# INSTRUMENTS MIXES TO REDUCE GHG EMISSION FROM ROAD PASSENGER TRANSPORT AND STIMULATE GREENING IN ETHIOPIA


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**This thesis is submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy**

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# Summary

This thesis explores climate mitigation instruments that would decarbonise, stimulate greening and foster leapfrogging in the Ethiopian road transport sector in general and cars in particular yet without compromising the many promises of enhanced mobility. To do so, a socio-legal approach and a broader designing approach involving 'principles' and frameworks that are common in climate and transport regulations - integration, leapfrogging, and complementary mixes - are used.

Transport has a significant potential for long-term carbon mitigation plans, and more importantly, in developing countries that are not in an infrastructure/carbon lock-in situation. For this, Ethiopia is taken as a case study jurisdiction. Review of existing strategies revealed that Ethiopian mitigation strategies are ineffective to decarbonise the sector, and instead, other government policies and decisions have fuelled motorisation and hence carbon emissions. Equally, the comparative analysis presented in the thesis revealed that there is no single instrument that fits all countries' situations. Thus, after a robust analysis of the socio-economic, political and environmental contexts of Ethiopia, the thesis presents additional instruments that would stimulate both the incremental and transformative changes required to decarbonise road transport. In the car regulation system, it is argued that a comprehensive and tailored mix of transport strategies and instruments that address both the demand and supply side of car market are needed. Hence, the potentials of fuel efficiency and carbon emissions standards, taxes, fiscal incentives, car use restrictions and other complementary instruments are discussed. Apart from the conventional mitigation strategies, the thesis argues that decarbonisation requires fixing regulatory loopholes and creating an integrated system in the importation/production, operation and final disposal of cars. It is also argued that instruments that stimulate non-motorised and mass transport, electric vehicles and integration of the modes are needed to open up the opportunity for a transport leapfrogging.

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Finally, this thesis is dedicated to the memory of my late father, Getu Sisay.

# Acronyms

| | |
|---|---|
| AAIT | Addis Ababa Institute of Technology |
| ACEA | European Auto-mobile Manufacturers’ Association |
| ACT | annual circulation tax |
| AfDB | African Development Bank |
| ASI | Avoid-Shift-Improve |
| AU | African Union |
| BAU | business as usual |
| BEV | battery electric vehicle |
| BRT | bus-rapid transit |
| CAA | Clean Air Act |
| CAC | command-and-control |
| CAFE | Corporate Average Fuel Economy |
| CC | cylinder capacity |
| CKD | complete knocked-down |
| CO2 | carbon dioxide |
| CRGE | Carbon Resilient Green Economy |
| DCs | developing countries |
| DG | Directorate-General |
| EAS | Ethiopian Academy of Sciences |
| EC | European Commission |
| ECC | Ethiopian Customs Commission |
| EEA | European Environmental Agency |
| EEU | Ethiopian Electric Utility |
| EI | economic instruments |
| ELV | end-life-vehicles |
| EPA | Environmental Protection Agency/Authority |
| EPCC | Ethiopian Panel on Climate Change |
| EPR | extended producers responsibility |
| EPSE | Ethiopian Petroleum Supply Enterprise |
| ERA | Ethiopian Road Authority |
| ERC | Ethiopian Railway Corporation |
| ESA | Ethiopia Standard Authority |

| | |
|---|---|
| ETB | Ethiopian Birr (currency) |
| EU | European Union |
| EV/s | electric vehicles |
| FES | fuel-efficient standards |
| FTA | Federal Transport Authority |
| GATT | General Agreement on Tariffs and Trade |
| GCC | Global Climate Coalition |
| GDP | Gross Domestic Product |
| GHG | greenhouse gas |
| Gt/GtCO2 | gigatonne/ gigatonne of carbon dioxide |
| GTP | Growth and Transformation Plan |
| HEVs | hybrid electric vehicles |
| HOV | high-occupancy vehicle |
| ICE | internal combustion engine |
| ICT | information communication technology |
| IEA | International Energy Agency |
| IMF | International Monetary Fund |
| INDC | Intended Nationally Determined Contributions |
| IPCC | Intergovernmental Panel on Climate Change |
| kWh | kilowatts hour |
| LAPSSET | Lamu Port-South Sudan-Ethiopia Transport Corridor |
| LDV | light-duty vehicle |
| LRT | light-rail transit |
| MIDI | Metal Industry Development Institute |
| MoFEC | Ministry of Finance and Economic Cooperation |
| MoT | Ministry of Transport |
| MoTI | Ministry of Trade and Industry |
| Mt | million tonnes |
| NBE | National Bank of Ethiopia |
| NDC | Nationally Determined Contributions |
| NEPAD | New Partnership for Africa's Development |
| NGOs | non-governmental organisations |
| NHTSA | National Highway Traffic Safety Administration |

| | |
|---|---|
| NMT | non-motorised transport |
| OECD | Organisation for Economic Co-operation and Development |
| PEVs | Plug-in electric vehicles |
| PM | Prime Minister |
| R&D | research and development |
| RSDP | Road Sector Development Program |
| RT | registration tax |
| SKD | semi-knocked down |
| SMEs | small and medium enterprises |
| SSA | Sub-Saharan African |
| SUV | Sports Utility Vehicle |
| TMA | Traffic Management Agency |
| TPMO | Transport Programmes Management Office |
| UAE | United Arab Emirates |
| UN/ECA | United Nations Economic Commission for Africa |
| UNEP | United Nations Environmental Program |
| UNFCCC | United Nations Framework Convention on Climate Change |
| URRAP | Universal Rural Road Access Program |
| VA | Voluntary agreement |
| VAT | Value Added Tax |
| VW | Volkswagen |
| WB | World Bank |
| WC | Washington Consensus |
| WHO | World Health Organisation |
| WTO | World Trade Organisation |
| ZLEV | zero- and low-emission vehicles |

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# Tables and Figures

## Tables



## Figures

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# Chapter 1
# Introduction, Theoretical Framework and Methodology

## Introduction

Environmental regulation in developing countries (DCs) is reported to be weak. There are many reasons for it, but often research emphasises the enforcement and implementation challenges such as capacity, corruption, and political commitment rather than the design of the regulation itself.[1] However, instead of understanding the local context and formulating instruments that suit its situation, DCs significantly rely on imported models that have resulted in ill-suited and ill-functioning regulations.[2] Research into this subject has been scarce, including in Ethiopia, where the Ethiopian Panel on Climate Change (EPCC) reported that '[l]iterature and studies on Ethiopia's policy and institutional response to challenges of climate change is limited.'[3] Literature is now emerging to call for context-specific regulatory designs and policy development in DCs for the achievement of environmental goals.[4] This thesis seeks to contribute to this growing body of knowledge and formulate climate mitigation regulation for Ethiopian road transport through a systematic understanding of its contexts and prevailing opportunities.

Before discussing the substance of the context and regulatory instruments, this chapter sets the foundation by presenting the background information and justification of the study and outlining the research questions and structure of the thesis. Central to this is an attempted explanation for singling out transport from among other aspects of the climate challenge, and cars in particular. The next sections will then provide a detailed discussion on the framework and methodologies designed for the study. Although there are various

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[1] Michael Faure, Morag Goodwin and Franziska Weber, 'Bucking the Kuznets Curve: Designing Effective Environmental Regulation in Developing Countries' (2010) 51 Virginia Journal of International Law 95; Susannah Fisher, 'Low-carbon resilient development in the least developed countries: Emerging issues and areas of research' (IIED Issue Paper, November 2013) <pubs.iied.org/pdfs/17177IIED.pdf> accessed 29 May 2020.

[2] Faure, Goodwin and Weber, 'Bucking the Kuznets Curve' (2010) (n 1) 100.

[3] EPCC, First Assessment Report - An Assessment of Ethiopia's Policy and Institutional Frameworks for Addressing Climate Change (Ethiopian Panel on Climate Change, Ethiopian Academy of Sciences, Addis Ababa 2015) 68.

[4] Faure, Goodwin and Weber, 'Bucking the Kuznets Curve' (2010) (n 1); Felix Creutzig and others, 'Beyond Technology: Demand-Side Solutions for Climate Change Mitigation' (2016) 41 Annu. Rev. Environ. Resour. 173; Leonardo Meira and others, 'Measuring social effective speed to improve sustainable mobility policies in developing countries' (2020) 78 Transport and Environment 102200.

instrumental design frameworks, instead of fully subscribing to an existing framework, the search for mitigation instruments and strategies were guided by a broader and culturally-attuned approach discussed in this chapter. Accordingly, understanding the environmental and socio-economic contexts of Ethiopia, integrating transport modes and strategies, and mixing complementary instruments were taken as overarching frameworks. More importantly, exploring the leapfrogging potentials and opportunities in the transport sector is considered as additional guiding framework to stimulate green transporting and to help the thesis feed into an 'optimistic' narrative for, at best, surprising leadership among DCs, and in the very least, avoidance of all the harmful policies and practices accompanying earlier industrialising nations.

Furthermore, the discussion on instrumental choice parameters elucidates controversies over criteria used to evaluate individual instrument's relevancy to the system. It, therefore, introduces the four parameters employed throughout the thesis – economic efficiency, environmental effectiveness, social and distributional equity, and political and institutional feasibility. The latter two are discussed in greater detail here as they are the most controversial and least used of the four. However, all four are integral to this analysis.

This chapter also presents the methodologies and approaches designed for the investigation. The thesis was designed as socio-legal research that combines several qualitative research methods. The justification for adopting the socio-legal approach and the data collection methods used – document review, comparative analysis, interview, and observation - together with their limitations, are discussed.

