Programme is a launching pad for a phased implementation of a holistic Sustainable Freight Transport Strategy, which entails, in particular, sustainable transport

policies, planning strategies, and investment decisions that effectively balance the economic, environmental, and social objectives.

4. The review of the Previous Strategic Plan (2017-2021) and stakeholder interviews revealed critical shortcomings: insufficient focus on sustainable infrastructure, lack of specialized expertise at the Secretariat, low public awareness, and inadequate attention to cross-cutting priorities like social and environmental factors.

5. In operational terms, the Northern Corridor abides by the directives articulated in the multilateral Northern Corridor Transit and Transport Agreement (NCTTA). This binding agreement among member countries regulates the transport and customs frameworks governing freight movement across one or two countries before reaching its ultimate destination. The NCTTA agreement originally encompassed 11 meticulously defined Protocols addressing pivotal areas for regional cooperation. These contain Maritime Port Facilities, Routes and Facilities, Customs Controls and Operations, Documentation and Procedures, Transport of Goods by Rail, Transport of Goods by Road, Inland Waterways Transport of Goods, Transport by Pipeline, Multi-modal Transport of Goods, Handling of Dangerous Goods and Measures of Facilitation for Transit Agencies, Traders, and Employees.

6. The Extra-Ordinary Meeting of the Executive Committee further took action in 2020, amending the Northern Corridor Transit and Transport Agreement and adding a 12th Protocol. The protocol considered mitigating the negative impact of transportation activities on the environment, as well as the effects of climate change on transport infrastructure and facilities along the Northern Corridor. In support of the Northern Corridor Transit and Transport Agreement, NCTTCA is implementing the Northern Corridor Strategic Plan 2022-2026, the Northern Corridor Infrastructure Master Plan, and the Northern Corridor Green Freight Programme.

7. In 2023, the NCTTCA requested the UNEP for assistance in updating the Northern Corridor Green Freight Programme by establishing the targets and recommending appropriate improvement measures for implementation until 2030.

8. NCTTCA, UNEP, and Smart Freight Center have jointly developed the updated Northern Corridor Green Freight Strategy 2030 using the UNCTAD framework for sustainable freight transport, which provides guidance and practical tools on how best to mainstream sustainability considerations into freight transport infrastructure, services, and operations and based on consultations with the stakeholders to develop the Green Freight Programme-2030.

Chapter 2: Green Freight in the Northern Corridor: The State of Play

A. Improvement in Infrastructure

9. The Northern Corridor transportation network integrates various modes, including road, rail, inland waterways, and pipelines. This network connects the Port of Mombasa with landlocked countries, specifically Burundi, the Democratic Republic of Congo (DRC), Rwanda, South Sudan, and Uganda, in addition to the inland regions of Kenya.

Figure 1: The Northern Corridor

Source: The Northern Corridor Strategic Plan for the Period 2022-2026

10. The Northern Corridor infrastructure network consists of about 12,700 Km of road infrastructure. About 32% of the road infrastructure is in the Democratic Republic of the Congo. The road infrastructure share of Burundi, Kenya, Rwanda, Uganda, and South Sudan is 4%, 9%,11%,16%, and 28%, respectively. Over the last decade, significant progress has been made towards improving the road infrastructure. About 41% of the road network is in good condition, 21% is in fair condition, and about 38% is in very poor condition and needs urgent rehabilitation.

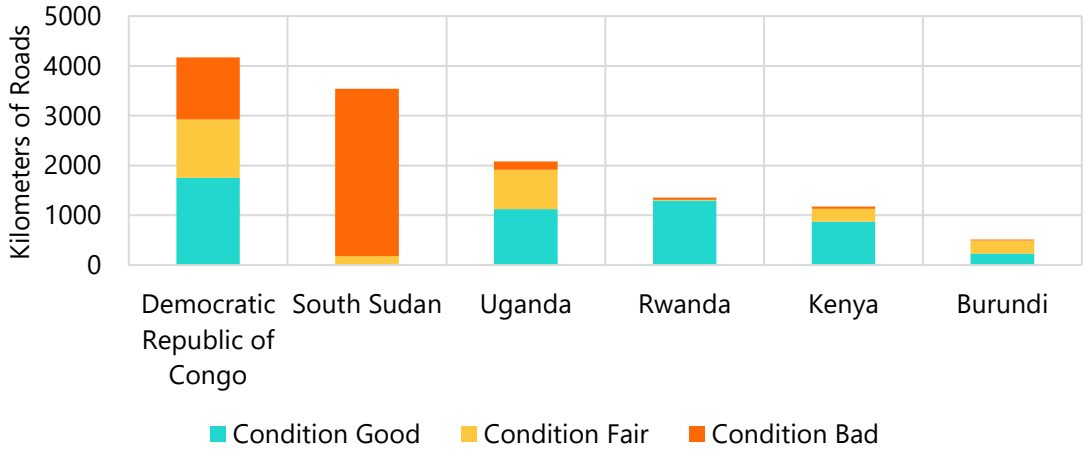


Figure 2: Road Pavement Quality in 2022

Source: The Northern Corridor Transport Observatory Report 2022

B. Increased Focus on Transport Green House Gas Emissions

11. In 2022, the Northern Corridor countries emitted about 16.5 million tonnes of CO_2 emissions from the transport sector. Since 2000, the transport sector emissions have increased at an annual rate of 6.6%, i.e., they have increased by more than four times. In 2022, the road subsector contributed about 94% of total CO_2 emissions, and railways about 1% of transport CO_2 emissions. While freight share in total transport CO_2 emissions in northern corridor member states is unknown, estimates indicate about 51% share in Kenya (Government of Kenya, 2019). International Transport Forum has estimated a global freight share of about 50% in domestic transport CO_2 emissions.

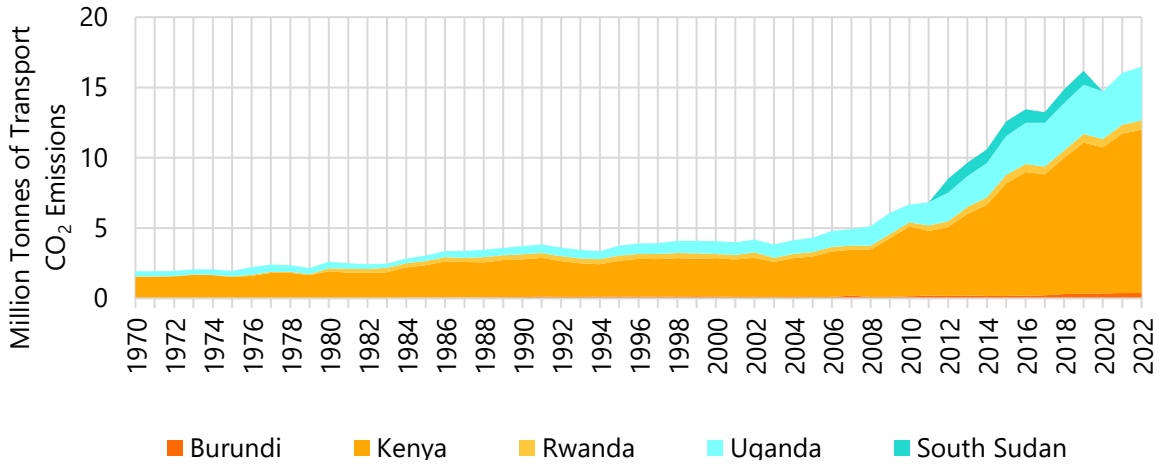


Figure 3: Transport CO_2 Emissions

Source: EDGAR - Emissions Database for Global Atmospheric Research

12. In 2018, the NCTTCA estimated that GHG emissions of the Northern Corridor were 1.73 $MtCO_2e$ emissions (NCTTCA, TMEA, & CCTTFA, 2021). In the Northern Corridor, the top 10 GHG emission-intensive routes are Mombasa-Malaba, Mombasa-Nairobi, Mombasa-Busia, Nairobi-Busia, Busitema-Kampala, Luwero-Elegu, Luwero-Goli, Mbale-Goli, Mubende - Kasindi, and Mbale -Elegu. Out of 25 routes in the Northern Corridor, these ten routes contributed about 86 % of the estimated total GHG emissions of the corridor. In Kenya and Uganda, the GHG emission share of the Northern Corridor as a percentage of total freight transport emissions of respective countries was estimated to be 48% and 97%.
13. In the Northern Corridor, empty trips constituted 25% of the total emissions (0.43 $MtCO_2e$).
14. In 2018, the NCTTCA carried out an emission inventory at the Mombasa Port. The emission inventory considers ship emissions, emissions from port operations, vehicles, and railway operations (within the Port boundary). The average annual emissions at the Port of Mombasa were estimated to be about 0.5 million tons of CO_2, 10 million KG of NO_X, and 0.4 million KG of PM2.5. The Ocean-going vessels accounted for about 94.7% of CO_2 Emissions while at the Port of Mombasa and anchoring. The other activities, such as Heavy Machinery, Electricity use, and Trucks and Commuter vehicles, constituted a minor share with 2.2%, 0.1%, and 0.8% share, respectively. The projections revealed that the Port's CO_2 emissions could increase by 125% by 2032 in a business-as-usual (BAU) scenario.
15. Northern Corridor countries have pledged to reduce economy-wide and transport sector GHG emissions under the Paris Agreement related nationally determined contributions (NDC). Some of the targets related to freight are summarised in the table below.

Table 1: Transport Measures and Targets in Nationally Determined Contributions

Country	Type of Document	Target Year	Content
Burundi	Updated NDC	2030	Concerning mitigation, Burundi had committed to reducing carbon emissions by 23% by 2030 greenhouse gases compared to the reference scenario (BAU), which corresponded to a reduction in 3% (1,958 Gg ECO_2)
Burundi	Updated NDC	2030	of 20% (14,897 Gg CO_2e) as part of its conditional objective
Burundi	Updated NDC	2027	By 2027, 7.5 km will be developed for non-motorised transport
Burundi	Updated NDC	2027	By 2027, 42.5 km will be developed for non-motorised transport By 2027, 3 modern ports will be developed and 6 boats available Develop ports on Lake Tanganyika and acquire 6 boats
Democratic Republic of the Congo	Updated NDC	2030	The combined unconditional and conditional contribution is thus a reduction of 21% in total GHG emissions compared to the BAU in 2030 (including 19% conditional and 2% 10 unconditional); this is equivalent to an estimated level of mitigation of up to 650 Mt CO_2e by 2030
Kenya	Updated NDC	2030	To abate GHG emissions by 32% by 2030 relative to the BAU scenario of 143 $MTCO_2eq$
Kenya	Updated NDC	2030	Promote the use of appropriate designs and building materials to enhance resilience of, at least 4500 km of roads to climate risk
Rwanda	Updated NDC	2030	A reduction of 16 per cent relative to BAU in the year 2030; equivalent to an estimated mitigation level of 1.9 million tonnes of carbon dioxide equivalent (tCO_2 e) in that year. This is an unconditional target, based on domestically supported and implemented mitigation measures and policies
Rwanda	Updated NDC	2030	An additional reduction of 22 per cent relative to BAU in the year 2030; equivalent to an estimated mitigation level of 2.7 million tCO_2 e in that year. This represents an additional targeted contribution, based on the provision of international support and funding
Rwanda	Updated NDC	2030	Measures introduced to increase vehicle emissions performance of national vehicle fleet, including tax incentives and scrappage of older vehicles, and inspection.
Rwanda	Updated NDC	2030	Conditional measures - Public transport infrastructure Wide range of measures including bus rapid transport (BRT) project, bus lanes, non-motorised transport lanes, and other modal shift projects contained in the Transport Sector Strategic Plan
Rwanda	Updated NDC	2030	Conditional measures - Electric vehicles (EVs) The e-mobility programme plans for the phased adoption of electric buses, passenger vehicles (cars) and motorcycles from 2020 onwards, resulting in displaced conventional vehicle sales, transport fuel imports and associated GHG emissions.
Rwanda	Updated NDC	2030	Investment requirement to implement transport mitigation measures – 1 billion USD
Rwanda	Updated NDC	2030	Reduction of length of roads vulnerable to flood and landslides, Environmental and engineering guidelines developed (for climate resilient road infrastructure) and Number of passengers using the public transport each year leading to Improved transport infrastructure and services