## 1.1 Why Study GHG Mitigation Instruments for Ethiopian Road Transport?

### *1.1.1 Transport carbon emissions*

Greenhouse gas (GHG) emissions continue to become a threat to the environment and humankind. Recently, emissions have shown a decreasing trend in some traditionally high emitting sectors (e.g. industry) but were matched with an increase in other sectors such as transport.[5] With about 7.9 GtCO2 annual emissions, the transport sector currently accounts for 28% of global final energy demand, 23% of global energy-related CO2 emissions, and

[5] IPCC, *Mitigation of Climate Change.* Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, UK, 2014) [IPCC, AR5-WGIII] 611

15% of the total GHG emissions in 2016.[6] Furthermore, transport continued to record faster emissions growth than any other sector and increased by 2.5% annually between 2010 and 2015, and will continue until 2050.[7] The emissions increase from 7 Gt in 2010 to 7.9 Gt by 2016 was said to be a significant increase by a sector and is expected to reach about 14 to 20Gt by 2050.[8] A further breakdown also revealed that about three-quarters of the total transport emissions were accounted for by road vehicles (passenger and freight).[9] A similar trend was observed at a regional and country-level as well. For instance, while the EU's (EU-28) 2017 total GHG emissions fell 22% below the 1990 level, transport emissions remained 28% above the 1990 levels and accounted for 27% of the EU's total GHG emissions.[10]

Researchers also warned that a higher transport emissions growth rate would come from low-income countries than in high-income countries.[11] An Intergovernmental Panel on Climate Change (IPCC) report reiterated that '[t]otal transport emissions from non-OECD countries would likely surpass OECD emissions by 2050 due to motorisation, increasing population and higher travel demand.'[12] The facts revealed two things: the current mitigation measures are not aggressive enough to decarbonise the transport sector, and replicating the motorisation trends exhibited in high-income countries into developing

[6] IEA, *Energy technology perspectives 2017: Catalysing energy technology transformation's (*Paris, IEA Publications 2017); IPCC, Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (In Press 2018) [IPCC Special Report on the impacts of global warming of 1.5°C] 142; World Resources Institute, 'Climate Analysis Indicators Tool - Global Historical Emissions' (2017) <www.climatewatchdata.org/ghg-emissions> accessed 26 May 2020.

[7] IEA, *Energy Technology Perspectives 2017* (2017) (n 6) 84; IPCC, *Special Report on the impacts of global warming of 1.5°C* (2018) (n 6) 142; Sudhir Gota and others, 'Decarbonising transport to achieve Paris Agreement Targets' (2019) 12 Energy Efficiency (2019) 363, 370.

[8] IPCC, AR5 WGIII (2014) (n 5) 8, 46; World Resources Institute, 'Climate Analysis Indicators Tool - Global Historical Emissions' (2017) (n 6); Gota and others, 'Decarbonising transport' (2019) (n 7) 370.

[9] IEA, 'CO2 Emissions from Fuel Combustion: CO2 emissions from fuel combustion by sector in 2017' (in CO2 Highlights 2019-Excel file, 2019) <www.iea.org/reports/co2-emissions-from-fuel-combustion-2019> accessed 27 May 2020; IEA, 'Tracking Transport' (May 2019) https://www.iea.org/reports/tracking-transport-2019 > accessed 26 May 2020.

[10] Amela Ajanovic, Reinhard Haas and Franz Wirl, 'Reducing CO2 emissions of cars in the EU: analysing the underlying mechanisms of standards, registration taxes and fuel taxes' (2016) 9 Energy Efficiency 925; EEA, 'Greenhouse gas emissions from transport in Europe' (EEA, 2019) <https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-ofgreenhouse-gases/transport-emissions-of-greenhouse-gases-12> (accessed 23 March 2020).

[11] IEA, 'Energy and Air Pollution: World Energy Outlook special report' (2016) <https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlookSpecialReport2016EnergyandAirPollution.pdf> (accessed 06 February 2018); Gota and others, 'Decarbonising transport' (2019) (n 7)

[12] IPCC, *AR5 WG3,* (2014) (n 5) 641

countries (DCs) would further accelerate the carbon emissions.[13] It is, therefore, captivating to investigate the causes and possible mitigation pathways of transport emissions in DCs. However, as contexts are different for every country and a nuanced understanding of each country's situation precedes designing an effective mitigation strategy,[14] Ethiopia is taken as a case study jurisdiction.

The landlocked country of Ethiopia, with more than 110 million population, according to a recent estimate, heavily relies on a few mechanised transport modes, principally road transport.[15] Air and water transport contribute little to the national transport services except for the international transport of passengers and goods. Similarly, Ethiopia has a single rail line connecting the capital with the port city of Djibouti that is used for freight transport and a light-rail transit (LRT) in Addis Ababa that accounts only for 5% of the city's daily public transport use.[16] That leaves road transport and non-motorised transport (NMT) as the most dominant modes of transportation.

On the other hand, Ethiopia's rate of motorisation, i.e. three vehicles per 1000 people, is still lower than the sub-Saharan African (SSA) average as cars are only affordable for a few better-off classes.[17] Studies reiterated that due to low penetration of roads and availability and cost of transport services, commuters cover a significant portion of their trips by NMT and public transport. For instance, in Addis Ababa, which hosts about 60% of the countries registered vehicles, most commuters use walking (54%) and public transport (31%) for their daily trips, and a few (15%) use private cars.[18] Furthermore, the modal share of NMT is

[13] Gota and others, 'Decarbonising transport' (2019) (n 7). See also GP Peters and others, 'Carbon dioxide emissions continue to grow amidst slowly emerging climate policies' (2020) 10 Nature Climate Change 2.

[14] Faure, Goodwin and Weber, 'Bucking the Kuznets Curve' (2010) (n 1).

[15] Ethiopia, 'Climate-Resilient Green Economy (CRGE) strategy' (MoFEC and EPA, Addis Ababa, September 2011) [CRGE Strategy] 13.

[16] Michał Kozicki, 'The history of railway in Ethiopia and its role in the economic and social development of this country' (2015) 49 Studies of the Department of African Languages and Cultures 143; MoT, 'Ethiopia: Transport Sector National GHG Inventory 2014-2016' (Ministry of Transport, Addis Ababa, 2019, Unpublished).

[17] MoT, 'Vehicle database' (Ministry of Transport, Addis Ababa, 8 July 2019); CRGE Strategy (2011) (n 15) 171; Martyn Davies and Thomas Schiller, 'Deloitte Africa Automotive Insights - Navigating the African Automotive Sector: Ethiopia, Kenya and Nigeria' (2018) 7.

[18] AA, 'Non-Motorised Transport Strategy 2019-2028' (Addis Ababa City Road and Transport Bureau, Addis Ababa, November 2018,).

higher in regional cities and rural settings where public transport services cover limited routes, and private car ownership is low.[19]

However, current dynamics in the socio-economic contexts and a developmental state political economy that relies on higher public investment such as in road expansion, pro-motorisation public expenditure, growth of the used-car market, and development of car assembling industry have fuelled motorisation.[20] Contrary, Ethiopia lacks the necessary environmental regulation to mitigate the externalities of motorisation such as fuel efficiency, carbon emission level or robust roadworthiness inspections. As a result, emissions from the transport sector in general and road sector, in particular, has increased dramatically. Transport accounted for only about 3% (5 Mt CO2e) of the country's total GHG emission in 2010 but was projected to grow to 10-12% (40-50 Mt CO2e) by 2030 in a business as usual (BAU) scenario, i.e. with no additional mitigation policies adopted.[21] Expectedly, road transport accounted for three-quarters of such emissions.

### *1.1.2 Mitigation strategies*

Indeed, transport is more than a single sector and overly complex to regulate and decarbonise, especially in DCs, where the inaccessibility of essential social services partly due to the poor transport systems are rampant.[22] The IPCC and other scholars also claimed that the transport sector is more challenging to decarbonise than other energy end-use sectors like industry and building.[23] In particular, the 'lock-in' situation in transport decisions in developed countries, the rapid increase in transport demand in DCs, the coupling of GDP growth with transport demand, and the dependency on a single energy source (petroleum)

[19] Interview with an official at Federal Transport Authority (FTA) (FTA-03) (Addis Ababa, Ethiopia, 8 August 2019); MoT, 'Existing conditions for pedestrians and cyclists in Ethiopia' (Ministry of Transport, UNEP and Institute for Transportation and Development Policy (ITDP), Addis Ababa, Ethiopia, June 2019).

[20] Teshome Adugna, 'Review: Meles's Development Paradigm and Its Impacts on Economic Transformation in Ethiopia' (2012) 1(11) Global Advanced Research Journal of Management and Business Studies 384; Donald Kaberuka, 'Meles Zenawi and economic transformation in Africa' (Inaugural lecture at the launching of the Meles Zenawi Foundation by President of African Development Bank, Addis Ababa, Ethiopia, January 29, 2015).

[21] CRGE Strategy (2011) (n 15) 16; MoT, 'Transport Sector National GHG Inventory' (2019) (n 16).

[22] Cesar Calderon and Luis Serven, 'Infrastructure and Economic Development in Sub-Saharan Africa' (2010) 19(1) Journal of African Economies i13.

[23] IPCC, *AR5 WG3,* (2014) (n 5) 604-5; Xiang Yin and others, 'China's transportation energy consumption and CO2 emissions from a global perspective' (2015) 82 Energy Policy 233, 246; Gota and others, 'Decarbonising transport' (2019) (n 7) 364.

are bottlenecks.[24] However, with stringent policies, transport has a significant potential for long-term carbon mitigation plans, and more importantly, in DCs like Ethiopia than in the high-income countries.[25] DCs have a lower-rate of motorisation and hence are not in an infrastructure/carbon lock-in situation where future investments in low- and zero-carbon transport systems could result in significant carbon savings.[26]

Ethiopia had already formulated an ambitious multipurpose plan of action called the Carbon Resilient Green Economy (CRGE) strategy in 2011 that focuses on mitigating emissions from seven priority sectors, including transport. The strategy was later used to fulfil Ethiopia's obligation under the Paris Agreement, where countries have agreed to limit global warming to 2°C and, possibly, to 1.5°C above pre-industrial level and submit their respective mitigation reduction targets.[27] Ethiopia's mitigation target was praised for being ambitious, '2°C compatible', and a model for other developing countries to emulate.[28] In the transport sector, it identified ranges of strategies that focus on 'leapfrogging to modern and energy-efficient technologies.'[29] The major measures come under four categories: improving the public transport system in Addis Ababa, improving vehicle efficiency, changing the fuel mix with locally produced biofuels, and construction of electric rail network for freight transport.

However, a detailed review of why the emissions from the transport sector will increase both in absolute values and share of total emission compared with other sectors is scarce. At least two observations could be made from the proposed measures – an apparent focus on using public expenditure (e.g. expansion of transport infrastructure and general provision of goods and services)[30] and undermining the potentials of other mitigation strategies such as NMT. This thesis argues that the measures planned have minimal potential and scope and will not enable to utilise the mitigation potential and decarbonise the transport sector. The 2018 IPCC report claimed that '[s]ince there is no silver bullet for this deep

[24] Ibid; Luis Mundaca, Diana Ürge-Vorsatz and Charlie Wilson, 'Demand-side approaches for limiting global warming to 1.5 °C' (2019) 12 Energy Efficiency 343, 351.