Country	Type of Document	Target Year	Content
Rwanda	Updated NDC	2030	Investment requirement to implement transport adaptation measures about 580 million USD
South Sudan	2nd NDC	2030	44% reduction in GHG emissions compared to baseline (2030 BAU)
Uganda	Updated NDC	2030	Transport sector GHG emissions under Business-As-Usual conditions will more than double from 4.2 MtCO2e in 2015 to 9.6 MtCO2e in 2030. If all the main mitigation measures under the NDC scenario are implemented fully, they have the potential to limit the growth of the emissions by 29% to 6.8 MtCO2e in 2030 as illustrated in the figure 3-6.
Uganda	Updated NDC	2050	Implement 1,412 km of fully electrified standard gauge rail by 2050.
Uganda	Updated NDC	2030	Rehabilitation of 634 km of meter gauge railway by 2026 to facilitate modal shift of freight from road to rail. 22% fuel economy improvement of diesel locomotives achieved in 2030 relative to 2015.
Uganda	Updated NDC	2030	Economy wide emissions reduction of 24.7% in 2030 below the BAU conditions.
Uganda	Updated NDC	2030	Of which, Uganda's unconditional efforts will result into reduction of 5.9% in 2030 below the BAU conditions
Uganda	Updated NDC	2030	Implement 61 km of passenger MGR rail in 2030. 22% fuel economy improvement of diesel locomotives achieved in 2030 relative to 2015.
Uganda	Updated NDC	2050	TOD reduces motorised travel demand by 5% in 2050.
Uganda	Updated NDC	2030	100 km of complete streets or dedicated NMT corridors, constructed in greater Kampala area in 2030 leading to 10% shift in PKM by mode from other passenger modes. Construct 100 km of NMT facilities in secondary cities in 2030.
Uganda	Updated NDC		1% per year increase in alternative fuel use for all road vehicles - 60% of the increase comes from natural gas. - 20% from ethanol (E10). - 20% from biodiesel.
Uganda	Updated NDC	2030	Global Fuel Economy Initiative (GFEI) 50 by 50 targets, improvement of fuel economy with 10-year time-lag: 2030: -20% 2040: -35% 2060: -50%
Uganda	Updated NDC	2025	Build climate-resilient roads, bridges, water, and Rail transport infrastructure systems. Paved National Roads (Kms): Baseline: 4971, 2025 target: 7600 Paved urban roads (Kms): Baseline: 1253, 2025 target: 1848 Permanent way /railway road (Kms): Baseline: 262, 2025 target: 7600
Uganda	Updated NDC	2025	Revise design codes, regulations and guidelines to climate proof strategic transport infrastructure Proportional of national road reserves with green infrastructure and vegetative reinforcement Baseline: 1% 2025 target: 30% 2030 target: 50%

Source: Based on Nationally Determined Contributions of Countries as submitted to UNFCCC

16. Approximately 50% of Africa's 250 largest publicly listed companies have established emission targets, with around 20% aiming for net-zero emissions (NZ, 2022). On a global

scale, nearly 140 countries have committed to net-zero targets (NZT, 2023). The member states of the northern corridor have yet to develop action plans for the net-zero transition of the transport sector. Some examples of net-zero announcements include

- Kenya's Nationally Determined Contributions (NDC) outline a shift towards a low-emission society by 2050. In 2023, Kenya launched the National Climate Change Action Plan (NCCAP) 2023-2027, Long-Term Low Emission Development Strategy (LT-LEDS) 2022-2050, and an amendment to the Climate Change Act (2023), all geared towards achieving a net-zero emissions future by 2050 (NDC Partnership, 2023).
- Rwanda's Green Growth and Climate Resilience Strategy (RoR, Revised Green Growth and Climate Resilience, 2022) has set ambitious targets to reduce greenhouse gas emissions, intending to achieve net-zero emissions by 2050.
- Uganda's Energy Transition Plan (EI, 2023) targets a peak in emissions by 2040 and net zero emissions by 2065

C. Climate Resilience Vulnerability

17. The UK's High Volume Transport Applied Research Programme (HVT) has established that East Africa faces significant economic losses from flooding damage to critical transportation networks. The research (HVT, 2022) reveals that East African infrastructure is vulnerable to flooding, with projected damages reaching $170 million annually by 2080. The current expected annual damages (EAD) due to direct damage to road and railway assets, ports, and trade in Northern Corridor countries is estimated to be in the range of 83 Million USD (Koks et al., 2019) with the most significant impact in South Sudan, with a share of about 50% of total damage in Northern Corridor countries.

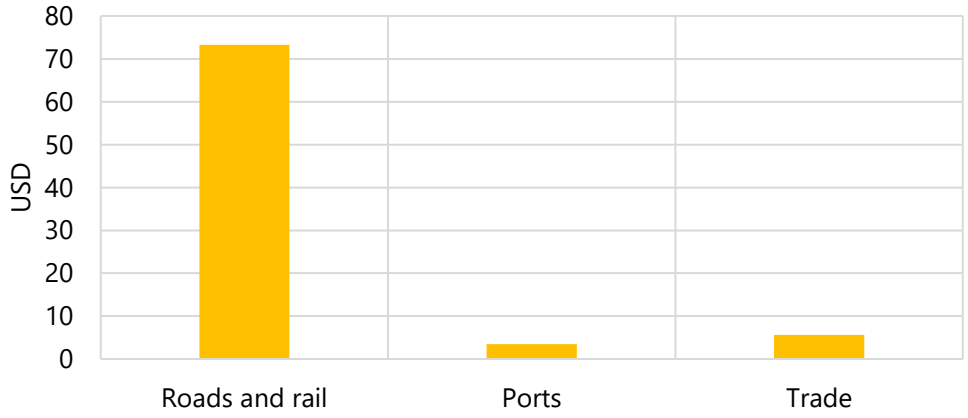


Figure 4: Multi-hazard expected annual damages to roads, rail, port, and trade in Northern Corridor countries

Source: Multi-hazard risk to global port infrastructure and resulting trade and logistics losses & A global multi-hazard risk analysis of road and railway infrastructure assets

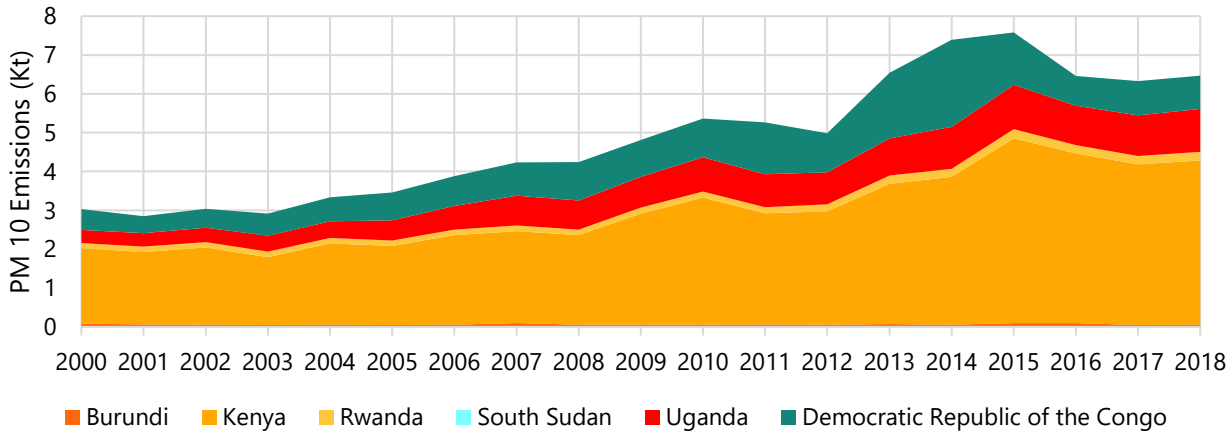
18. In the Nationally Determined Contributions (NDC), Kenya, Rwanda, and Uganda have set ambitious climate-proofing targets for the national roads, which overlap with the Northern Corridor. Further, climate-proofing transport infrastructure and supply chains to minimize

climate-related issues are also highlighted by the National Climate Change Action Plan and National Adaptation Plans.

D. Growing Air Pollution

19. Among the world's regions, Africa experiences some of the most significant impacts on human health due to exposure to air pollution. Every year, it is projected that more than 1.1 million premature deaths in Africa can be linked to air pollution (Fisher, et al., 2021), including fine particulate matter (PM2.5) and tropospheric ozone. The transport contribution accounts for approximately 16% of global air pollution-related fatalities (UNEP, CCAC, & AU, Integrated Assessment of Air Pollution and Climate Change for Sustainable Development in Africa, 2023). The freight transport sector in the Northern Corridor countries also contributes significantly to the Air Pollutant Emissions (Kinney et al., 2011).

20. Growing concerns about the health risks of diesel emissions are putting pressure on the freight transport industry to reduce air pollutant emissions. This pressure will likely intensify as more research emerges linking diesel exhaust to various health problems, including lung cancer, particularly among truck drivers (HEIDEP, 2015). In one of the investigations, it has been estimated the elevated cancer risks for truck drivers ranged from 966 to 2,631 cases in a million, which is up to 2,000 times greater than typically considered acceptable by environmental protection agencies (Medindia, n.d.). It is important to note that estimates from the Emissions Database for Global Atmospheric Research indicate that PM 10 and NOx emissions have collectively increased by 2.3% and 6.5% annually from 2010 to 2018, respectively.



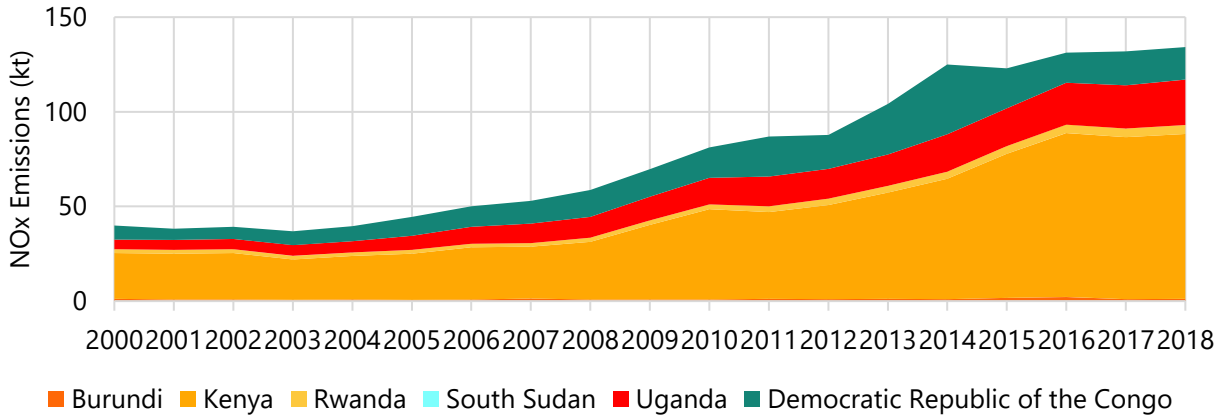


Figure 5: PM10 and NO_X emissions from Road Transport in Northern Corridor Member States

Source: Emissions Database for Global Atmospheric Research

E. Prioritising Modal Shift

21. The railway network within the Northern Corridor comprises two rail lines: the Standard Gauge Railway (SGR) and the Meter Gauge Railway (MGR).

22. The SGR, operational for cargo since January 2018, connects Mombasa to Nairobi (480 km) and Nairobi to Naivasha (120 km). The new line has attracted a modal shift from the road, contributing to a 20% share of the total throughput.

23. The older MGR network, spanning approximately 2,770 km but facilitating a slow movement of freight, traverses from Mombasa Port through Nairobi, Malaba, and Kampala to Kasese in Western Uganda, close to the border with the Democratic Republic of Congo (DRC). Some segments of the MGR network in Kenya and Uganda are undergoing rehabilitation.

24. Statistics available with the Northern Corridor member states indicate that in 2022-2023, 26% of the port throughput was moved by rail compared to 5% in 2017-2018.

25. One of the main targets stipulated in the 2013 Mombasa Port Community Charter was to ensure at least 35% of railway freight mode share by 2018. The priority recommendations in the 2018-2024 Mombasa Port and Northern Corridor Community Charter included extending the railway corridor to Naivasha and Kisumu and enhancing efficiency to induce modal shifts.

26. However, despite railway network improvement, the lack of intermodal coordination with poor connectivity and services has worked to the competitive advantage of road freight transport. Projections reveal that, by 2030, due to the development of the Single Gauge Railway Line (SGR)[1], the railway mode share could increase from 10% to 20%-60% (JICA,

[1] The SGR project from Mombasa to Nairobi and towards Uganda is now on-going with financial support by the Chinese EXIM bank

2017), depending on the magnitude of railway reforms carried out and due to the implementation of the supportive mode-shift policies.

27. Projections reveal that the benefits intensify if the modal shift happens to electric SGR. The complete electrification of the SGR is estimated to result in emissions savings of over 53,000 tCO2e annually (WB, Transport Sector Background Note, 2023).

28. East Africa boasts vast inland waterways, including the expansive lakes Victoria, Tanganyika, Kivu, and Albert. These waterways offer immense potential for transportation and logistics, but for decades, this potential has remained largely untapped. However, recognizing this opportunity, East African countries are now experiencing a resurgence of Inland Waterway Transport (IWT).

29. Driven by the growing demand for transportation and the need to support the African Continental Free Trade Area (AfCFTA), East Africa is revitalizing its IWT sector. Countries are adopting an integrated multi-modal corridor approach, drawing on best practices worldwide.

30. Lake Victoria is the primary inland waterway for the Northern Corridor, with key ports in Kenya, Uganda, and Tanzania.

    - Kenya has invested in upgrading Kisumu Port and operates train wagon ferries on the lake.
    - Uganda has constructed the Mahathi Oil Jetty and plans to build the new Bukasa Port.
    - Burundi is rehabilitating Bujumbura Port, and the DRC is developing Ntoroko Port on Lake Albert.
    - Rwanda is constructing four ports on Lake Kivu.

31. The NCTTCA assessed the status of IWT in the region and has identified specific areas for improvement.

F. High Intensity of Growth

32. While the Mombasa port is the largest in East Africa, the Northern Corridor is one of Africa's busiest and most crucial multi-modal trade routes. Over the last decade, the Mombasa port traffic increased at an annual growth of about 5.7%, i.e., from 14 Mt in 2006 to 33.75 million tons in 2022.

33. The Project for Master Plan on Logistics for the Northern Corridor estimates that by 2030, the traffic volume could double due to high economic growth. By 2030, the total import freight (tonnage/year) from the Port of Mombasa could be 57 million tons 2030, growing 2.4 times from 24 million tons in 2015. Total export freight could be 4,650 thousand tons, growing 1.9 times of 2,451 thousand tons in 2015 (JICA(b), 2017). The proposed high increase in traffic could translate to high delays at the Port and along the corridor if the infrastructure improvements do not match the pace of the increase in traffic. However, the

2023 projections indicate that the total throughput from Mombasa port could grow from 33.62 million tonnes in 2020/2021 to 37.7 million tonnes in 2028 showing an annual growth of about 1.6% (Oketch, 2023).

34. The transport link between Mombasa and Nairobi is the region's most important driver for freight flows in the coming years. As per the World Bank estimates, the corridor segment is projected to carry about 66.1 million tonnes in 2040 (WB, Transport Sector Background Note, 2023). High intensity of freight demand increase could induce a significant increase in freight's greenhouse gas emissions.

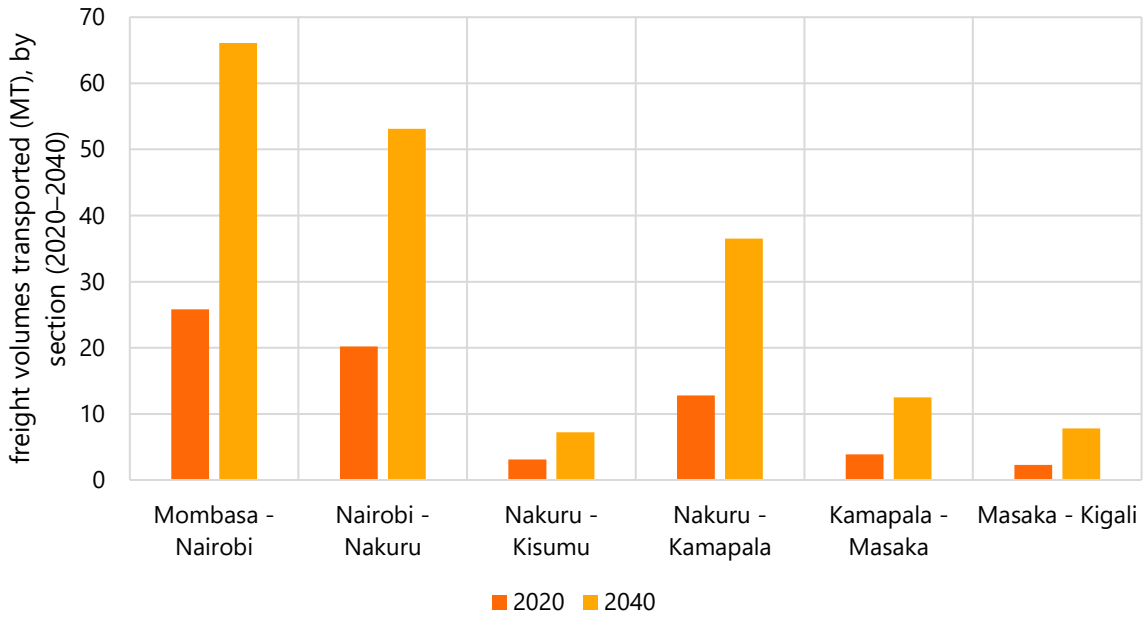


Figure 6: Freight volumes transported (MT), by section (2020–2040)

Source: Country Climate and Development Report: Kenya

G. Reducing Idling, Stop and Start, and Delays

35. The average transit time at the mandatory stoppages has been reduced due to improvements at the port, borders, police check posts, and weighbridges. Implementing the High-Speed Weigh-in-Motion (HSWIM), weighbridges, and One-Stop Border Posts (OSBP) and establishing the Northern Corridor Police Transit Patrol Unit have significantly reduced transit time, idling, and stop-and-start manoeuvres impacting greenhouse gas emissions. While no assessment exists quantifying the impact of the improvements on greenhouse gas and air pollutant emissions, economic productivity is measured by the NCTTCA observatory.

H. Reducing Fuel Expenses is a Priority

36. Within the countries along the Northern Corridor, road transport enterprises accord utmost importance to fuel expenses, considering high fuel costs. These costs, constituting a substantial portion ranging from 25% to 50% of the revenue per trip, wield significant influence over the overall cost structure of the trucking industry. Truck operators pay truck drivers for trips based on perceived fuel efficiency and diesel costs. Thus, improving fuel efficiency is critical for truck drivers and operators driving logistics cost optimization. A noteworthy illustration of this trend is observed among prominent Kenyan transporters who increasingly favour pricier Mercedes trucks for their operations. This preference is rooted in the perceived advantages of more excellent reliability, extended lifespan, and superior fuel efficiency offered by these models compared to alternatives available at half the cost.

37. Furthermore, larger companies often utilize newer trucks for a shorter period (3-4 years) before selling them to smaller operators. This practice maximizes the fuel economy benefits of newer vehicles, highlighting fuel efficiency's crucial role in the industry's success.

38. Interestingly, there is a lack of penetration of technologies that promote fuel efficiency due to high investment costs despite significant savings and short payback periods.

39. The East African nations substantially rely on imported fossil fuels, constituting approximately 30% of their merchandise imports (WB, 2023). This heavy dependence on imported fossil fuels has subjected the region to unfavourable fiscal and trade consequences, with cascading impacts on economic development. Given the significant and sustained rise in fossil fuel prices in recent years, coupled with the likelihood of continued elevated price levels in the long term, the East African countries are experiencing escalating costs associated with fossil fuel imports. Notably, the freight and logistics sector significantly contributes to energy consumption. Consequently, efforts to reduce energy costs in East African countries have the potential to enhance regional growth and bolster competitiveness.

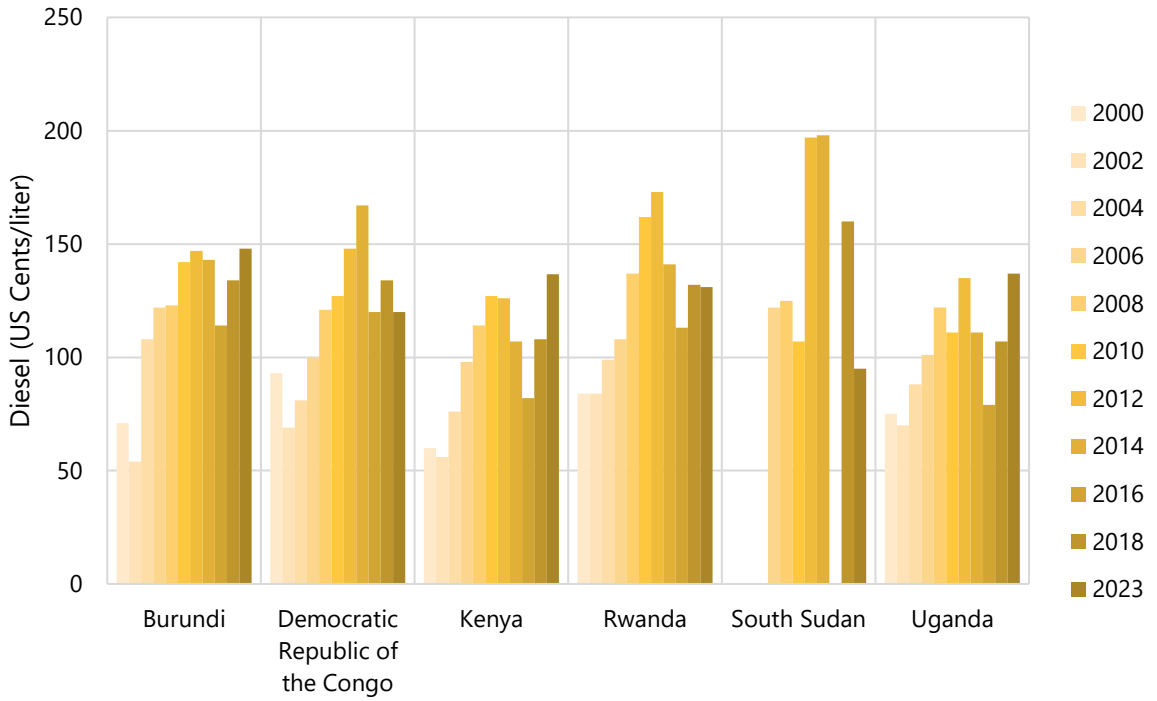


Figure 7: Diesel Pump Price

Source: (Globalpetrolprices, 2023)

40. The transport sector is a significant driver of energy efficiency policies in Northern Corridor member states. For example,

- Kenya's National Energy Efficiency and Conservation Strategy (MOE, 2020) anticipates implementing initiatives to enhance fuel efficiency, such as introducing vehicle standards and labels. These measures would encompass average fuel consumption per mile and CO2 emissions targets.
- The Ministry of Energy and Mineral Development (MEMD) (IEA, 2023) in Uganda includes "promoting more efficient modes of transportation" as a significant strategy in the transport sector.
- Rwanda Energy sector plan 2018/2019-2023/2024 (RoR, 2018) mentions, "The key demand segments for petroleum products are road transportation, thermal power generation, and aviation. The reduction of imported diesel for electricity production will be more than offset by the increased need for petroleum products in transportation, particularly aviation and heavy industry, and also increased re-exports."
- The Rapid Situation Assessment and Gap Analysis Report of South Sudan (UNDP, 2013) mentions, "Transportation policy would take into account the energy efficiency in the transport sector".

I. Fragmented Industry

41. In the Northern Corridor nations, the ownership patterns of truck fleets exhibit marked differences. Larger companies with convenient access to financial resources operate bigger fleets with relatively newer trucks, and smaller operators use older trucks. Approximately half of the trucking enterprises in Kenya manage fleets of four trucks or fewer, while in Rwanda, nearly 80% of enterprises operate a solitary truck. In Kenya, a mere 5% of enterprises control 45% of the truck fleet. The average age of trucks in Kenya and Rwanda is approximately 7.5 years and 12 years (UNU-WIDER, 2016), respectively. The trucking industry is characterized by the prevalence of older trucks in Uganda, Rwanda, Burundi, South Sudan, and the Democratic Republic of Congo, contrasted with relatively newer trucks dominating the landscape in Kenya. Given the seasonal nature of freight transport demand, which is unidirectional based on commodities and characterized by intense competition, the primary focus is keeping trucks in constant motion rather than seeking ways to enhance overall operational efficiency.

J. Need for Driver Training

42. Numerous research findings indicate that seasoned and proficient drivers exhibit superior and quicker hazard detection compared to their less experienced counterparts, particularly regarding hazards located at a greater distance from the driver. The lack of skilled operators and drivers hinders regional economic potential and exposes trainer availability and training quality gaps. To tackle this head-on, the East African Community has partnered with TransAID to develop a standardized curriculum and instructor's manual to equip drivers with recognized skills and boost the region's transportation backbone (transaid, n.d.). Further, in the past, GIZ launched a Professional Driver Training Project intending to deliver high-quality driver training to at least 800 drivers in Uganda (SWRW, 2017). NCTTCA, with partners such as UNEP, has piloted driver training as a part of the green freight program – 2017-2021. Stakeholder consultations revealed high interest in driver training, especially in identifying training needs assessment and developing capacity-building programs on road safety.

K. Lack of data related to Freight Environmental and Climate Impacts

43. The freight and logistics sector has significant positive and negative impacts on the environmental dimension. However, despite the universal recognition of the significance of the freight and logistics sector on sustainable development goals and the Paris Agreement (UNCTAD, n.d.), effective mechanisms for measuring and monitoring the state and impacts of the industry are often not in place. No publicly available data exists on fuel consumption, fuel efficiency, or carbon efficiency of different modes in the Northern Corridor countries. Further, the information available on the effect of logistics policies and strategies is insufficient and potentially misleading as they lack the necessary data. While

there are limited efforts in collecting freight and logistics data, these are often motivated by outdated objectives or limited by specific applications.

44. The Northern Corridor countries are still defining sustainability goals within the freight and logistics sector and, therefore, need a better understanding of the impacts of goods movement on negative environmental externalities and in assessing strategies towards energy efficient and low emissions logistics systems in the region. The lack of reliable data has hampered the development of policy interventions and investment in the sector.

L. High Empty Trips

45. Imports constitute about 79% of the total port throughput, exports 14%, and transshipment about 7%. Regarding freight typology, about 47% is container cargo, about 26% is liquid bulk, about 20% is dry bulk, and 8% is conventional cargo. Out of total import freight, about 35% are transit freight destined to hinterland landlocked countries of Uganda, Rwanda, Burundi, South Sudan, and the Democratic Republic of Congo (DRC). The severe trade imbalance explains the high-cost calculus for freight transport in the Northern Corridor, as freight movement is unidirectional with significant empty return trips. Stakeholders suggest an estimate of about 70% of trucks returning empty due to lack of demand (ecdpm, 2023).