[25] Mundaca, Ürge-Vorsatz and Wilson, 'Demand-side approaches' (2019) (n 24).

[26] IPCC, *AR5 WG3,* (2014) (n 5) 7 & 1086; Creutzig and others, 'Beyond Technology' (2016) (n 4) 186.

[27] Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104.

[28] Climate Action Tracker (CAT), 'Ethiopia'<http://climateactiontracker.org/countries/ethiopia.html> accessed 6 June 2020.

[29] CRGE Strategy (2011) (n 15) 20 and 40.

[30] EPCC, *AR1 Policy and Institutional* (2015) (n 3) 67.

decarbonisation [in the transport sector], every possible measure would be required to achieve this stringent emissions outcome.'[31] Hence, this thesis explores and evaluates additional instruments that would stimulate both the incremental and transformative structural changes in the sector. More importantly, alternative strategies and instruments that target both the supply and demand side of motorisation and support the decarbonisation goal are analysed.

The current lower rate of motorisation and a more significant share of public transport and NMT in daily trips are opportunities for greater emissions mitigation. However, a growing economy, population and income, and hence rising demand for mobility are challenges a regulatory system should respond to. Furthermore, beyond its acclaimed mitigation effects, climate mitigation strategies and instruments are increasingly required to demonstrate co-benefits to the socio-economic situation of the communities they operate in.[32] Hence, the thesis presents a comprehensive road transport regulation and policy measures that best rectify the pitfalls of a car-oriented mobility strategy, harness the potentials of other modes, and embrace leapfrogging opportunities.

### *1.1.3 Research questions*

Unfortunately, in Ethiopia, designing environmental regulation in general and mitigation instruments, in particular, are in their early stage of development and often outclassed by the complexities of the problem.[33] Hence, transport mitigation measures are far from being comprehensive, lack the arguably necessary details, and are spread across piece-meal documents. Although the CRGE strategy and the subsequent transport documents provided the initial frameworks, albeit incomplete, comprehensive and robust regulatory instruments meant to decarbonise the transport sector are absent. For that matter, other government actions are not harmonised with the mitigation goal to incentivise green transport and discourage gas guzzlers and high emitting cars. Hence, the full mitigation potential of Ethiopian transport remained unexplored and unutilised, which this thesis tries to rectify by contributing to the new body of knowledge in the mitigation instrument designs.

[31] IPCC, Special Report on the impacts of global warming of 1.5°C (2018) (n 6) 142.
[32] IPCC AR5-WGIII (2014) (n 5) 604.
[33] Faure, Goodwin and Weber, 'Bucking the Kuznets Curve' (2010) (n 1); EPCC, *AR1 Policy and Institutional* (2015) (n 3) 65-68.

This thesis explores the mitigation potential and attempts to design strategies and instruments that could decarbonise the road transport sector yet without compromising the many promises of enhanced mobility. Hence, the thesis aims to investigate mitigation instruments that would decarbonise, stimulate greening and foster leapfrogging in the Ethiopian road transport sector. These will be achieved by examining the following research questions:

1. *What are the environmental impacts and socio-economic contexts of the Ethiopian road transport system? [Chapters 2,3]*
2. *Which climate strategies and instruments would decarbonise and stimulate greening in Ethiopia's road transport sector? [Chapters 3, 5-6]*
3. *Which climate instruments would stimulate the reduction of GHG emissions from passenger cars in Ethiopia? [Chapters 5-7]*
4. *What are the potential paths for Ethiopia to leapfrog into a greener road transport system, and which climate instruments foster it? [Chapters 3,7, 8]*

The research questions are designed to allow us to explore beyond the mitigation instruments and elucidate the complexities of the subject by exploring the socio-economic and political dynamics of road transport. These, among other things, assist in understanding the triggers of motorisation and then carbon emissions, identifying regulatory loopholes and mitigation opportunities, and designing a tailored and comprehensive regulatory system. Guided by the logical flow of the subject, the thesis presents the context first, followed by the discussion on road transport in general and then cars. Furthermore, the work has exceptionally combined the discussions on incremental efficiency improvements sought from cars with the transformative and structural changes (leapfrogging path) envisaged for transport at later chapters. Thus, it raises new areas of the car system and explored possible interventions that were not often seen as climate measures before.

### *1.1.4 Scope and limitation*

The research explores GHG emissions from passenger transports and how that could be stabilised by formulating a context-specific regulatory system. It is noted that many DCs are constrained by meagre transport infrastructure and services while also committing themselves to stabilise GHG emissions. Eventually, strategies and instruments that seek to reduce the sector's GHG emissions are also expected to foster access to transport services but not disrupt or restrict it further. This thesis offers to balance these seemingly competing interests – enhancing accessibility of transport services while not fuelling the sector's carbon emissions.

Motorised transport has been the dominant modes of transportation for many high-income countries, and the rest of the world was in the race to catch it up. However, accumulated knowledge over the last few decades proved that diesel and petrol car uses have brought significant disruption to the natural environment and threaten human wellbeing.[34] Climate change has intensified that pressure on greening cars and forced countries to evaluate the features of their transport services, infrastructure design and mobility decisions that they have taken for granted. There are two broad solutions to it in the eyes of the IPCC – improving the environmental efficiency of the existing system and introducing transformative structural changes to the whole transport system (shift and avoid).[35] Both of these solutions are crucial to short- to long-term mitigation efforts, but none are easy to achieve due to the nature of existing infrastructure, way of life and values attached to motorisation. Countries with a high rate of motorisation have attempted both to improve the efficiency of cars and introduce alternatives to conventional cars, but results were unsatisfactory.[36] This thesis seeks to contribute to the discussion that reducing GHG emissions through both ways could be more viable in DCs due to the current low rate of motorisation and greater opportunities to invest in low carbon transport solutions. Furthermore, by taking Ethiopia as a case study, it analyses mitigation strategies and regulatory instruments that could be implemented in the road transport sector.

The thesis primarily considers mitigating emissions from passenger road transport but with greater emphasis on car regulation due to its emissions share and mitigation potential. However, public transport and non-motorised transport (NMT) are integral parts of the design where their integration with car regulation and leapfrogging possibilities are discussed. Even then, many of the chapters are relevant to other modes such as freight transport.

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[34] See Penny Harvey and Hannah Knox, 'The Enchantments of Infrastructure' (2012) 7(4) Mobilities 521; Moritz Kammerlander and others, 'A resource-efficient and sufficient future mobility system for improved well-being in Europe'(2015) 3(8) Eur J Futures Res; Peter Newman, Leo Kosonen and Jeff Kenworthy, 'Theory of urban fabrics: planning the walking, transit/public transport and automobile/motor car cities for reduced car dependency' (2016) 87(4) TPR 431.

[35] IPCC, *Special Report on the impacts of global warming of 1.5°C* (2018) (n 6) 142-43.

[36] IPCC, *AR5-WGII* (2014) (n 5) 611.

Ethiopia's overall context has passed through many twists, including changes in political and institutional structures since the study has begun. With the introduction of the new concept *Medemer* (meaning coming together or synergy in Amharic) in 2019, the developmental state political economy which was in place for more than two decades has been withered away yet with many uncertainties about its impact on the development plans and policies.[37] Likewise, the country's foreign debt burden has increased dramatically and has forced the government to reduce its foreign borrowing that is used to fund infrastructure expansion.[38] These have reinforced the thesis' finding on the financial sustainability of aggressive road expansions and public expenditure oriented mitigation strategies. More importantly, as rightly noted by an interviewee, climate change discourses have disappeared from the government's agenda and mainstream media as an apparent sign of losing its priority to economic and political discourses.[39] This has significant repercussions on enforcing environmental regulation and mitigation strategies.

As a result, institutional instability, restructuring of agencies, and staff turnovers were witnessed in the environmental and transport agencies and other institutions that coordinate and monitor mitigation activities. This has a significant knock-on effect on Ethiopia's ambition of stabilising GHG emissions, building capacity, and formulating long-term strategies in the transport sector. The research was conducted during this period of uncertainties and institutional restructuring. The new political system has not boldly showed its commitment to climate change initiatives, and the attempt to document changes in climate change policies, if any, was unsuccessful. Therefore, some of the discussions and recommendations were constrained by the uncertainties over the institutional setup, political economy, and government commitment. However, efforts were made to not

[37] Tefera Negash Gebregziabher, 'Ideology and power in TPLF's Ethiopia: A historic reversal in the making?' (2019) 118(472) African Affairs 463, 483; Sara Mokaddem, 'Abiy Ahmed's 'Medemer' reforms: Can it ensure sustainable growth for Ethiopia and what are the challenges facing the new government?' Policy Center for the New South PB-19/08 March 2019, <https://media.africaportal.org/documents/Policy_brief_Sara_Mokaddem_Anglais.pdf> accessed 25 August 2020.

[38] Paul Collier, 'Ethiopia's path to prosperity is opening up under Abiy Ahmed' *Financial Times* October 16 2019 <www.ft.com/content/502dc8f4-ef62-11e9-a55a-30afa498db1b> accessed 25 August 2020; IMF, '2019 Article IV Consultation and Requests for Three-Year Arrangement Under the Extended Credit Facility and an Arrangement Under the Extended Fund Facility—Press Release and Staff Report' (IMF, January 2020) 4 <www.imf.org/~/media/Files/Publications/CR/2020/English/1ETHEA2020002.ashx> accessed on 2 July 2020.

[39] Interview with an expert in an environmental consulting firm (EC-01) (Addis Ababa, Ethiopia, 8 August 2019).

overshadow the analysis of the choice of instruments and strategies by considering the current implementation capacity and policy uncertainties.

Ethiopia is taken as a case study to represent DCs due to its population size, low rate of motorisation, recent economic growth, presence of climate strategy, international climate commitment, and unique institutional and cultural conditions. As most DCs face similar challenges in the transport sector, the discussions and findings could be vital for understanding the situation of other DCs, which have a similar context with Ethiopia. However, a country should adopt strategies and instruments only after assessing its context and evaluating the suitability of the proposed measures to the situation.

### *1.1.5 Structure of the thesis*

The remainder of this introductory chapter presents the theoretical frameworks and methodological designs pursued in the investigation. Mitigation strategy formulation in DCs does not lend itself to a single defined concept. Hence, a broader approach guided by 'principles' is set to facilitate the exploration and discussion therein. These principles and approaches help to frame and contextualise the discussion, guide the socio-legal research approach adopted in this thesis, and analyse the qualitative data obtained through multiple methods of document analysis, comparative analysis, and interview and observation.

The thesis takes that for new mitigation strategies and instruments to succeed, the country's environmental, socio-economic, political and institutional contexts within which the strategy and instrument would operate need to be studied. This is, it is argued, central to the 'principles' of good regulatory design in DCs, if not elsewhere. Chapters two and three thus explore this matter closely and try to address the first research question. Chapter two discusses GHG emission trends, mitigation strategies, instruments and institutions adopted in Ethiopia and exposes the strengths and limitations of the country's current GHG emissions mitigation strategies. It argues that the emissions target set for the transport sector and mitigation strategies designed have overlooked crucial features of the sector and instrument design, and hence unattainable.

This is followed by Chapter three that investigates socio-economic contexts of road transport and underlying forces behind its contested expansion in Ethiopia. Thus, the underlying theoretical justification and the contested virtues of the massive road expansion and counter-arguments against it are presented to lay down the foundation for the subsequent discussion of regulatory design. Although the rate of motorisation and accessibility of transport services are lower in Ethiopia compared to other sub-Saharan African (SSA) countries, critical infrastructure decisions taken are fuelling motorisation and carbon emissions, increasing social inequalities, accelerating traffic fatalities, and escalating the country's foreign debt burden. The thesis argues that these decisions rooted in the developmental state political economy that Ethiopia has followed for decades expose the inherent limitations of public-funded and capital intensive mobility solutions.

Transport emissions are global problems that every country is struggling to stabilise and not unique to Ethiopia. Lessons from countries with a higher rate of motorisation and developed mitigation strategies are explored in Chapter Four. Thus, the salient features of car regulation in more developed societies of the EU, the UK, and the US, and mitigation instruments commonly used at the global level are discussed. The discussion reveals the competing interests and positions witnessed in climate regulation and that apart from its technical efficiencies, the instrument choice is the subject of lobbying, ideological considerations, and political divisions. This serves as a comparative experience to the subsequent discussion on car regulation systems in Ethiopia

Chapter five then brings the unique threats posed by used car and the features of used car regulation in Ethiopia. It analyses the demand (pulling) and supply (pushing) factors behind the surge in the number of used cars in the streets, including international trade and regulations enforced in car-producing countries. The thesis found that the regulation of used-cars has global dimensions and regulatory instruments, and marketing strategies adopted in used-car exporting countries (e.g. the EU) have played a significant role in the proliferation of clunker (a dilapidated old car) and used-car markets in DCs. Hence, the discussion presents both domestic and international instrumental mixes importing countries could use to stabilise car emissions through regulation of used-cars.

Not only used-cars but carbon emissions from the new internal combustion engine (ICE) cars remained unregulated in Ethiopia. Chapter six treats ICE cars separately and discusses alternative strategies and regulatory instruments needed to increase efficiency and reduce carbon emissions. It follows that a comprehensive approach to understanding regulatory loopholes from a car's production or importation through its operation and safe disposal is needed. Mixes of instruments such as ownership taxes, emissions standards, fuel quality standards, restrictive measures such as parking prices are proposed to the mostly unregulated areas.

After discussing the incremental changes required within the short- to mid-term mitigation plans, one of the leapfrogging potential and green transport technologies available for latecomers like Ethiopia, i.e. electric vehicles (EV), are discussed in Chapter seven. Ethiopia's low rate of transportation and desire to leapfrog in transport technologies makes EVs a potential mobility solution for a country that sources its electricity from green sources. However, the much overdue fiscal and non-fiscal instruments that would make EVs competitive in the market and attractive for early movers are yet to come in Ethiopia. The thesis critically investigates the mitigation potential, infrastructure demands, and regulatory instruments required to adopt and diffuse EVs in Ethiopia.

Chapter eight brings together the main findings and considers the implications of the results. It also looks back to the theoretical approaches designed for the thesis and how the integration of modes, complementary mix of instruments, and leapfrogging have informed the recommended strategies and instruments. It summarises the strengths and weaknesses of these approaches and the opportunities to execute the recommended strategies and instruments. The importance of the thesis, challenges faced during the investigation due to the dynamic nature of the subject and areas for future research work are also recapped. Finally, the thesis closes with a brief conclusion chapter that brings together the key issues raised in the thesis and presents the complexities of the topic.

## 1.2 GHG Transport Emission Reduction Design Approaches and 'Principles'

Environmental regulation is the subject of multi-disciplinary scientific investigations. However, there is no consensus on the characterisation of the environmental problem, how to approach it, with what types of instruments, and who should regulate it. Over the years, different regulatory and policy choice theories such as 'smart,' 'risk-based,' 'responsive' and 'reflexive' were crafted, tested, and refuted.[40] All of these frameworks have assumptions whose existence varies across jurisdictions and with the nature of environmental problems.

[40] Robert Baldwin and Julia Black, ' Really responsive regulation' (2008) 71(1) Modern Law Review 59; Neil Gunningham, 'Compliance, Enforcement, and Regulatory Excellence' (Paper Prepared for the Penn Program on Regulation's Best-in-Class Regulator Initiative, June 2015).

Besides, most of these theories were designed and tested in the contexts of developed countries and rarely applied in DCs that manifest different governance culture and structure, regulatory capacity, degree of environmental problems and information asymmetry.[41]

Hence, instead of fully subscribing to an existing framework, a broader designing approach involving 'principles' and frameworks are prepared to guide the investigation for the thesis. None of these design approaches, however, are new to environmental or transport regulation but were adapted to suit the context of DC and transport mitigation.[42] Accordingly, this and the coming sections explain the relevancy of the approaches and how and why they are used in the investigation.

### *1.2.1 Understanding the environmental problem and contexts*

Researchers claimed that understanding contexts are vital for determining regulatory types, institutional setup, and the implementation style that significantly influence the success and operation of instruments.[43] Thus, a regulatory design should start with a thorough investigation of the context within which the instruments operate, such as the characterisation of environmental problems, identification of objectives, and characterisation of the institutions, actors and legal culture.[44] The data obtained at this stage would help in understanding the external factors (social, political, legal and economic) that influence the choice and operation of mitigation instruments.

Hence, before analysing the technical efficiencies of the mitigation strategies and instruments and how far they could mitigate emission levels, a thorough discussion of the salient features of transport emissions and the socio-economic and political forces that determine the regulatory system are made.

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[41] John Braithwaite, 'Responsive Regulation and Developing Economies' (2006) 34(5) World Development 884; Neil Gunningham, 'Environment Law, Regulation and Governance: Shifting Architectures' (2009) 21(2) Journal of Environmental Law 180, 180.

[42] See Neil Gunningham and Peter Grabosky, *Smart Regulation: Designing Environmental Policy,* (Clarendon Press, Oxford, 1998); Ian Ayres and John Braithwaite, *Responsive Regulation: Transcending the Deregulation Debate,* (Oxford, 1992).

[43] Michael Howlett, 'Governance modes, policy regimes and operational plans: A multi-level nested model of policy instrument choice and policy design' (2009) 42 Policy Sci 73; Faure, Goodwin and Weber, 'Bucking the Kuznets Curve' (2010) (n 1); John Braithwaite, 'The Essence of responsive regulation' (2011) 44 U.B.C. Law Review 475, 490.

[44] Gunningham and Grabosky, *Smart Regulation,* (1998) (n 42) 32.

Accordingly, the thesis focuses on two aspects of the context:

***(a) Environmental problems and goals*** – this covers a comprehensive assessment of the transport system to characterise the scope and intensity of transport emissions, factors that triggered the spike in emissions, and socio-economic contexts of transport as a service. Besides Ethiopia's commitment to climate mitigation, mitigation goals already set, and the types of policies and strategies designed to achieve the goals are investigated. In a country where road transport accounts for a larger modal share, understanding the factors behind motorisation and the socio-economic justifications for expanding road infrastructure would help to establish the foundation for a tailored regulatory design.

In the forthcoming chapters, it would be clear that although Ethiopia had prepared its climate change strategy nearly a decade ago, emissions have continued to rise and, more importantly, from road transport due to increasing motorisation and the absence of robust environmental regulation.

***(b) Institutions (system and actors) -*** Another aspect of this context is the institutions and actors involved in the transport and beyond that influence transport decisions. Regulations operate in tandem with the standard government functioning, and the broader political economy in place that determines mobility patterns and critical infrastructure decisions influences transport. Furthermore, understanding the environmental and transport governance structures, legal culture, role of stakeholders, nature of interaction among different stakeholders, and decision making culture in the system provides the premise for designing the regulatory system.[45] In this respect, we will discuss the actors behind the design and execution of the climate strategy and measures taken to coordinate the institutional response to the growing threat of climate change.

Strategies and laws are under the constant influence of multiple actors and interest groups. The thesis explores the legal framework that defines the operation of key stakeholders like media, civic societies, and car manufacturers and what role they would assume in the future regulatory system. Overall, the involvement of third parties in transport regulation is

[45] Faure, Goodwin and Weber, 'Bucking the Kuznets Curve' (2010) (n 1).

reported to be minimal due to a hostile legal environment that constrained the operation and capacity of third parties.[46]

### *1.2.2 Integration*

Integration has always been the guiding principle in the transport sector for enhancing its efficiency and effectiveness.[47] In the current sense, integration is considered as a principle of linking different transport strategies and modes together to support rather than undermine each other in pursuing the decarbonisation goal.[48] Informed by the interdependency of transport measures and modes, integration requires different actors and sets of measures functioning as one interactive process and contributing to the same goal.[49] This involves harnessing all the mitigation potentials in the transport system to enhance the effectiveness of each measure and creating structural and operational synergy among different actors. Two of its dimensions are considered in this research.

#### *a) 'Avoid-Shift-Improve' (ASI) goals*

Scholars argued that the full mitigation potential of transport would only be realised with a 'balanced implementation of low-carbon mitigation policies that avoid (or reduce) the need for transport trips, promote a shift towards more efficient travel modes and improve performance of vehicles and fuels.'[50] The Avoid-Shift-Improve approach dictates that transport mitigation strategies 'need to consist of measures aimed at avoiding the need to travel, for example by improved urban planning, or teleworking; shifting travel to the lowest-carbon mode, such as cycling [and foot travel]; and improving vehicles to be more energy-efficient and fuels to be less carbon-intensive'.[51] Indeed, any mitigation strategy results in one or more of the 'Avoid, Shift and Improve' goals but a comprehensive

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[46] See Sisay Alemahu Yeshanew, 'CSO Law in Ethiopia: Considering its Constraints and Consequences' (2012) 8(4) Journal of Civil Society 369.