46. High empty trips may also lead to high overloading. Excessive loading of trucks escalates damage to the road surface, with the impact growing exponentially as the load increases. The resultant road damage not only incurs elevated maintenance and repair expenses but also reduces the road's lifespan. The northern corridor member states have become vigilant towards overloading. Implementing the East Africa Community Vehicle Load Control Act of 2016 is already leading to significant penalties for some transporters found violating overloading regulations. The coupling of the weighbridge management infrastructure with the Weigh-In-Motion system is leading to high benefits in Kenya.

M. Ripple Effects of Fuel Quality Improvements

47. In January 2015, the East African Community became the pioneering sub-region on the African continent to adopt low-sulphur fuels. This shift led to enforcing standards permitting a maximum sulphur content of 50 ppm in diesel and 150 ppm in gasoline. Further, with the rapid increase in kerosene prices, fuel adulteration has decreased significantly across the Northern Corridor countries.

48. In July 2022 (UNEP, EAC, UNECE, & SACUV, 2022), the East Africa Community released a gazette notice that enacted the initial edition of EAS 1047:2022 standards concerning Air Quality – Vehicular exhaust emission limits. This East African Standard delineates acceptable thresholds for common pollutants present in the exhaust emissions of motor vehicles, including carbon monoxide (CO), particulate matter (PM), oxides of nitrogen (NO_x), and hydrocarbons. The standard encompasses emissions from new vehicles, imported used vehicles, and currently in-use vehicles across various types of motor vehicles with internal

combustion engines, including passenger cars, light commercial vehicles, heavy-duty vehicles, motorcycles, and three-wheelers.

49. Improving fuel quality and vehicle emission standards generates a need for effective vehicle emissions inspection and maintenance (I/M) programs. Significant differences exist among the member states regarding the frequency of inspections and maintenance regimes for different vehicle categories. For instance, in Kenya, regulations mandate annual inspections for commercial vehicles, while personal cars aged four years and above undergo inspections every two years. In Rwanda, commercial vehicles face biannual inspections, while personal cars undergo annual scrutiny. An urgent need is to harmonize the inspection frequency for various vehicle categories (ECI, 2017) to ensure consistent emission reductions.

N. Summary

50. While substantial investments remain crucial for enhancing Northern Corridor freight and logistics infrastructure, its intricate links to global priorities like the Paris Agreement, Sustainable Development Goals, New Urban Agenda, and Sendai Framework present opportunities and challenges. Effectively translating these ambitions into tangible benefits for East Africa hinges on the corridor's transformation, where numerous untapped possibilities exist to mitigate freight-related externalities and unlock significant economic and social gains from optimized logistics. Conducting a comprehensive SWOT analysis of the corridor, considering the specific contexts of individual member countries, will inform streamlined decision-making and pave the way for this transformative journey.

Table 2: Current Status of Green Freight Landscape

Strength and Opportunities	Weaknesses and Threats
Socio-Economic Growth: – High economic growth: A thriving economy creates increased demand for efficient and sustainable freight solutions. – Rapid urbanization: Growing city populations necessitate robust logistics networks for essential goods and services. – Young population: A youthful workforce offers a dynamic pool of talent and entrepreneurs for the sector. – Human capital: East Africa is developing a skilled workforce capable of driving advancements in logistics and technology. **Institutional support and strategic focus:** – NCTTCA: The Northern Corridor Transit and Transport Coordination Authority facilitates regional collaboration and policy harmonization. – SDG and Paris Agreement alignment: Investment priorities focused on sustainability	**Structural imbalances:** – Unbalanced trade flows: Heavy reliance on imports creates empty return trips, inefficiency, and dependence on foreign markets. – Limited multi-modal options and poor utilisation: Lack of developed rail and waterway infrastructure restricts logistics flexibility and increases reliance on expensive road transport. – Fragmented institutions and regulations: Disjointed governance and policy frameworks hinder coordination and effective implementation of solutions. **Resource constraints and operational inefficiencies:** – Scarce capital: Limited access to finance for infrastructure upgrades, technology adoption, and green initiatives. – Data deficiency: Lack of reliable, comprehensive data on freight volumes, routes, and costs hinders informed decision-making. – Outdated technology and trucks: Reliance on inefficient vehicles increases fuel consumption, emissions, and maintenance costs.

Strength and Opportunities	Weaknesses and Threats
create opportunities for green freight solutions. – Infrastructure expansion: Rapid development of roads, railways, and ports offers improved connectivity and efficiency. – Industrialization: Growing industries generate increased freight demand and opportunities for specialization in logistics. **Technological, political and environmental drivers:** – Technology innovations: new advancements in automation, data analytics, and e-commerce offer new efficiencies and cost savings. – Regional harmonization: Standardized regulations and policies across East Africa simplify cross-border trade and logistics. – Transport Observatory: Improved data collection and analysis provide insights for informed decision-making and infrastructure development. – Global green freight initiatives: Growing international support for sustainable practices opens doors for funding and technical assistance. – Electric mobility: Prioritizing electric vehicles creates cleaner and more efficient freight solutions opportunities. – GMAC and CBAM: The Green Maritime Africa Coalition and Carbon Border Adjustment Mechanism incentivize sustainable shipping practices. – The implementation of the African Continental Free Trade Area to significantly boost intra-Africa trade, particularly trade in value-added production and trade across all sectors of Africa's economy.	– Poor stakeholder cooperation: Fragmented industry actors often lack coordinated efforts for optimal logistics solutions. – Non-tariff barriers: Customs delays, port inefficiencies, roadblocks, and excessive bureaucracy inflate costs and increase transport times. **Environmental and market vulnerabilities:** – Limited green freight awareness and capacity: Lack of knowledge and skills for adopting sustainable practices like fuel efficiency and emissions reduction. – Missing incentives for sustainable practices: Absence of recognition and rewards for sustainable freight operators discourages widespread adoption. – Volatile export markets: Dependence on global market fluctuations and unpredictable demand makes trade flows unstable. **Political and external challenges:** – Political uncertainty: Lack of clear commitment to green freight policies, sustainable freight action plans and strategies creates hesitation for long-term investments. – Reliance on government subsidies: Dependence on public funding for operations and infrastructure expansion exposes the sector to fiscal constraints. – Low trucking profitability: Low margins in the sector discourage investment and innovation. – Limited mode choice: Lack of developed alternatives to road transport restricts options and increases congestion. – High competition: Intense competition among truck operators hinders collaboration and collective action. – Lack of consumer demand for sustainable products: Low public awareness and interest in green freight limit its market potential. – Fuel price fluctuations: Stable fuel prices can reduce incentives for adopting fuel-efficient technologies.

Source: Author

Chapter 3: Green Freight in the Northern Corridor: The 2030 strategy

51. The "Northern Corridor Green Freight Transport Strategy 2030" takes a unique, circular approach to envisioning and achieving ambitious goals for the region's freight sector. Instead of starting with grand solutions, it focuses on identifying and tackling real-world "problems" that hinder green freight transport. This problem-driven approach fosters holistic solutions that reconcile various stakeholders' diverse and sometimes conflicting aspirations. Crucially, the Strategy prioritizes consensus-building, recognizing the intricate interplay between freight transport's economic, social, and environmental factors. It advocates for a "living document" approach to ensure continuous improvement, where ongoing monitoring against crucial performance indicators informs adjustments and adaptations.

52. The Strategy recognizes that specific objectives, targets, and activities may fall beyond the complete control or jurisdiction of the Northern Corridor Transport and Transit Coordination Authority (NCTTCA) in terms of resource mobilization and implementation. Therefore, all stakeholders are expected to play a crucial role in maximizing the impact of green freight interventions. The Strategy also acknowledges the time required for Green Freight Transport's transformation in the East African region. Nevertheless, based on past and present experiences, a regional consensus exists that no-regret or quick-win actions can be identified for immediate implementation. By concentrating on these no-regret actions, the green freight strategy recognizes the urgent need for short-term guidance for decision-makers in the freight and logistics sector.

53. This plan marks a significant milestone in the extensive restructuring of the freight and logistics landscape. It signifies the commencement of a comprehensive, cross-sector, and cross-government approach to address the sector's environmental challenges. With

sustained visibility, well-defined structures, and tangible deliverables, this initiative is poised to bring a transformative shift in the long-term trajectory of freight and logistics.

A. Vision

54. The vision for the Strategic Plan 2022-2026 by NCTTCA is for the Northern Corridor to become **a safe, sustainable, and competitive trade and transport corridor**. The vision combines diverse freight transport perspectives and sets the foundation for preparing and implementing long-term plans. The green freight component is integrated with the phrase "sustainable."

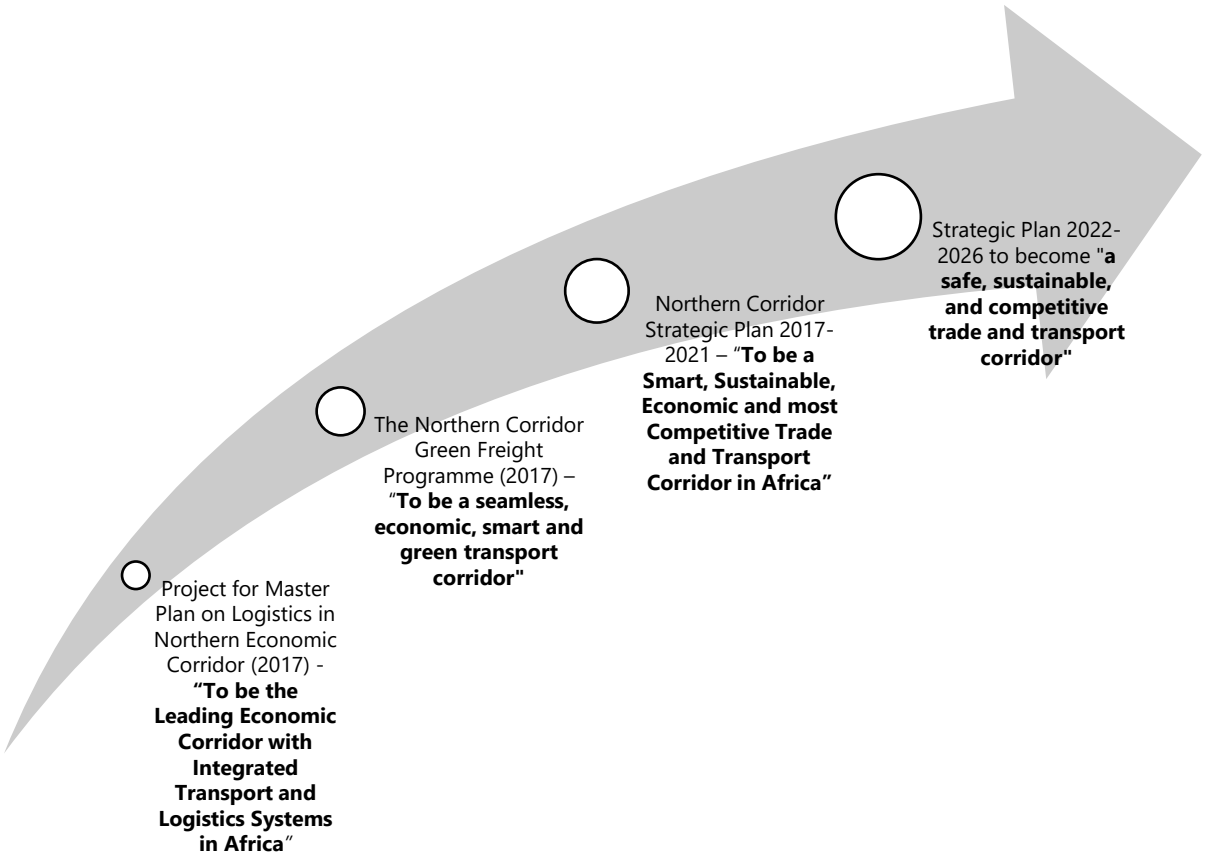


Figure 8: Northern Corridor Vision

Source: Author

B. Objectives and Targets

55. In the Strategy, a set of ambitious and interconnected objectives takes center stage. The primary focus is prioritizing enhanced fuel efficiency and reducing carbon footprint to combat climate change actively. Simultaneously, the Strategy aims to target the reduction of harmful pollutants such as particulate matter, black carbon, and NOx, aiming to safeguard public health and preserve air quality.

56. A key objective is building resilience against climate impacts, ensuring that the Northern Corridor freight system remains robust and adaptable in the face of a changing planet. Pursuing these intertwined immediate goals, the Strategy distinctly charts a course toward establishing a safe, sustainable, and highly competitive corridor in trade and transport over the long term. **Thus, by 2050, the Northern Corridor aspires to become a net-zero emission corridor.** Thus, in terms of green freight, the following priority targets for 2030 are set. The baseline for 2024 would be determined by NCTTCA and the targets re-adjusted if required.

    - Improve the Fuel Efficiency of freight transport by 10% by 2030 when compared to 2024 levels
    - Reduce CO2 emissions intensity by 10% by 2030 when compared to 2024 levels
    - Reduce Particulate matter (PM), Black Carbon, and Oxides of nitrogen (NO_X) by 12% by 2030 when compared to 2024 levels
    - Enhance Climate Resilience of at least 2000 km of roads
    - Implement Eco-driving training for 1000 drivers

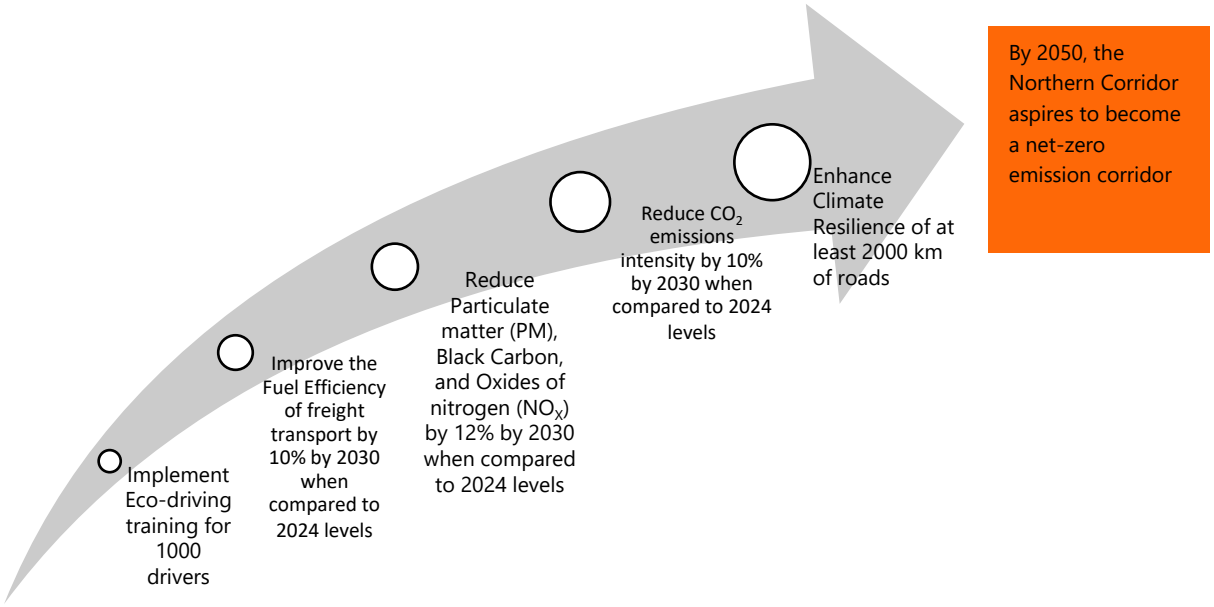


Figure 9: Northern Corridor Target

Source: Author

57. In the past, the Mombasa Port Community Charter and The Northern Corridor Green Freight Programme had proposed the following targets –

    - Achieve an average of 120,000 km per truck per annum by December 2016
    - Grow cargo offtake by rail to above 35% of throughput by December 2018
    - Improved fuel economy litres per ton-km for trucks by at least 5% by 2021 (considering a baseline of 2016).

- Reduction in Particulate Matter (PM), black carbon emissions, and Oxides of Nitrogen (NO_X) grams per ton-km by at least 10% by 2021 (considering a baseline of 2016).
- Reduction of CO_2 emission intensity grams per ton-km by 10% by 2021 (considering a baseline of 2016).
- Reduction of road accidents by 10% per million truck kilometres (considering a baseline of 2016).

58. However, consultations reveal that the earlier targets were either too ambitious or lacked effective monitoring. Thus, in this Strategy, a step-change approach has been recommended. The green freight 2030 strategy is intended to be a milestone in an ongoing partnership for the years to come, with future opportunities for course correction. The proposed carbon emissions target is in sync with the International Transport Forum's high-ambition scenario for the Sub-Saharan Africa region (OECD, 2023), which reflects the pace of transition that can realistically be implemented in the region.

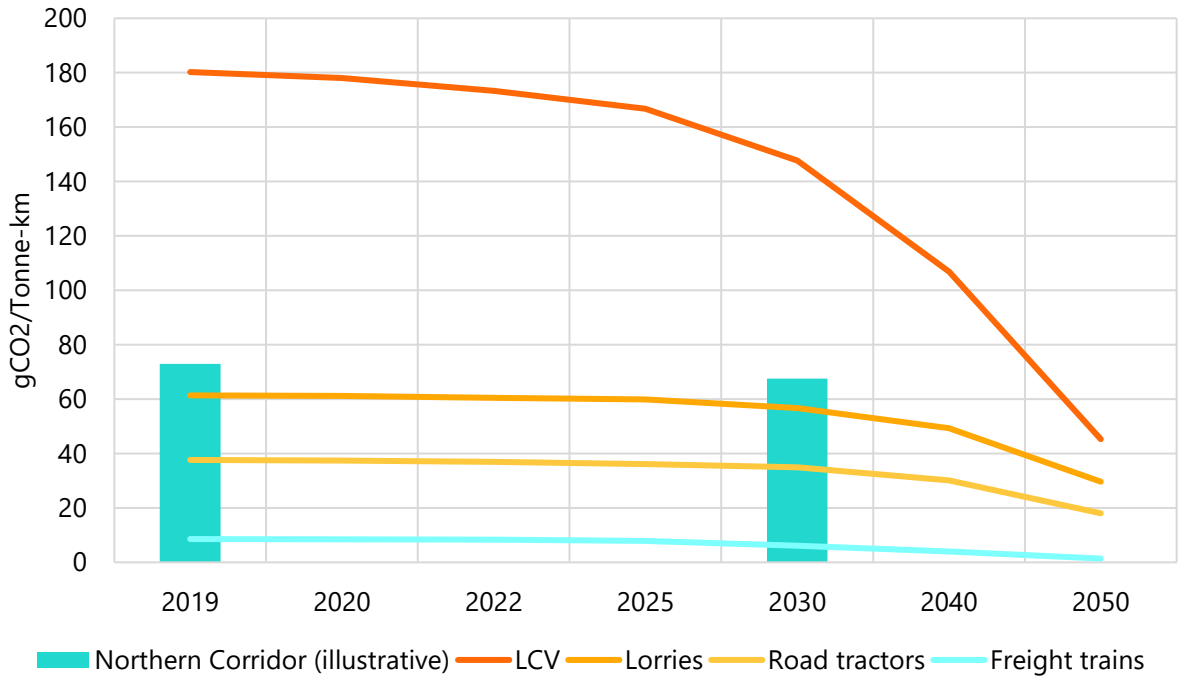


Figure 10: High Ambition Scenario for Freight

Source: ITF Transport Outlook, NCTTCA

C. Translating the vision into action

59. Achieving green freight is a complex endeavour necessitating a fundamental shift in direction. To embark on this sustainability journey, a robust foundation involving collaborative partnerships with diverse stakeholders and a commitment to continual improvement is essential. Recognizing the unique characteristics and developmental

asymmetries within the Northern Corridor region, the development of this Strategy involved considering various innovative measures, focusing on identifying the most impactful and swiftly implementable actions at the regional level. The overarching principle guiding this Strategy is "**Common Borders, Common Stakeholders, Common Vision, Common Solutions**," emphasizing the potential benefits of regional collaboration.

60. These "no-regret" actions align with regional and national priorities, grounded in pilot projects, stakeholder input, and extensive research. They represent proven solutions, optimally chosen and effectively combined to deliver maximum value for every investment.

D. Establishing A Green Freight Transport Network

61. At the regional level, East African countries should strive to develop a regional platform – the Green Freight Transport Network (GFTN) - bringing together all national representatives from transport ministries, Logistics divisions, freight associations, and leading regional civil society members. Led by NCTTCA, the GFTN could connect and enhance Coordination, Information exchange, and Cooperation among freight and logistics practitioners, government officials, and academia to enable more decisive collective action on sustainable freight and logistics. The network will coordinate closely among ministries and civil society to ensure green freight initiatives are successfully designed and implemented.

62. Objectives of Green Freight Transport Network (GFTN)

    i. Build consensus among public, private, scientific, and other civil society communities

    ii. Pilot regional use of innovative solutions

    iii. Demonstrate innovative, replicable solutions and case studies

    iv. Enhance collaboration, cooperation, and partnerships among national and city governments, civil society, development agencies, and private-sector companies

    v. Foster open peer-to-peer learning and exchange, including sharing and collaborating on the development of standardised methodologies and tools, delivery of training, and technical assistance

    vi. Improve public recognition and customer perception through involvement in the sustainable freight movement, i.e., Secure a public commitment for sustainable freight and logistics from stakeholders

    vii. Act as a forum where all members can identify and attract sources of funding for a pipeline of well-developed and investment-ready sustainable freight transport projects

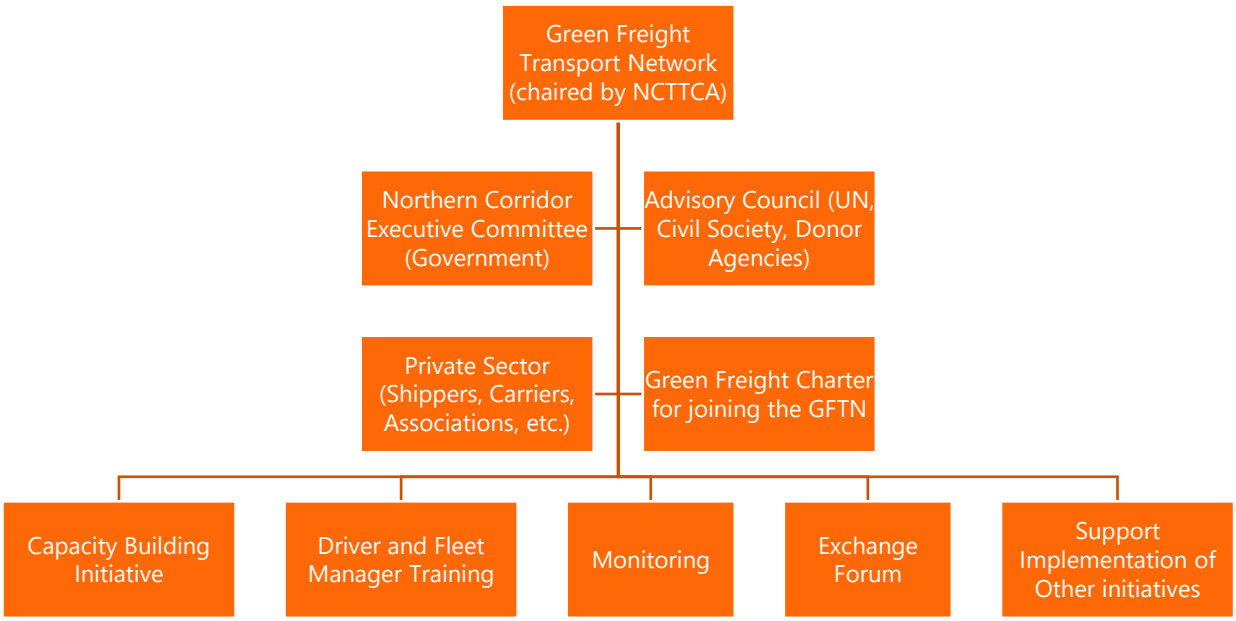


Figure 11: Green Freight Transport Network

Source: NCTTCA

63. The GFTN facilitates and strengthens coordination, the exchange of information, and collaboration among professionals in freight and logistics, government officials, and academia, fostering more effective collective efforts toward sustainable freight practices in the member states of the Northern Corridor.

64. The GFTN is a non-legally binding platform in Northern Corridor member states. Active commitment to green freight and logistics practices is the sole membership criterion. Potential members endorse a voluntary "Green Freight Charter" developed by the NCTCCA in consultation with the stakeholders. Active participation includes information sharing, collaborative projects, and open dialogue. While membership carries no legal or financial obligations, contributions are welcome to support the platform's ongoing mission.

65. The core principle of GFTN lies in the conviction that collaboration, cooperation, and partnerships can yield results unattainable by any single stakeholder working in isolation. Given the multitude of stakeholders in the freight transport sector, each with diverse objectives, the network recognizes the impracticality of including and integrating all of them. Instead, it focuses on engaging leading organizations from the public, private, scientific, and civil society sectors to enhance the sustainability of freight transport systems.

66. The network primarily addresses freight transport with a multi-modal approach encompassing road, rail, inland waterways, sea, air, pipelines, transshipment centres, and warehouses. Although operating as a non-legal and non-binding platform, the importance of governance is acknowledged to shape coordination mechanisms among network partners. The proposal suggests an annual meeting for partners to assess the network's progress.

67. The platform's governance is overseen by NCTCCA and supported by an Advisory Council comprising selected leading organizations providing in-kind or financial support to fulfil the platform's mission. An inter-governmental executive committee, composed of Permanent Secretaries or their equivalents, also contributes to the governance structure.

68. The proposed network structure could be revised after the initial phase of two years. However, it is expected that putting in place a strong partnership among concerned stakeholders in the initial years will enable these stakeholders to develop continued sustainability efforts (GHG, air pollution, etc.) themselves after the end of the initial phase.