[47] Felix Creutzig, 'Evolving narratives of low-carbon futures in transportation' (2016) 36(3) Transport Reviews 341; IEA, *Energy Technology Perspectives 2017* (2017) (n 6); IPCC, *Special Report on the impacts of global warming of 1.5°C* (2018) (n 6) 148.

[48] Michael Howlett and Jeremy Rayner, 'Design Principles for Policy Mixes: Cohesion and Coherence in 'New Governance Arrangements' (2007) 26(4) Policy and Society 1, 7.

[49] Kieron Flanagan, Elvira Uyarra and Manuel Laranja, 'Reconceptualising the 'policy mix' for innovation' (2011) 40 Research Policy 702, 709.

[50] Gota and others, 'Decarbonising transport' (2019) (n 7) 363.

[51] Felix Creutzig and others, 'Towards demand-side solutions for mitigating climate change' (2018) 8 Nature Climate Change 260, 262.

regulation that balance and integrate measures that address all the three transport mitigation goals enable to fully realise the mitigation potential of transport.[52]

As a transport approach, integrating ASI enables the regulation of both the supply and demand aspects of green transport services.[53] That is, as much as measures require technological improvement in the carbon emissions of cars (e.g. fuel efficiency and switching) and invest in green infrastructure (supply), they should induce structural changes and influence commuters' behaviour and modal choices (demand).[54] However, the virtues of such structural and demand-side measures and its significant co-benefits, greater flexibility, local relevancy, and cost-effectiveness were overshadowed by the pursuit of technological solutions both in the literature and policies.[55]

Literature is now emerging to call for a full exploration and integration of these mitigation strategies into the decarbonisation process.[56] To this, the IPCC report reiterated that '[a] 1.5˚C pathway for the transport sector is possible using a mix of additional and stringent policy actions preventing (or reducing) the need for transport, encouraging shifts towards efficient modes of transport, and improving vehicle fuel efficiency.'[57] As a result, this thesis explores the potentials of the often understudied and underutilised 'avoid and shift' measures such as NMT, public transport, and EV together with the 'improve' strategies.

*b) Transport modes integration*

The integration of different transport modes, in principle, enhances efficiency and effectiveness, fosters cooperation than competition among green transport modes, and improves mitigation potentials of each mode. Such integration occurs at different levels of the system, such as a physical (infrastructure), operational (system), and institutional

[52] 'Bogota Declaration - Sustainable Transport Objectives' (Latin American national transport and environment agencies, 24 June 2011, Bogota, Colombia); Gota and others, 'Decarbonising transport' (2019) (n 7).

[53] Juan Zamora, 'The "Avoid-Shift-Improve" Model: A Powerful Planning Tool for Transportation Schemes with Low GHG Emissions' 141-150 (MIPALCON Conference Proceeding, Climate Change – A Global Challenge, Stuttgart (Germany), 23rd-26th September 2014).

[54] Mundaca, Ürge-Vorsatz and Wilson, 'Demand-side approaches' (2019) (n 24).

[55] Creutzig and others, 'Beyond Technology' (2016) (n 4); IEA, *Energy Technology Perspectives 2017* (2017) (n 6) 215; IPCC, *Special Report on the impacts of global warming of 1.5°C* (2018) (n 6) 142; ibid.

[56] Ibid.

[57] IPCC, Special Report on the impacts of global warming of 1.5°C (2018) (n 6) 149.

(actors).[58] There are long lists of examples for that, such as creating feeder bus routes to bus rapid transit (BRT) and light rail transit (LRT) services, seamless transit among green modes, bike parking slots in transport terminals, and coordination among transport operators. Possibly such integration could also accelerate the leapfrogging path in the BRT and NMT modes as experienced in some countries and cities (e.g. China, Bogota and Curitiba).

Another aspect of modal integration is its benefit to assess the impact of a strategy adopted in one mode on others. For instance, decarbonising road transport requires, besides making car ownership expensive and inconvenient, robust interventions to expand and modernise green transport modes such as public transport and NMT.[59] Trends show that the current higher rate of green transport modes in Ethiopia will shrink as more people shift to private cars. However, the expansion of attractive and competitive public transport and NMT would enable to preserve the current high modal share of green modes and stimulate shifting from private cars.[60]

### *1.2.3 Complementary instrument mixes*

Another approach utilised in the thesis to design an appropriate transport regulatory system is the use of a complementary mix of instruments. Evidence suggests that a single instrument cannot address multiple goals and multiple levels of behaviours (such as the complexity of transport regulation).[61] After analysing ranges of environmental problems in its member states, OECD concluded that most environmental issues fall into multi-aspect than single-aspect situations that demand multiple instruments.[62] Hence, there is a growing consensus that the use of multiple rather than single policy instruments and a broader range of regulatory actors than the single party would bring better regulation and accelerate the attainment of environmental objectives.[63]

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[58] Klotildi Saliar, 'Public Transport Integration: the Case Study of Thessaloniki, Greece' (2014) 4 Transportation Research Procedia 535.

[59] Hari Bansha Dulal, Gernot Brodnig and Charity G. Onoriose, 'Climate change mitigation in the transport sector through urban planning: A review' (2011) 35 Habitat International 494.

[60] Lee Chapman, 'Transport and climate change: a review' Journal of Transport Geography 15 (2007) 354, 357.

[61] Pablo del Rio and Michael Howlett, 'Beyond the "Tinbergen Rule" in Policy Design: Matching Tools and Goals in Policy Portfolios' (Lee Kuan Yew School of Public Policy WP Series, WP LKYSPP13-01, 2013) Available at http://ssrn.com/abstract=2247238/ (accessed 12 April 2018).

[62] OECD, Instrument Mixes For Environmental Policy, (OECD, Paris 2007) 21 & 158.

[63] Zifei Yang and others, 'On a pathway to de-carbonization – A comparison of new passenger car CO2 emission standards and taxation measures in the G20 countries' (2017) Transportation Research Part D; Denis

A single instrument has got strengths but also weaknesses that could be redressed by another complementary instrument. A combination of instruments is preferred for various reasons such as to provide information to the market, stimulate innovation, limit enforcement and monitoring costs, and reduce uncertainty.[64] Some authors also argued that instrument mix is preferred to achieve a long-term reduction in GHG emissions and to overcome potential barriers for implementation like finance, public acceptability, and equity issues.[65]

Nonetheless, not all mixes would bring a better result. Applying multiple instruments at the same time and against the same actors may result in layering of instruments or counterproductive effects, which regulatory designers tried to eliminate.[66] A complementary mix is a selection of the most effective and efficient regulatory combinations – a plurality of instruments and actors - without resulting in regulatory overload and one creating a perverse effect on the other. Hence, complementarity is not about combination alone but ensure the positive interaction among the instruments and the resulting impact on the environmental goal.

Often information instruments are believed to be complementary to any other instruments as long as it is cost-effective.[67] Information instruments such as labelling and eco-driving shape the behaviour of commuters and enhance the political acceptability of a given tool.[68] Likewise, instruments that strengthen the participation of third parties (business, media, civic society and community) in the regulatory process could complement other measures and instruments. In some contexts, instruments like self-regulation are a standalone instrument capable of achieving the environmental goal by itself.[69] However, the absence of an informed private sector, well developed civic societies and community groups, and asymmetry of information in DCs constrain third parties from assuming the role of surrogate

Dineen, Lisa Ryan and Brian Ó Gallachóir, 'Vehicle tax policies and new passenger car CO2 performance in EU member states' (2018) 18(4) Climate Policy 396-412; IPCC, *Special Report on the impacts of global warming of 1.5°C* (2018) (n 6) 149.

[64] OECD, *Instrument Mixes For Environmental Policy* (2007) (n 62) 25-27.

[65] Georgina Santos, Hannah Behrendt and Alexander Teytelboym, 'Part II: Policy instruments for sustainable road transport' (2010) 28 Research in Transportation Economics 46, 83.

[66] Gunningham and Grabosky, *Smart Regulation* (1998) (n 42); Howlett and Rayner, 'Design Principles for Policy Mixes' (2007) (n 48) l8.

[67] Gunningham and Grabosky, *Smart Regulation* (1998) (n 42).

[68] Ibid.

[69] Ibid 15; Braithwaite, 'Responsive Regulation and Developing Economies' (2006) (n 41).

regulators (regulation is considered to be an inherent power of agancies and third parties could only assume surrogate regulatory role). Hence, the thesis argues that third parties' participation through different modalities such as independent review, self-reporting, and auditing, media scrutiny etc are more complementary than a substitute to a stronger regulation in this context.

These are not the only design approaches used as frameworks to guide the search for better strategies and instruments in the sector. The next section further explains the transformative or structural change required in the sector and how leapfrogging paths are the heart of transport decarbonisation in DCs.

## 1.3 Leapfrogging

### *1.3.1 Characteristics*

Leapfrogging is defined as 'bypassing stages in capability building or investment through which countries were previously required to pass during the process of economic development.'[70] Thus, leapfrogging is often associated with a specific new product that stimulates economic development. However, here it is understood as bypassing the conventional carbon-intensive paths that high-income countries have gone through and augmenting and consolidating the low carbon mobility alternatives in DCs.[71] Hence, it includes both embracing new modes or technologies (e.g. EV) and redesigning the low-carbon mass and active transport modes by improving its features to offer the virtues of modern transport, i.e. accessibility, reliability, quality and efficiency etc.

The theoretical argument behind a leapfrogging approach is that high-income countries have passed through carbon-intensive and unsustainable transport systems and are currently struggling to decarbonise it, but DCs do not have to go through the same resource-intensive and degrading development paths to shape its future.[72] Scholars criticised the universality of the environmental Kuznets curve (EKC), which asserts that environmental degradation witnessed in the early stages of a country's economic development improves

[70] WE Steinmueller, 'ICTs and the possibilities for leapfrogging by developing countries' (2001) 140(2) International Labour Review 193, 194.

[71] Richard Perkins, 'Environmental leapfrogging in developing countries: A critical assessment and reconstruction' (2003) 27(3) Natural Resources Forum 177, 178.

[72] ibid; Desta Mebratu and Mark Swilling (ed), *Transformational Infrastructure for Development of a Wellbeing Economy in Africa* (AFRICAN SUN MeDIA and STIAS, South Africa, 2019) 25-52.

once it achieves a high-income status.[73] Opponents of EKC argued that latecomers have the chance to pursue an environment-friendly, resource-efficient, non-consumptive and technology-driven development trajectory within the limits of the natural environment.[74] Hence, DCs can leapfrog over some of the costly and environmentally damaging transport modes and avoid future lock-in to carbon-intensive transport through creative designs of its mass transit and other low-carbon transport infrastructure.[75]

Scholars also make a distinction between incidental leapfrogging that uses newly available knowledge and technology for incremental change and transformative leapfrogging that uses the new know-how and technology for far 'broader and transformative impacts'.[76] The former comes as a consequence of externally driven changes in technology and know-how while building foundations and capabilities are required for a transformative leapfrogging to flourish. Transformative leapfrogging involves challenging the existing pattern and designing new development trajectories, including creating a new system and process.[77] Such changes are not impossible in the transport sector for Ethiopia, but it requires more careful and thorough planning than incidental leapfrogging. Transformative leapfrogging could happen in some areas where the country has a greater opportunity (e.g. NMT and BRT) than in other areas that are prone to incremental leapfrogging (e.g. EV) due to the investment it requires.

Leapfrogging is already occurring in different areas, including transport. Lee claimed that 'a latecomer does not simply follow the path of the forerunner, but often skips some stages or even creates a path that is different from those of the forerunners'.[78] Newman also argued that 'absolute decoupling' of GHG emission from economic growth is already occurring in

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[73] Ibid; Rainer Walz, 'Competences for green development and leapfrogging in newly industrializing countries' (2010) 7 Int Econ Econ Policy 245, 247; Faure, Goodwin and Weber, 'Bucking the Kuznets Curve' (2010) (n 1).

[74] Mebratu and Swilling, *Transformational Infrastructure in Africa* (2019) (n 72) 28 & 117.

[75] Carlota Perez and Luc Soete, 'Catching up in technology: Entry barriers and windows of opportunity' in Giovanni Dosi and others (eds), *Technical Change and Economic Theory* (London, Pinter Publishers, 1988) 478; Daniel Sperling and Deborah Salon, 'Transportation in developing countries: An overview of greenhouse gas reduction strategies' (2002) <https://escholarship.org/uc/item/0cg1r4nq> (accessed 20 March 2020); IPCC, *AR5 WG3,* (2014) (n 5) 7 & 1086.

[76] Jose Goldemberg, 'Technological leapfrogging in the developing world' (2011) 12(1) Georgetown Journal of International Affairs 135; Mebratu and Swilling, *Transformational Infrastructure in Africa (2019)* (n 72) 35.

[77] JRA Butler and others, 'Scenario planning to leap-frog the Sustainable Development Goals: An adaptation pathways approach' (2016) 12 Climate Risk Management 83, 89-90.

[78] Keun Lee, Economic Catch-up and Technological Leapfrogging: The path to development and Macroeconomic Stability in Korea (2016 Edward Elgar Publishing, USA and UK) 1.

countries but at a faster rate in DCs such as India, China, and African countries.[79] Such 'absolute decoupling' amounts to leapfrogging for countries like Ethiopia, which has lower historical GHG emissions and has invested in renewable energy sources like electricity. As the most prominent GHG emitter of energy end-user, this stimulates innovation in the EVs (e.g. battery storage) and mass-transit (e.g. BRT and LRT) and accelerate the transformation.[80]

Leapfrogging paths are evaluated not only against the nature and speed of change but also its ability to consolidate and sustain the change over the middle- to longer-term periods.[81] That makes it challenging to win political support, especially in a system where electoral goals are set for a relatively shorter period, and politicians promise to make swift changes to existing challenges. As a result, stakeholders in DCs often focus on immediate development needs and conceive a short time horizon incomparable with the transformational and long-term solutions that climate change requires.[82] There is no immediate and universal solution to such challenges, but balancing incremental change to emissions and cultivating leapfrogging could be considered. Besides, leapfrogging paths that would make future mobility affordable, reliable, efficient, clean, safe and accessible are likely to be supported.[83] It is this point that makes NMT and mass-transit feasible in defining future mobility systems in Ethiopia.

### *1.3.2 Possible paths*

Often leapfrogging is viewed as technological innovation or discovery that was not widely used or implemented before in a particular sector or system.[84] However, transformative changes do not necessarily require hardware innovation, although it is an essential component in many ways and could be accomplished through system innovation, behavioural change and scaling up of best practices. Butler and others found that as much as they are technological, transformative strategies that bring about leapfrogging are

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[79] Peter Newman, 'Decoupling Economic Growth from Fossil Fuels' (2017) 8 Modern Economy 791.

[80] Ibid 800 ff.

[81] Mikiko Kainuma, Rahul Pandey, Toshihiko Masui and Shuzo Nishioka, 'Methodologies for leapfrogging to low carbon and sustainable development in Asia' (2017) 9 Journal of Renewable and Sustainable Energy 021406.

[82] Butler and others, 'Scenario planning to leap-frog the SDGs' (2016) (n 77) 84 & 93; ibid.

[83] NITI Aayog and Rocky Mountain Institute, 'India Leaps Ahead: Transformative mobility solutions for all' (2017) 28 <www.rmi.org/insights/reports/transformative_mobility_solutions_india> accessed 28 May 2020.

[84] See for example Butler and others, 'Scenario planning to leap-frog the SDGs' (2016) (n 77).

behavioural, influencing resource allocation and decision-making patterns at all levels – individual, society or government.[85] International Energy Agency (IEA) also claimed that transforming the energy sector and reducing emissions in DCs could be achieved through not only high-performing technologies but also leapfrogging in best-practices and behaviours.[86] This strengthens the thesis's argument that new technologies are not the only means of transforming mitigation efforts in DCs.

Ethiopian CRGE embraced leapfrogging as one of its four-pillar economic-wide mitigation approaches and the single most important in the transport sector, and right to consider it as a designing approach here.[87] However, CRGE took the narrowed version of leapfrogging where technological innovation and public procurement dominates the transport mitigation with no mention of its other features. Contrary, in this thesis, leapfrogging is taken more broadly enclaving technology innovation, system and institution transformation (e.g. integration), behavioural change and preserving the higher modal share of NMT and public transport. Hence, it is taken both as a goal and an overarching guiding principle throughout the designing and instrumental choice processes.

A broader understanding of leapfrogging is essential in the road sector where hardware innovations are slow, costly and only incremental while transport solutions that could achieve behavioural and systemic transformation are within the reaches of DCs. Scaling up of local best-practices and preserving low-carbon transport modes to meet the carbon budget of a country have promising futures. This is not, however, an effort to undermine the importance of technology innovation – however big or small it could be, in transforming the path. Even these low carbon transport modes benefit immensely from technology solutions to redress many of its limitations. Although new technologies are at the heart of many leapfrogging stories, it could also happen at a system level where mobility services are offered to commuters through a newly designed and low carbon mode. Accordingly, leapfrogging could be considered as an approach available for latecomers to decouple carbon emissions from economic growth and avoid possible future lock-in situations.

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[85] ibid 89.
[86] IEA, *Energy Technology Perspectives 2017* (2017) (n 6) 94 & 155.
[87] CRGE Strategy (2011) (n 15) 19, 26 & 165.

Sperling and Salon also claimed that despite the challenges, there are many opportunities for DCs to leapfrog over some of the costly and environmentally damaging paths taken by developed countries.[88] Although favourable opportunities exist for attempting a leap in the development of whatever size, a 'complete reassessment of each country's condition in the light of the new opportunities' should be conducted.[89] An excellent example of this assessment is conducted in India. A transport plan prepared in India by stakeholders found that creating a shared, electric and connected mobility system is the way for transforming passenger road transport.[90] It further explained that such a leaping path includes system integration of different modes, scaling up manufacturing of green technologies (e.g. EV) and shared infrastructure development around NMT, mass-transport and EV charging. Such efforts were expected to cut passenger-road transport energy demand by 64% and carbon emissions by 37%, along with other health, economic and social co-benefits.[91] To avoid the trap (lock-in system) in a carbon-intensive mobility path, India identified their existing capabilities and business models (e.g. ICT, entrepreneurial culture, and public-private partnership), low car ownership and a higher share of NMT as opportunities.[92]

The approaches taken and socio-economic conditions analysed in India offer vital lessons for this investigation and Ethiopia. The core modes chosen for realising transport leapfrogging in India are EV, NMT and mass-transit. Instead of heavily relying on technology innovation, the model envisaged integrating the other low-carbon modes and preserving the higher modal share of NMT and mass-transit. This could be replicated in Ethiopia, which shares a similar context and passenger modal shares with India. Accordingly, this thesis argues that EVs, BRT, NMT and integration are essential in the mid- to long-term transport decarbonisation in Ethiopia. After analysing the institutional, policy and socio-economic contexts, the thesis explores the formulation of policies that would support and stimulate the leapfrogging path.

For instance, researchers argue that for any successful decarbonisation effort and to maintain the 1.5$^{o}$C scenario, conventional passenger cars should be phased-out by 2030,

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[88] Sperling and Salon, 'Transportation in developing countries' (2002) (n 75).
[89] Perez and Soete, 'Catching up in technology' (1988) (n 75) 478.
[90] NITI Aayog and Rocky Mountain Institute, 'India Leaps Ahead' (2017) (n 83).
[91] Ibid.
[92] Ibid.

and the passenger fleet should be entirely electrified by 2050.[93] EVs are becoming the next technology for road transport and many high- and middle-income countries have designed policies to stimulate its adoption and diffusion. Although the technology is evolving, policy supports are required to reduce the purchase cost gap between EVs and conventional cars and expand charging infrastructures.[94] The thesis takes a systemic approach to formulate a comprehensive regulatory system involving different actors (government, business) across the value chain, including EVs final disposal. The discussion touches upon the fiscal instruments, infrastructure expansion, business models, and a public-private partnership that would bring structural and regulatory changes to the existing system.

Likewise, the potentials of leapfrogging to technology-supported NMT and BRT systems are significant in Ethiopia. In addition to their lower or zero carbon emissions, these modes do not require advanced hardware technology but innovative system design and use of modern ICT technologies to integrate it with other modes and create seamless transport services. Ethiopia has more significant potential to emulate the integrated BRT and smart bike-sharing systems practised in South American, Asian and European cities.