69. In terms of implementation, the GFTN would implement and support the following initiatives and activities.

a. Green Freight Capacity-Building Initiative

70. There have been only a few attempts to improve the capacity of policymakers and private sector representatives comprehensively. Considering the green freight topic's novelty in the region, capacity building is central to developing green freight and logistics systems. Developing partnerships and networks to scale up capacity-building efforts in green freight transport is also important. It is essential to pilot a comprehensive training course on green freight for policymakers and private sector representatives.

71. The United Nations Conference on Trade and Development (UNCTAD) has developed a dedicated comprehensive global training course[6] (toolkit) on sustainable freight, tailored to suit the expectations and needs of a diverse set of stakeholders from the East African region. UNCTAD carried out a training and capacity-building workshop in 2016 organized in cooperation with the Northern Corridor Transit and Transport Coordination Authority (NCTTCA) and the Central Corridor Transit Transport Facilitation Agency (CCTTFA) in Nairobi, Kenya. The training and workshop helped identify relevant needs and challenges and clear priority action areas to ensure effective design, articulation, and implementation of a sustainable freight transport strategy across the two East African Corridors. This training course could be piloted and institutionalized in the East African region using a train-the-trainers approach with the NCTTCA. The NCTTCA could also work with universities to include a "green logistics" certification course that provides field exposure and enhances skills. Further, organizing technical study tours for innovative international freight transport projects could enhance stakeholders' interest in East African countries.

b. Driver and Fleet Manager Training Schemes

72. Eco-driving is considered a driving style that reduces fuel consumption, air pollutants, improves road safety, and reduces GHG emissions. Promoting Eco-driving in the East African region could provide the following benefits:

    - reduction of fuel consumption and vehicle maintenance costs,
    - reduction of CO_2 emissions,

- reduction of traffic congestion and increased road safety,
- improvement of comfort and health,
- promotion of the company's corporate social responsibility and
- contribute to the implementation of national climate change, energy efficiency, and road safety strategies

73. The primary objective of the regional eco-driving initiative of the Northern Corridor is to equip truck drivers with the knowledge (theoretical training) and skills (practical training) to drive more efficiently. Stakeholders such as the Kenya Transporters Association (KTA) consider eco-driving training an immediate necessity due to the rising fuel cost and high fuel imports. The skilled driver shortage is a significant driver of eco-drive demand in the countries. Many eco-driving pilot studies and programs have claimed fuel savings in the 5-10% range at a meagre cost of about 0 to 100/driver, indicating a very short payback period. The priority target is to ensure driver training of at least 1000 drivers in the Northern Corridor countries.

74. NCTTCA could lead this initiative with partners such as the Kenya Port Authority (KPA), Transporters Associations such as KTA in Kenya, truck manufacturers, oil companies, national road authorities, container freight stations and other stakeholders. For long-term impact, eco-driving training activities must be incorporated into institutionalized structures. Integrating eco-driving training in the national driver examination procedures would provide an effective way to scale up eco-driving practices. By including an eco-drive simulator, the eco-driving costs could be further reduced, as it allows one to check the effects of behaviour changes and experience their impact directly. A scalable, modular, low-cost simulator could assist in the rapid scale-up of the eco-drive initiative. In 2012, the World Bank and TransAID, the Transport Research Laboratory (TRL), and the National Institute of Transport (NIT) developed an HGV Driver Training Curriculum. There is an ongoing discussion of regional adaptation of this Curriculum. The predominant emphasis of the training is on safer driving, and NCTCCA could integrate eco-driving component and mainstream it.

c. Implementing the Monitoring Plan

75. Supply chain transparency remains elusive for Northern Corridor companies due to a lack of comprehensive, up-to-date data on green freight transport. Existing data is often limited in scope, outdated, or unavailable. The Northern Corridor Transit and Transport Coordination Authority (NCTCCA) established the Transport Observatory System to address this gap.

76. This dedicated system monitors the corridor's performance by collecting and collating data on forty key performance indicators (KPIs). These KPIs span various aspects, including volume and capacity, tariffs and rates, travel times and delays, efficiency and productivity, intra-regional trade, environmental impact, and road safety. Data sources vary, with some derived from annual surveys and others directly provided by Member States. By centralizing

and analyzing this data, the Transport Observatory System empowers the NCTTCA to identify roadblocks to freight implementation, track progress, and inform strategic decision-making. This, in turn, paves the way for a more transparent and sustainable Northern Corridor supply chain.

77. An additional KPI is proposed for monitoring environmental performance, which involves collecting, measuring, and analyzing data during strategy implementation to evaluate progress and impact. The KPIs proposed (indicative) to be included in the Transport Observatory System is highlighted below - **Northern Corridor Emissions Index** - For the priority links, the emission intensity in grams of CO_2, PM, NO_X, BC/tonne-km would be quantified for all the sections and averaged. This emission intensity for CO_2 and all the air pollutants would be converted to 100 for the base year 2024 and tracked and reported in the future.

78. Operationalizing the emission quantification methodology across the corridor is a key component of the monitoring plan. The corridor consists of about 12,707 kilometres of road and railway infrastructure. Thus, carrying out an emission inventory across the complete infrastructure network is difficult. The first report on the Central and Northern Corridors GHG Inventory identified eight segments contributing to most emissions across the corridor - Mombasa-Malaba, Mombasa-Nairobi, Mombasa-Busia, Kampala – Busitema, Elegu -Luwero, Goli – Luwero, Kasindi – Mubende, Mbale-Goli.

79. The measurement and reporting plan propose quantifying emissions across a minimum of one segment across each Northern Corridor member state. It tracks the performance via the Northern Corridor CO_2 Index, as described below. The methodology proposed to be operationalized is based on the bottom-up "ASIF" framework (ADB, 2009). The Data template for an individual segment is shown in Table 3.

1) Total Freight Movement (tonne-km) = Total Daily Traffic* Average Loading* Segment Kilometres
2) Total Vehicle Kilometres Travel = Total Daily Traffic* Segment Kilometres
3) Total Fuel Consumption (Diesel-Liters) = [Total Daily Traffic (loaded trips) * Segment Kilometres (km)/ Average Fuel Efficiency (kmpl) - Loaded Truck] + [Total Daily Traffic (empty trips) * Segment Kilometres (km)/ Average Fuel Efficiency (kmpl) - empty Truck]
4) CO_2 Emissions (Tonnes) = Total Fuel Consumption (Diesel-Liters) * Carbon Content of Fuel
5) PM or NO_X or BC Emissions = Total Vehicle Kilometres Travel * Air Pollutant Emission factor for PM or NO_X or BC Emissions
6) CO_2 Emission Intensity = Total CO_2 Emissions/ Total Freight Movement (tonne-km) (sum of all links)
7) Northern Corridor Emissions Index = CO_2/PM/NO_X/BC Average Emission Intensity when base year is considered as 100

Table 3: Emission Quantification Template

Section											
Km											
	Total Daily Traffic	No Of Trucks with Empty Load	Average Loading (Tons)	Average Fuel Efficiency (kmpl) - Loaded Truck	Average Fuel Efficiency (kmpl) - Empty Truck	Total Freight Movement (tonne-km)	Total Fuel Consumption (Diesel-Liters)	Total CO_2 Emissions (Tonnes)	Total PM10 Emissions (Kg)	Total BC Emissions (Kg)	Total NOx Emissions (Kg)
LCV											
MCV - 3Axle											
MCV-4 Axle											
HCV- 5 & 6 Axle											
HCV- 7 & 8 Axle											
HCV- >8 Axle											
Total											

Railway	Tonnes	Diesel	Total CO_2 Emissions (Tonnes)	Total PM10 Emissions (Kg)	Total BC Emissions (Kg)	Total NOx Emissions (Kg)
MGR						
SGR						

	Input
	Output

Source: Author

80. The methodology considers the following parameters

- **Freight Activity in Tonne-Kilometres -** This indicator is a unit of measurement indicating the transport of one ton of goods over a kilometre. This indicator depicts the level of freight activity as it combines distance, and the amount of goods that are transported. Monitoring such an indicator can provide insights about the pace by which freight activity is growing. Comparing sub-mode-specific values also provide insights about each sub-mode's relative importance in performing freight activity, and can feed into policy making and intervention decisions. There are several ways by which data is generated for calculating the ton-kilometre indicator. As the name implies, the indicator represents distance, and the amount of goods carried by a certain fleet in a certain time. In instances where comprehensive data is not available, vehicle-kilometre averages are multiplied by available estimates for average loads, in order to gauge the level of magnitude.

$$TKM_z = \sum (AVKM_i * VehiclePop_i * AL_i)$$

Where:

TKM_z	= total tonne-kilometres performed by mode z
$VehiclePop_i$	= number of freight vehicles type i
$AVKT_i$	= average vehicle kilometres travelled by freight vehicle type i (VKM)
AL_i	= average load of freight vehicle i (TKM/VKM)
i	= freight vehicles belonging to mode z
z	= transport modes (LCV, MCV - 3Axle, MCV-4 Axle, HCV- 5 & 6 Axle, HCV- 7 & 8 Axle, HCV- >8 Axle

- **Total Vehicle-kilometres** - This indicator is a measure of the total distance travelled by road vehicles in a given year. It is often used as primary activity data for bottom up estimation of energy consumption, and emissions from road transportation. Ideally, comprehensive vehicle-kilometre estimates can be derived from aggregated odometer readings for the registered vehicle population, if such is being conducted during the regular vehicle inspection procedures, or during the recurring vehicle registration processes. If odometer readings are indeed being collected from such processes, generating such for different segments (e.g. by vehicle type, or by fuel type, or combination of these) is feasible. However, there might be existing studies that have taken sample surveys that can be used in estimating total vehicle kilometres for different segments of the vehicle fleet. Average VKT/year/vehicle type (or by vehicle-fuel type) is multiplied by the respective population numbers for the vehicle segment in order to estimate total VKM for that vehicle fleet segment. The simplified method of estimating total VKT is given below:

$$VKM = \sum (VehiclePop_i * AVKM_i$$

Where:

VKM	= total vehicle kilometres travelled by road vehicles/year
VehiclePopi	= number of vehicle type i
AVKMi	= average vehicle kilometres travelled by vehicle type i (VKM/year)
i	= vehicle type

- **Average Loads of Freight Vehicles** - This indicator is defined as the ratio of the average load to the total freight capacity, or the average load that is being transported by specific freight vehicles. Load factors for freight vehicles are calculated based on surveys (e.g. commodity flow surveys, operator surveys or roadside surveys), or through data from weighbridges. The surveys include the collection of enterprise data (e.g. type of company, operations, fleet size), vehicle, and journey-related data. The vehicle data includes parameters such as: age of the vehicle; type and amount of fuel purchased during survey period, body type of the vehicle, and the trailer/semi-trailer; total kilometres covered during the survey period. Detailed vehicle data provision is encouraged as well (e.g. make and model). The data collected for the journeys include details about the stages of the journey as well, as freight trucks can have multiple stops while delivering the goods. Details about the spatial movements are also collected – first place of loading/ last place of unloading, countries crossed in transit (if applicable), places of loading/unloading. Data on

the goods carried are collected as well such as the types of goods carried (based on a standard classification), weight of goods carried, cargo type and the distance travelled

- **Total Fuel Consumption** - Average vehicle fuel economy is an indicator of the amount of fuel consumed for traveling a unit of distance by a vehicle. This is a measure of the average efficiencies of vehicles in a certain fleet and reflects the amount of fuel or energy needed in performing a vehicle kilometre. Average fuel economy values are normally based on specific studies that either conduct on-road, or laboratory fuel economy tests (using drive cycles that mimic real world conditions).
- **CO_2 Emissions** - This indicator keeps track of the contribution of the transportation sector in terms of GHGs. Official estimates normally include the Kyoto Protocol gases that are relevant to the transportation sector – Carbon dioxide (CO_2); Methane (CH4); and Nitrous oxide (N_2O). Among these GHGs, CO_2 is primarily the key pollutant of concern for the transport sector, as it is a direct result of the complete combustion of conventional transport fuels. Other indirect GHGs and precursor substances such as CO, NMVOCs, SO_2, PM and NOx are also calculated by some countries.

$$CO2\ Emissions = \sum \left(\left(Distance_{a,b,} * EF_{a,b} \right) \right)$$

Where:

CO_2 Emissions	= transport emissions of CO_2 emissions (tonnes)
$EF_{a,b}$	= emission factor (kg/km)
$Distance_{a,b}$	= distance travelled during the operation phase of vehicles
a	= fuel type
b	= vehicle type

- **PM 10/NOX/BC Emissions** - Monitoring the amount of air pollutants from transportation is particularly important from a health perspective. Mobile source emissions are estimated using a variety of approaches. Direct measurement can be done in vehicle laboratories with the appropriate equipment and local drive cycles or emissions test cycles). Direct measurement is also possible using off-road portable emissions measurement devices. Localised emission factors (gram pollutant/vehicle kilometre) from such tests can be used in developing larger-scale emissions inventories. The amount of emissions is estimated in emissions inventories using the general formula:

$$Emissions = Activity * Emission\ Factor$$

81. The simplest method is multiplying vehicle kilometre estimates by the appropriate emission factors for each vehicle sub-set. Suppose local vehicle emissions models that are based on empirical observations are available. In that case, a more sophisticated approach is utilized, one that captures the changes in emissions based on the changes on the characteristics of driving, and driving conditions. For macro-level estimates, changes in the amount of emissions are primarily driven by assumptions on vehicle numbers, the percentage distribution of these vehicles according to their fuel types, the vehicle kilometres driven, and the distribution of vehicles based on emission standards – which is particularly important in macro-level estimates, as vehicle emission standards (and the utilization of

appropriate particulate matter exhaust technologies) heavily determine particulate pollution (along with other criteria air pollutants). Unlike CO_2 estimation, which is primarily a question of "how much fuel is burnt," estimating air pollutants pollution is also concerned with "how the fuel is burnt.