The thesis reveals that Ethiopia is lagging and faces numerous challenges to embrace the opportunities for leapfrogging in many areas. Although the CRGE mentions leapfrogging, albeit predominantly as technology innovation, practical measures such as enacting technology road map, detailed action plans, policy measures etc are absent. Hence, the thesis argues that Ethiopia could achieve a win-win solution to the mobility and carbon emissions problems by formulating sound policies and instruments tailored to its conditions. However, apart from fostering the environmental goals, the introduction of new policies and instruments are required to pass other social, economic and political tests discussed below.

## 1.4 Instrumental Choice Parameters: Evaluation Criteria

A new policy instrument should only be introduced, most regulatory scholars argue, if there is a reasonable expectation that this instrument will add to the total welfare of society and environmental improvements. Scholars, however, differ on the criteria to be utilised for

[93] Gota and others, 'Decarbonising transport' (2019) (n 7) 378.
[94] IEA, '*Energy Technology Perspectives 2017* (2017) (n 6) 86.

evaluating the overall importance of a proposed instrument and how to weight these criteria objectively. Relatively, the less contentious four criteria used for assessing climate change policies and instruments, i.e. environmental effectiveness, economic efficiency, distributional equity, and institutional, political and legal suitability, are used for this study.[95] Even then, there is no consensus on how to objectively measure these criteria and which should get priority in a case when they seem to be simultaneously unachievable. Economists and institutions such as IPCC and OECD gave more weight to the economic and environmental parameters, whereas other social science scholars (e.g. politics, public policy and legal) leaned to the institutional and political suitability and equity parameters.[96]

Hence, in the absence of agreed values and methods of assessment and quantifying these criteria, it is reiterated that the environmental objectives set and other contexts in the sector should determine the weights to be given to these parameters.[97] Since the economic and environmental criteria are less controversial and discussed extensively in the literature – and worked into the main body of the thesis pervasively - the forthcoming discussion aims only at the other two parameters.

### *1.4.1 Social and distribution equity*

Equity has various meanings to different groups, but in the transport sector, it is often understood as distributing cost and benefits of mobility among different social groups (sex, economic condition, location etc), commuters, transport mode users (e.g. non-motorised transport access and personal security) and property rights holders.[98] Generally, equity is concerned with 'how appropriately and equally, the impacts of transportation are distributed among different types of users.'[99] This is central to transport discourses because access to transport accrues significant economic and social benefits to communities such as

[95] IPCC, *AR5 WG3,* (2014) (n 5) 207-282; Gunningham and Grabosky, *Smart Regulation* (1998) (n 42) 26 .

[96] Ibid; Kenneth R Richards, 'Framing Environmental Policy Instrument Choice' (2000) 10(2) Duke Environmental Law & Policy Forum 285; Chris Hilson, *Regulating Pollution: A UK and EC Perspectives* (Hart Publishing, 2000); OECD, *Instrument Mixes for Environmental Policy,* (2007) (n 62).

[97] Gunningham and Grabosky, *Smart Regulation* (1998) (n 42) 27-29.

[98] Caroline Mullen and others, 'Knowing their place on the roads: What would equality mean for walking and cycling?' (2014) 61(A) Transportation Research 238, 246.

[99] Pooya Najaf and others, 'Evaluating traffic safety policies for developing countries based on equity considerations' (2017) 9 sup 1 Journal of Transportation Safety & Security 178, 178.

better access to markets, education and health, supporting trade and competitiveness, and opportunities to reduce poverty and increase equity.[100]

Transport service is generally in a deplorable condition in DCs in all settings, but some community groups are disproportionally affected by its absence.[101] Inaccessibility of transport service in some areas has created mobility-related social exclusions where communities are 'prevented from participating in the economic, political and social life'.[102] Transport regulation is, therefore, evaluated based on its impact on averting this social exclusion, fostering social integration, and promoting the equitable distribution of benefits and costs of transport services to various groups.[103]

Another dimension of equity is the protection against disproportionate amounts of risks posed to personal health and safety due to one's modal choice, i.e. sharing the risks associated with mobility choices.[104] In Ethiopia, commuters that walk or bike, often due to their inability to purchase cars or afford to pay or access public transport, bear disproportionate risks related to the externalities of motorised transport. Hence, strategies that exacerbate the exposure of NMT users (cyclists and pedestrians) to such threats are challenged for closing the mobility choices of the poor.

However, reconciling equity with other parameters like cost-effectiveness and political acceptability in the regulatory design has always been a challenge and forced equity parameters to be side-lined in a transport strategy and instrument design process. For instance, the political acceptability of motorisation has hindered the application of equity tests in the transport sector for a long.[105] However, ignoring equity parameters has a far-reaching consequence on the success of a system as Levinson found that perceived inequity weakens the acceptability and execution of proposed instruments.[106]

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[100] Kennedy K Mbekeani, 'Infrastructure, Trade Expansion and Regional Integration: Global Experience and Lessons for Africa' (2010) 19 Journal of African Economies 88; IPCC, *AR5 WG3,* (2014) (n 5) 641.

[101] Mullen and others, 'Knowing their place on the roads' (2014) (n 98) 28.

[102] Susan Kenyon, Glenn Lyons and Jackie Rafferty, 'Transport and social exclusion: Investigating the possibility of promoting social exclusion through virtual mobility' (2002) 10 Journal of Transport Geography 207, 210.

[103] Karen Lucas, 'Transport and social exclusion: Where are we now?' (2012) 20 Transport Policy 105.

[104] Peter Jones and Karen Lucas, 'The social consequences of transport decision-making: clarifying concepts, synthesising knowledge and assessing implications' (2012) 21 Journal of Transport Geography 4; Mullen and others, 'Knowing their place on the roads' (2014) (n 98).

[105] Mullen and others, 'Knowing their place on the roads' (2014) (n 98) 247.

[106] David Levinson, 'Equity Effects of Road Pricing: A Review' (2010) 30(1) Transport Reviews 33, 45.

Throughout the thesis, equity is used as a tool to challenge the utilities of motorisation, the reluctance of imposing stringent measures on cars, and the disproportionate public funding allotted to NMT and public transport infrastructures. Equity calls for a win-win solution to the accessibility of transport services and reducing emissions through low-carbon transport modes.

### *1.4.2 Political and institutional feasibility*

Likewise, political and institutional feasibility is often overlooked when designing regulatory instruments but taken as an essential parameter in this thesis. Political feasibility includes the political acceptability and administrative feasibility of the instruments given the countries situation and context.[107] Haines reiterated that 'capacity to develop and retain legitimacy within the broader political arena' should be assessed while adopting new regulatory schemes.[108] Likewise, Gunningham noted that 'policy proposals, to gain traction, must promise not only effectiveness but also political acceptability'.[109] Political acceptability is also associated with the process of adoption rather than the outcome and content of the instrument, i.e. credibility, inclusiveness, legitimacy and certainty during the adoption and down the enforcement line.[110] Therefore, even if they are useful and sound to achieve the environmental objectives, instruments could be rejected for lack of acceptability and political will.[111]

Besides, the instruments' synergy with the prevalent legal and institutional culture gives confidence and enthusiasm for decision-makers to accept and enforce the regulatory system. Institutional feasibility, however, goes beyond political acceptability and could paralyse the effective enforcement of any new instrument. During the regulatory design stages, as much as one assesses the technical efficiency of the instrument, weight should be given to the process and instrument's compatibility with the existing legal and institutional culture.

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[107] Neil Gunningham and Darren Sinclair, 'Policy instrument choice and diffuse source pollution' (2005) 17(1) Journal of Environmental Law 51; IPCC, *AR5 WG3,* (2014) (n 5) cha 8.

[108] Fiona Haines, 'Regulatory Failures and Regulatory Solutions: A Characteristic Analysis of the Aftermath of a Disaster' (2009) 34 Law and Soc Inq, 31, 34. See also Fiona Haines, A Sutton and C Platania-Phung, 'It's All about Risk Isn't It? Science, Politics, Public Opinion and Regulatory Reform' (2008) 10 FJLR 435.

[109] Neil Gunningham, 'Enforcing Environmental Regulation' (2011) 23(2) Journal of Environmental Law 169.

[110] Gunningham and Sinclair, 'Policy instrument choice and diffuse source pollution' (2005) (n 107) 74.

[111] Stefan Gössling and Scott Cohen, 'Why sustainable transport policies will fail: EU climate policy in the light of transport taboos' (2014) 39 Journal of Transport Geography 197.

An aspect of this considered during the discussion was the institutional culture and exercise of regulatory power by agencies. It was found that the regulators predominantly practice direct regulation than cooperative regulation. As a result, the thesis discusses instruments that foster and cultivate this cooperative environment, along with a step-by-step approach to it. Likewise, a fiscal instrument that requires higher monitoring capabilities, technical efficiencies and smooth and frequent communication is recommended to be mixed with direct regulations so that its political acceptability would be enhanced. Regarding fuel regulation, for reasons of political acceptability, fuel quality improvement and removing fuel subsidy were proposed in the short-term over the fuel carbon tax, which has the same effect of reducing private car use by increasing the pumping price.

Finally, it is worth noting, however, that the discussion under this section does not necessarily imply that these four parameters are mutually exclusive and lead to trade-offs. There are instances where they reinforce each other. For example, a cost-effective instrument is likely to get political support from, at least, elite groups. Contrary, socially accepted instruments that impose an additional cost on businesses may be rejected due to the lobbying power of companies.

However, the objective evaluation of the parameters and types of data required to weigh them is contentious. This thesis attempted to use qualitative empirical data and a socio-legal approach to developing the evidence.

## 1.5 Methodology and Approaches

### *1.5.1 Socio-legal approach*

The enquiry of environmental regulation is dominated by statistical analysis and economic modelling and less through other methods. Although IPCC admitted that statistical analysis is not enough and should be complemented with qualitative case studies and research to effectively capture the social, institutional and political factors of policy design and success, its reports were biased toward economic modelling.[112] Very recently, Creutzig argued that IPCC's report on mitigation 'predominantly focus on techno-economic scenarios' and failed to embrace other frameworks to explore additional mitigation potentials.[113] This by no

[112] IPCC, *AR5 WG3,* (2014) (n 5) 239 & 1156.
[113] Creutzig and others, 'Towards demand-side solutions for mitigating climate change' (2018) (n 51) 260.

means is denying the various research works, albeit relatively fewer, that have used multi-disciplinary design such as a socio-legal approach in the area of environmental regulation.