82. The monitoring plan could be strengthened by installing at least six low-cost monitoring sensors for PM 10 monitoring along the Northern corridor. This activity could be carried out with support from local universities, UNEP, UN-Habitat, and air quality civil society members like the Health Effects Institute (HEI), Stockholm Environment Institute – Africa Centre, and World Resources Institute (WRI Africa). The collected data could be reported periodically using the Transport Observatory System.

d. Exchange Form

83. The exchange forum is essential to the Green Freight Program's efforts to promote and support sustainable development in the region. Annual meeting of GFTN members would be organised to provide a platform for peer-to-peer knowledge exchange, collaborative problem solving, joint approaches to developing green freight initiatives, and effective monitoring across the corridor and among the private sector stakeholders.

e. Other supporting Initiatives

- ***Truck Operator Labelling Scheme***

84. Freight recognition programs drive up service standards by recognizing and awarding freight and logistics operators that provide an example of best practices in their operations. A regional truck operator labelling initiative could be piloted by stakeholders with funding and support from the national governments and regional institutes such as TradeMark Africa, UNEP, African Development Bank, World Bank, GIZ, and NCTTCA, and supported by the national and regional truck associations and universities. The proposed truck operator labelling scheme could be based on ISEAL principles for sustainability standards and the ISO 1402039 series of standards on environmental labels and declarations.

Figure 12: Possible Criteria for Freight Operator Labelling

Source: Author

- ***Modal Shift***

85. The environmental impact and cost of freight transport vary greatly depending on the mode chosen. Cleaner modes, like rail and inland waterways, have a lower impact per unit of cargo shipped compared to more polluting options like air and road. Diversifying transport options and shifting towards cleaner modes reduce environmental damage and improve supply chain resilience. However, the choice of transportation mode (modal split) is heavily influenced by regional factors like geography, infrastructure, and economic considerations. Other crucial factors influencing mode choice include terminal access, speed, frequency, reliability, cargo damage risk, and flexibility. The critical task of the modal shift strategy is updating the 2011 - Northern Corridor Infrastructure Master Plan. The infrastructure plan must consider enhanced ambition on railways, new inland waterway ports and oil jetties, dry ports, and other intermodal connections2. NCTTCA needs to coordinate efforts at the regional level to avoid the implementation of fragmented infrastructure initiatives. NCTTCA and other stakeholders can accelerate the shift towards sustainable transport by supporting the implementation of diverse policy instruments. These instruments fall into two main categories:

[2] For example, Uganda targets 80% of cargo freight on rail by 2040 (WB, n.d.)

- **Making Alternatives More Appealing:**
  - **Reduce Costs:** Implement higher truck taxation, fuel duty, and road user charges
  - **Increase Revenue Support:** Provide financial incentives for rail and lake transport, like increased revenue support for rail track access.
  - **Improve Service Quality:** Invest in infrastructure and operational efficiency to ensure predictable and efficient railway and lake-transport services.
- **Discouraging Unsustainable Practices:**
  - **Stricter Regulations:** Enforce tighter emission controls, weight/size limits, and mandatory truck speed governors.
  - **Land Use Planning:** Promote integrated land-use planning to reduce unnecessary freight movement.
  - **Benchmarking and Recognition:** Implement benchmarking programs and recognition schemes to highlight the environmental and economic benefits of the modal shift.
  - **Engaging Shippers for Lasting Change:** NCTTCA can actively convince shippers of the advantages of rail and lake transport through targeted information campaigns and freight transport seminars across the corridor. Providing easy-to-access logistics planning resources can further empower current and potential users. Further, stakeholders can explore the feasibility of a mode-shift financing program or recognition scheme in collaboration with partners like TradeMark Africa, UNEP, UNCTAD, and other stakeholders from civil society and government agencies, which can incentivize companies to embrace sustainable transport modes in the Northern Corridor.

- ***Feasibility of Electrifying the Corridor and Freight Supply Chains***

86. Throughout 2022, the electric vehicle market witnessed remarkable expansion, overcoming challenges such as economic and geopolitical uncertainties, disruptions in the supply chain, and increased costs in commodities, energy, and logistics. The collective sales of electric cars, including battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), exceeded the milestone of 10 million units. This achievement represents a substantial 55% surge compared to the figures reported in 2021.

87. In contrast, global sales of traditional internal combustion vehicles have reached their peak and are now experiencing a decline. Projections for the worldwide vehicle fleet indicate that the majority will be electric by 2040, with a notable shift expected by 2050. Various countries, including those along the Northern Corridor, are actively prioritizing electric vehicles in their agendas.

88. As part of this initiative,
    - stakeholders within the Northern Corridor can engage in a pre-feasibility study to identify potential charging stations and mechanisms.

- Stakeholders are encouraged to initiate a feasibility study for the Standard Gauge Railway (SGR) electrification.
- Support a battery electric truck or fuel cell truck demonstration study led by the private sector
- Developing a guide that will provide information and guidance to companies owning and operating private truck depots may be essential. It aims to support better and more informed decisions on investing in charging solutions.
- Developing a Road Freight Electrification Guidance note which helps fleet owners and freight buyers optimize their operations for a sustainable future by shedding light on the most beneficial scenarios for transitioning to electric vehicles, using data-driven approaches and global benchmarks
- GFTN to advocate and support efforts towards introduction of e-mobility across member States

Table 4: Electric Vehicle Policy

	EV Policy
Kenya	In Kenya's National Energy Efficiency and Conservation Strategy of 2020, the country set an ambitious goal of raising the import share of electric vehicles from 0% in 2020 to 5% by 2025. In recent years, Kenya has implemented various legislative initiatives to bolster the promotion of electric mobility. Kenya has actively participated in the COP26 declaration focused on expediting the shift to 100% zero-emission cars and vans. Within this commitment, Kenya has pledged vigorous efforts to facilitate the rapid expansion and adoption of zero-emission vehicles.
Uganda	Uganda is transitioning towards electric mobility. Kiira Motors, a government-backed venture with 96% ownership and local assembly ambitions, aiming to roll out 22 EVs annually by 2022, steadily increasing local component integration to 65% by 2030. The country has implemented Zero import duty on EVs, pilot charging stations, and battery-swapping initiatives for two- and four-wheelers, fuelled by international support, paving the way for a 30% electric motorcycle fleet by 2030. Uganda's National Planning Authority, guided by Vision 2040's focus on sustainable development, further reinforces this commitment alongside a targeted triple average vehicle fuel efficiency goal for 2030.
Rwanda	Rwanda is fast-forwarding its journey to a cleaner future with a bold commitment to e-mobility. Targeting carbon neutrality by 2050, the nation has prioritized electrifying both public and private vehicles, aiming for 20% electric buses by 2030. This ambition is fuelled by a thriving e-mobility ecosystem, attracting global investors and nurturing local companies like Ampersand, Rwanda Electric Motorcycle, and VW Mobility Solutions. To accelerate this shift, Rwanda offers generous incentives – free land for charging stations, reduced taxes for manufacturers, and lower charging costs – making e-mobility an attractive option for all.

Source: Author

89. Taking steps toward becoming an electric vehicle (EV)-ready corridor by 2030 aligns with the goal of achieving a net-zero target by 2050 and Paris Agreement targets. This proactive approach positions the Northern Corridor to play a vital role in fostering the transition to electric mobility.

- ***Technology Demonstration, Verification, and Rollout***

90. Fuel consumption stands out as one of the most substantial expenses for truck operators. Technology demonstration projects and access to innovative solutions play a crucial role in improving the fuel efficiency of existing fleets. In the countries along the Northern Corridor, the adoption of key technologies (such as aerodynamics, emission control, tires, idle management, and GPS) remains limited, with a notable lack of information regarding the associated benefits. Additionally, there is an absence of institutional mechanisms for developing regional certification protocols, approving technologies, and disseminating information on the percentage reduction in emissions for each technology option tested or verified. To address this gap, stakeholders could facilitate a technology verification program, drawing inspiration from initiatives like the Smartway Initiative in the U.S. This program would involve submission, testing, and certification phases, providing stakeholders with confidence in the proven emission reduction performance and durability of endorsed technologies.

91. Moreover, the technology initiative could encompass a technology advancement program designed to expedite the development and commercialization of clean technologies. This program would involve demonstration studies showcasing the effectiveness of technologies (e.g., electric, lng) to stakeholders and financing agencies. Small-scale pilot projects would demonstrate the impact of technologies, fostering partnerships and building confidence across the supply chain. Access to affordable finance is recognized as crucial for technology penetration, hence the inclusion of grant funding in the technology advancement program to support clean technology's design, demonstration, evaluation, and commercialization. Verifying emissions reductions within this initiative serves as a mechanism for gaining approval and subsidies from regulatory authorities to apply specific technologies. It offers detailed information on the reductions achievable when implementing a verified technology.

92. Implementing the technology demonstration project would result in a reduction in the operating cost of truck fleets managed by companies, a reduction in fuel consumption, and a reduction in CO_2 emissions and air pollutants such as particulate matter, black carbon, nitrogen oxide, etc.

- ***Regulating the Import of Old Inefficient Trucks***

93. In Northern corridor countries, a significant share of annually registered HDVs is through imports of used HDVs. The international trade in the import of "old" trucks has been increasing in the last decade, primarily due to high demand in low-income economies. All Northern Corridor countries import trucks (majorly second-hand) from the US, Europe, Japan, and China, where most trucks no longer meet safety, efficiency, and emissions criteria. This trade significantly affects operating costs, road safety, air pollution, health impacts, energy consumption, and GHG emissions. In the East Africa region, there are no harmonized vehicle standards yet. Existing vehicle regulatory gaps between Northern corridor countries and high-income economies ensure that the old and inefficient trucks

penetrate the markets, undermining the gains made in other policy areas – including air quality and fuel quality.

94. Northern corridor countries are currently trying various regulation and incentive options, such as

- Taxes, i.e., environmental or ad valorem tariffs
- Minimum environmental standards, i.e., emission inspection for import of second-hand vehicles (i.e. Euro IV for example)
- Age restriction, i.e. prohibit the entrance for second-hand trucks older than 7 years. (Kenya)
- Mileage restriction
- Inspection, License, and Certification
- Incentives for import of "cleaner" vehicles, i.e. selective taxation scheme as one of the ways to deal with imported vehicles

95. The impact of such regulations and incentives has been low due to a lack of regional cooperation, regulatory gaps that include more lax inspection and maintenance regimes, and obsolete taxation schemes that do not incentivize less polluting and more energy-efficient vehicles. Priority recommendations for stakeholders to regulate the import include

a) Regional Harmonization:

i. **Develop a common framework:** Establish a harmonized policy framework across East Africa for import standards, age restrictions, mileage limitations, and emission requirements (e.g., minimum Euro IV standard).

ii. **Regional cooperation:** Facilitate joint enforcement and knowledge sharing to address regulatory gaps and ensure consistent implementation.

iii. **Technical exchange and capacity building:** Provide training and support to government agencies and customs officials on inspection procedures and enforcement mechanisms.

b) National Action Plans:

i. **Develop country-specific plans:** Tailor regulations to each country's economic realities, infrastructure capacity, and enforcement capabilities.

ii. **Focus on technical exchange:** Promote knowledge sharing and collaboration on best practices for inspection, maintenance, and alternative technologies.

iii. Explore innovative financing mechanisms, such as public-private partnerships, to support the transition to cleaner trucks.

c) Financial Incentives:

i. **Selective taxation schemes:** Implement tax breaks or reduced tariffs for importing cleaner and more fuel-efficient trucks.

ii. **Scrappage programs:** Offer incentives for retiring older trucks and replacing them with newer, more efficient models.

iii. **Carbon pricing mechanisms:** Consider carbon taxes or emissions trading schemes to incentivize cleaner transportation options.

d) Public Awareness and Advocacy:

i. **Raise public awareness:** Educate citizens about the environmental and health risks associated with old trucks and the benefits of cleaner alternatives.

ii. **Engage stakeholders:** Build partnerships with private sector, NGOs, and civil society to promote policy changes and support implementation efforts.

iii. **Advocacy campaigns:** Lobby for stronger regulations and financial incentives to accelerate the transition to cleaner and more efficient truck fleets.

96. By implementing these comprehensive recommendations, East Africa can effectively address the influx of old, inefficient trucks, promoting a cleaner, safer, and more sustainable transportation system for the Northern Corridor and beyond. It is essential to consider the gradual implementation of stricter regulations to allow for adaptation and infrastructure improvements. Further, monitoring the effectiveness of implemented policies and adjusting them based on data and feedback is necessary.

- ***Climate Resilient Corridor Initiative***

97. The Northern Corridor faces significant vulnerability and inadequate preparation for the impacts of climate change, coupled with a heightened susceptibility to extreme weather events. Recognizing that climate adaptation today is essential for tomorrow's resilience, implementing the following policy recommendations by stakeholders is crucial to fortifying the Northern Corridor transport network against climate change effects, ensuring enduring and sustainable connectivity for future generations.

a) Assess and Prioritize:

98. Conduct a comprehensive climate vulnerability assessment to pinpoint areas on the Northern Corridor network most susceptible to extreme weather events (floods, landslides, heatwaves, etc.) and quantify potential economic losses.

99. Develop a risk-based prioritization framework to focus on critical infrastructure segments with the highest risk and potential for disruptive impact.

b) Policy and Regulatory Framework:

100. Review and revise design standards and codes by integrating climate change considerations into building codes and material specifications for road construction and maintenance.

101. Develop climate-resilient infrastructure guidelines, establishing national standards for incorporating climate change adaptation into all phases of road infrastructure projects.

c) Capacity Building and Knowledge Sharing:

102. Upskill personnel in climate risk assessment by providing training to engineers, planners, and decision-makers on methodologies and tools, ensuring effective integration into project planning and management.

103. Strengthen collaboration and knowledge sharing by facilitating exchanges between countries and institutions through workshops, training programs, and information platforms, promoting best practices in climate-resilient road infrastructure development.

d) Addressing Market Barriers and Funding:

104. Identify and address market barriers by analyzing incentives and disincentives for private sector investment in climate-resilient infrastructure, and develop policies to encourage private participation.

105. Mobilize climate finance by exploring funding opportunities from international development agencies and climate finance mechanisms to support investments in climate-resilient infrastructure projects.

e) Continuous Improvement:

106. Integrate vulnerability assessment into project planning, making it a mandatory step in all road infrastructure projects on the Northern Corridor.

107. Develop new road asset management systems by incorporating climate change risks and adaptation strategies into existing systems, ensuring long-term network resilience.

108. Monitor and evaluate adaptation measures regularly, adjusting strategies based on new information and evolving climate risks.

109. Promote multi-modal transportation options to reduce reliance on vulnerable road infrastructure and build network redundancy.

110. Invest in early warning systems and emergency response capacity to improve preparedness and response to extreme weather events.

- ***Implementing the Green Port Policy***

111. Mombasa's Green Port Policy, initiated in 2015 by the Kenya Ports Authority, aims to position the port as Africa's foremost advocate for "clean fuels" and a regional exemplar in sustainability. The policy emphasizes the following key pillars:

    i. **Environmental Stewardship:** Prioritizing the reduction of port-related pollution, safeguarding biodiversity, and continual enhancement of the local environment for both the community and port personnel.

    ii. **Public Health:** Pledging to eliminate health hazards associated with cargo within a two-year timeframe.

iii. **Sustainable Technology:** Directing investments towards eco-friendly operations, electric vehicles, and equipment powered by "clean fuels."

iv. **Stakeholder Collaboration:** Actively involving and educating stakeholders, including port operators, vessel owners, truckers, and the community at large.

112. The successful implementation of the green port policy hinges on:

i. **Collaborative Efforts:** The active participation of all stakeholders is crucial to achieving the goals outlined in the policy.

ii. **Accountability:** Ensuring environmental goals are met, holding all involved parties responsible for their contributions.

iii. **Regular Review and Improvement:** The policy commits to a continuous cycle of assessment and enhancement, reflecting a commitment to adapt to evolving environmental standards and technologies.

E. Delivering the strategy

113. Green freight strategies are useless without action. In East Africa, greening the transport corridor hinges on how infrastructure, operations, policies, and regulations interplay for economic, environmental, and social impact. Despite limited data, capacity, and literature, this region needs proactive green freight initiatives.

114. This Green Freight Strategy serves as a blueprint and catalyst for current and future transport initiatives. Achieving sustainable freight transport demands bold ideas and forward-thinking. We must signal the importance of green freight to diverse stakeholders, support innovative initiatives, and build the necessary skills and knowledge.

115. The Northern Corridor Green Freight Strategy 2030 tackles institutional, regulatory, and operational challenges through five key actions:

i. **Enable:** for example, institutional transformation via the Green Freight Transport Network and Climate Resilient Corridor Initiative.

ii. **Encourage:** For example, there are incentives like the Truck Operator Labelling Scheme and disincentives like restrictions on old truck imports.

iii. **Engage:** for example, consultations, capacity-building programs, and stakeholder mobilization platforms like the Green Freight Capacity-Building Initiative.

iv. **Experiment:** example - Technology demonstrations, verification, and rollout for innovative solutions.

v. **Exemplify** example - Operationalizing emission quantification methodologies and implementing the monitoring plan.

116. These initiatives fall into two categories: led by NCTTCA through the GFTN and supported by GFTN, acknowledging resource and jurisdictional limitations.

117. The initiatives need to be implemented immediately. However, this does not mean that additional efforts should not be considered. The Northern Corridor stakeholders should expand the list of actions based on stakeholder consultations, data, and modelling efforts. For each proposed initiative, **stakeholders must develop detailed action plans or implementation proposals.**

118. Ultimately, the Northern Corridor Green Freight Strategy 2030 is owned by its members. Its impact will be only as strong as its actors. Moving forward, the regional Strategy needs to be synchronized into country plans, and the success will require transparent stakeholder consultations, partnerships, and a process to refine, build on, and prioritize actions towards sustainability.

References

ADB. (2009). *Transport and Carbon Dioxide Emissions: Forecasts, Options Analysis, and Evaluation*. Retrieved from https://www.adb.org/publications/transport-and-carbon-dioxide-emissions-forecasts-options-analysis-and-evaluation

ecdpm. (2023). *Navigating green economy and development objectives: The political economy of greening transport in East Africa*. Retrieved from https://ecdpm.org/work/navigating-green-economy-and-development-objectives-political-economy-greening-transport-east-africa

ECI. (2017). *Roadmap for Harmonization of Vehicle Emission Standards in East Africa*. Retrieved from https://www.eci-africa.org/wp-content/uploads/2017/03/Roadmap-for-Harmonization-of-Vehicle-Emission-Standards-in-East-Africa_ECI.pdf

EI. (2023, Dec). *Uganda sets out new net zero energy plan*. Retrieved from Energy Institute: https://knowledge.energyinst.org/new-energy-world/article?id=138478

Fisher, S., Bellinger, D., Cropper, M., Kumar, P., Binagwaho, A., Koudenoukpo, J., & et al. (2021). Air pollution and development in Africa: impacts on health, the economy, and human capital. *The Lancet Planetary Health, 5*(10). doi:https://doi.org/10.1016/S2542-5196(21)00201-1

Globalpetrolprices. (2023). *Diesel prices, liter, 18-Dec-2023*. Retrieved from https://www.globalpetrolprices.com/diesel_prices/

Government of Kenya. (2019). *Transport Sector Climate Change Annual Report: Performance and Implementation of Climate Change Actions.* Nairobi, Kenya: Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works.

HEIDEP. (2015). *Diesel Emissions and Lung Cancer: An Evaluation of Recent Epidemiological Evidence for Quantitative Risk Assessment*. Retrieved from https://www.healtheffects.org/publication/diesel-emissions-and-lung-cancer-evaluation-recent-epidemiological-evidence-quantitative

HVT. (2022). *Transport networks in East Africa are at risk from severe climate events, HVT project finds.* Retrieved from https://transport-links.com/news-and-events/transport-networks-in-east-africa-are-at-risk-from-severe-climate-events-hvt-project-finds#:~:text=HVT%20project%20finds-,Transport%20networks%20in%20East%20Africa%20are%20at%20risk,climate%20events%2C%20HVT%20p

IEA. (2023). *Uganda 2023 Energy Policy Review*. Retrieved from https://memd.go.ug/wp-content/uploads/2020/07/Uganda2023-Energy-Policy-Review.pdf

JICA. (2017). *Project for Formulation of Master Plan on Logistics in Northern Economic Corridor*.

JICA(b). (2017). *Project for Master Plan on Logistics in Northern Economic Corridor*. Retrieved from https://openjicareport.jica.go.jp/pdf/12291779_01.pdf

Kinney et al. (2011). *Traffic Impacts on PM2.5 Air Quality in Nairobi, Kenya*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3138055/

Koks et al. (2019). A global multi-hazard risk analysis of road and railway infrastructure assets. *Nature Communications*. doi:https://doi.org/10.1038/s41467-019-10442-3

Medindia. (n.d.). *High Prevalence of AIDS among Indian Truck drivers*. Retrieved from https://www.medindia.net/news/high-prevalence-of-aids-among-indian-truck-drivers-6733-1.htm

MOE. (2020). *Kenya National Energy Efficiency and Conservation Strategy*. Retrieved from https://unepccc.org/wp-content/uploads/2020/09/kenya-national-energy-efficiency-and-conservation-strategy-2020-1.pdf

NCTTCA, TMEA, & CCTTFA. (2021). *Report on GHG Inventory of the Central and Northern Corridors*. Kenya: ClimateCare and Meghraj Capital Limited.

NDC Partnership. (2023, Sept). *Kenya Unveils Comprehensive Legal Framework to Accelerate Climate Action*. Retrieved from https://ndcpartnership.org/news/kenya-unveils-comprehensive-legal-framework-accelerate-climate-action

NZ. (2022). *Net Zero Commitments by Businesses in Africa*. Retrieved from https://netzeroclimate.org/wp-content/uploads/2022/11/NZ-Businesses-Africa-report-Nov22.pdf

NZT. (2023, June). *Net Zero Stocktake 2023*. Retrieved from https://zerotracker.net/analysis/net-zero-stocktake-2023

OECD. (2023). *ITF Transport Outlook 2023*. Retrieved from https://www.oecd-ilibrary.org/transport/itf-transport-outlook-2023_b6cc9ad5-en

Oketch, W. (2023). *KPA charts ambitious course, sees profits hitting Sh20b in five years*. Retrieved from https://www.standardmedia.co.ke/health/business/article/2001486470/kpa-charts-ambitious-course-sees-profits-hitting-sh20b-in-five-years

RoR. (2018, Sept.). *ENERGY SECTOR STRATEGIC PLAN 2018/19 - 2023/24*. Retrieved from https://www.reg.rw/fileadmin/user_upload/Final_ESSP.pdf

RoR. (2022, Sept). *Revised Green Growth and Climate Resilience*. Retrieved from https://www.rema.gov.rw/fileadmin/user_upload/Rwanda_Green_Growth___Climate_Resilience_Strategy_06102022.pdf

SFT. (n.d.). Retrieved from https://www.sft-framework.org/UNCTAD-SFT-Framework.pdf

SWRW. (2017). *Launch of the Professional Driver Training Project*. Retrieved from https://safewayrightwayug.org/wp-content/uploads/2019/05/4-PDTU%20Launch%20-%20July%202017%20-%20Remarks%20by%20Ms.%20Sarah%20Mann,%20British%20Deputy%20High%20Commissioner%20to%20Uganda.pdf

Trademarkea. (n.d.). Retrieved from https://www.trademarkea.com/download/1005/

transaid. (n.d.). *Developing an East African Community Standardised Driver Training Curriculum and Instructor's Manual for Drivers of Large Commercial Vehicles*. Retrieved from https://www.transaid.org/wp-content/uploads/2015/10/Technical-Case-Study-Developing-the-East-Africa-Community-Standardised-Curriculum-and-Instructors-Manual.pdf

UNCTAD. (n.d.). Retrieved from https://www.sft-framework.org/UNCTAD-SFT-Framework.pdf

UNDP. (2013, Jul). *Rapid Situation Assessment and Gap Analysis Report*. Retrieved from https://www.seforall.org/sites/default/files/South_Sudan_RAGA_EN_Released.pdf

UNEP, CCAC, & AU. (2023). *Integrated Assessment of Air Pollution and Climate Change for Sustainable Development in Africa*. Retrieved from https://www.ccacoalition.org/sites/default/files/resources/files/Chapter%201-%20Africa%E2%80%99s%20Development%20in%20the%20Context%20of%20Air%20Pollution%20and%20Climate%20Change.pdf

UNEP, EAC, UNECE, & SACUV. (2022). *Regional Training on Inspection and Monitoring Framework for Used Vehicles Imported in the East Africa Community (EAC) Sub Region and Used Vehicles Importers and Exporters Meeting*. Retrieved from https://sustmob.org/PCFV/pdf/UsedVehicles_Kigali_Agenda.pdf

UNU-WIDER. (2016). *How trucking services have improved and may contribute to economic development*. Retrieved from https://www.wider.unu.edu/sites/default/files/wp2016-152.pdf

WB. (2023). *Fuel exports (% of merchandise exports)*. Retrieved from https://data.worldbank.org/indicator/TX.VAL.FUEL.ZS.UN

WB. (2023). *Transport Sector Background Note*. Retrieved from https://openknowledge.worldbank.org/server/api/core/bitstreams/84e32dea-8cd3-4295-9258-19d9746493f7/content

WB. (n.d.). *Uganda Vision 2040*. Retrieved from https://consultations.worldbank.org/content/dam/sites/consultations/doc/migration/vision2020 4011.pdf

NORTHERN CORRIDOR GREEN FREIGHT STRATEGY 2030

January 2023