Environmental law has been understood as a reflection of 'political struggles between competing interests and ideas'[114] and significantly affected by contexts like institutions and actors.[115] Environmental law operates in a more complex and dynamic social setting where individuals, government institutions, businesses and civic societies at the national and international level regularly interact to define and redefine its nature. Hence, a socio-legal approach is preferred to understand such pluralistic phenomena of environmental regulation.[116] Literature concurs that socio-legal research with multiple methods 'provide a more nuanced understanding of the law, legal institutions, and legal processes than can be provided by anyone methodology alone due to the complex nature of the social world in which they operate.'[117]

Socio-legal research 'involves the systematic collection of information ("data") and its analysis according to some generally accepted methods.'[118] Such is the approach taken in this thesis where empirical evidence was collected through multiple methods and analysed to explore and understand the context under which environmental regulation operates and paths for the decarbonisation and leapfrogging of the transport system.[119] Thus, several qualitative research methods were combined to address the various research questions. It used *document review* that is commonly applied in (legal) history research, *interviews* that are used in policy-related studies, and *comparative study, and law and economic analysis* that are used in development law and environmental law research. Although with varying degrees, all these methods are combined to address each of the research questions identified.

[114] Cary Coglianese and Catherine Courcy, 'Environmental Regulation' in Peter Cane and Herbert M Kritzer (eds), *The Oxford Handbook of Empirical Legal Research,* (Oxford, 2010) 450.

[115] Darren O'Donovan, 'Socio-Legal Methodology: Conceptual Underpinnings, Justifications and Practical Pitfalls' in Laura Chaillane and Jennifer Schweppe (eds) *Legal Research Methods: Principles and Practicalities* (CLARUS Press, 2016) 117.

[116] Ibid.

[117] Laura Beth Nielsen, 'The Need for Multi-Method Approaches in Empirical' In Peter Cane and Herbert M. Kritzer (eds), *The Oxford Handbook of Empirical Legal Research,* (Oxford 2010) 955.

[118] Peter Cane and Herbert M Kritzer, 'Introduction' in Peter Cane and Herbert M Kritzer (eds) *The Oxford Handbook of Empirical Legal Research* (Oxford, 2010) 4.

[119] Lisa Webley, 'Qualitative approaches to empirical legal research' In Peter Cane and Herbert M Kritzer (eds), *The Oxford Handbook of Empirical Legal Research,* (Oxford, 2010) 928.

These multiple methods were crucial in redressing the difficulties of finding reliable data and the absence of previous research on the area, and overreliance on only one account on phenomena. Understanding the situation in Ethiopia was difficult due to the lack of organised databases and repositories in institutions, weak enforcement of access to information rights, the confidentiality of government functioning and institutional and staff instability. Besides, regulatory instruments and transport mitigation are relatively new subjects to Ethiopia, which has not had enough attention and institutional form. That makes finding relevant and recent information and panel data from mainstream sources (e.g. internet or research institutions) difficult.

### *1.5.2 Document analysis*

Document analysis is a systematic review of documents where data from it are 'examined and interpreted to elicit meaning, gain understanding, and develop empirical knowledge.'[120] In legal studies, 'documents provide evidence of policy directions, legislative intent, understandings of perceived shortcomings or best practice in the legal system, and agenda for change.'[121] Environmental regulation documents reveal empirical data that help to understand the underlying social structure, environmental problems and actors. As May noted, 'documents, as the sedimentations of social practices, have the potential to inform and structure the decisions' actors make and the reasons and assumptions intrinsic to such decisions.[122]

In this study, besides academic works and legal texts, various documents were reviewed, such as policies and strategies, guidelines and manuals, background papers and draft bills, program proposals, organisational or institutional reports, institutional databases, news articles, and other public records. Document reviews provided information for understanding the political economy, socio-cultural and environmental situation within which the new instruments would function. Furthermore, documents provided valuable evidence on the strength and weaknesses of strategies and instruments as applied in different jurisdictions and contexts. Given the diverse nature and form of the documents

[120] Glenn A Bowen, 'Document analysis as a qualitative research method' (2009) 9(2) Qualitative Research Journal 27, 27.

[121] Webley, 'Qualitative approaches to empirical legal research' (2010) (n 119) 939.

[122] Tim May, *Social Research: Issues, Methods and Practices* (2nd edn, Buckingham: Open University Press. 2001) 157-8.

reviewed, and interpretative analysis was employed to understand their meaning and implications.

These documents provided invaluable information for the thesis, which were used either as primary data or to complement or verify other data and findings. Whenever possible, texts were subjected to triangulation for its true expression of the existing context through observation, interview and internal consistency.[123] This was done to avoid overreliance on documents when they were not the only source of information or doubted as a credible source.[124]

However, the attempt to access more institutional repositories such as minutes of discussions in the Ministry of Trade while determining the pumping price of fuel, research and discussions conducted during the drafting of new legislation on excise tax and minutes of the road prioritising discussions was unsuccessful. These documents could have provided more context to understand the institutional culture and underlying justifications for policy decisions that were relevant for the transport sector.

### *1.5.3 Comparative analysis*

In DCs with a low rate of motorisation like Ethiopia, mitigation instruments in general and in the transport sector, in particular, are underdeveloped, and the process of regulatory designs is only evolving.[125] This gap could be filled with a comparative method that allows us to critically understand the domestic system by contrasting it with a comparative foreign system.[126] Given the emergence of new governance systems and instruments to respond to unique environmental problems such as climate change, understanding the characteristics of mitigation instruments and the nature of their interaction with other social forces are possible through comparative study.

A comparative analysis is a process of contrasting several objects (e.g. institutions, norms, instruments or systems) of different jurisdictions through a scientific framework to generate

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[123] Bowen, 'Document analysis as a qualitative research method' (2009) (n 120) 28 & 33; Paul Atkinson and Amanda Coffey, 'Analysing documentary realities' In David Silverman (Ed.), *Qualitative research: Theory, method and* practice (Sage 1997) 47.

[124] Bowen, 'Document analysis as a qualitative research method' (2009) (n 120) 32.

[125] EPCC, *AR1 Policy and Institutional* (2015) (n 3) 65-68.

[126] Marie-Luce Paris, 'The Comparative Method in Legal Research: The Art of Justifying Choices' in Laura Cahillane and Jennifer Schweppe, *Legal Research Methods: Principles and Practicalities* (CLARUS Press, 2016) 46.

new knowledge and understanding. [127] It provides both the technical perspectives about the instruments and functional perspectives about the practice and context under which they function best.[128] However, it does not mean that what worked well in the foreign regime would work for the host (recipient) regime but will provide data about the strengths and weaknesses of the instruments and its operational context.[129] Whether such regulatory instruments fit into the new context, i.e. Ethiopia, will require further investigation of the situation in Ethiopia that will be provided with empirical evidence.

The comparative jurisdictions of the EU, the UK and the USA were chosen due to the presence of a well-developed and multi-instrument transport regulatory system that offers valuable lessons for understanding the characteristics of the instruments and operational context. However, not all instruments were adopted in any single jurisdiction, and these comparative jurisdictions did not necessarily have valuable experiences on all of the instruments discussed. For instance, the EU and the USA are pioneers of fuel efficiency and carbon emission standards but not on non-motorised and public transport. The South American cities of Bogota (Colombia) and Curitiba (Brazil) were praised for their BRT systems, while China has recently accelerated its scrappage schemes and electric vehicle diffusions. Thus, instead of limiting the comparative analysis to a few jurisdictions, each of the instruments and strategies was discussed along with additional jurisdictions that implemented it to offer a valuable and adaptable experience to Ethiopia.

However, comparisons were not necessarily chosen based on the jurisdiction's success story in executing the instruments nor comparing the 'like with like'. Lessons were also taken from unsuccessful adoption as long as it has offered transferable lessons, and data were available to comprehend it.

[127] Geoffrey Samuel, *An Introduction to Comparative Law Theory and Method,* (Hart Publishing 2014) 11.

[128] Mathias Siems, 'Bringing in Foreign Ideas: The Quest for 'Better Law' in Implicit Comparative Law' (2014) 9 Journal of Comparative Law 119.

[129] John Bell, 'Legal Research and the Distinctiveness of Comparative Law' in Mark Van Hoecke (ed), *Methodologies of Legal Research: Which Kind of Method for What Kind of Discipline?* (Hart Publishing 2011) 170.

### *1.5.4 Interview and observations*

#### *a) Why and how to interview?*

Other widely used qualitative data collection methods – interview and observation – were used to explore and understand the regulatory context in Ethiopia. The interview and field observation enabled the capturing of a broad range of personal experiences both from the executive and industrial representatives, which other methods would not capture.[130] This additional empirical data complemented the limitedness of documents in ranges of topics and sometimes provided new insights about organisational behaviour and assumptions intrinsic to the decision making process.[131] Particularly in the car regulations system (chapters 5, 6, 7 and 8), participants who have direct experience in the system revealed the legal loopholes, practical challenges and regulators' perspectives on such problems.

Interviews were conducted exclusively in Ethiopia in July and August 2019 through a face-to-face semi-structured interview protocol. The protocols allowed to explore the subject systematically and comprehensively and focus the interview on relevant topics, at the same time, be flexible and probe and pose follow-on questions whenever necessary.[132] This 'natural encounter' with the interviewee helped to create a constructive interview environment, build trust and communication, read body language, silence and facial expressions to get subtle meanings conveyed and then generate rich data.[133] The open-ended interview questions were prepared for different groups of interviewees and arranged in themes considering the logical flow of the topic. However, the flexibility of the design allowed for additional questions to emerge during the dialogue.[134] In the absence of documented accounts of a phenomenon or an incidence, such methods allowed us to dig further and obtain primary data about the existence or absence of the phenomena and personal account of it.

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[130] Webley, 'Qualitative Approaches to Empirical Legal Research' (2010) (n 119) 937.

[131] Reza Banakar and Max Travers, *Theory and Method in Socio-Legal Research* (Hart Publishing 2005) 135.

[132] Barbara DiCicco-Bloom & Benjamin F Crabtree, 'The qualitative research interview' (2006) 40 Med Educ 314.

[133] Annie Irvine, Paul Drew and Roy Sainsbury, 'Am I not answering your questions properly?' Clarification, adequacy and responsiveness in semi-structured telephone and face-to-face interviews' 13(1) Qualitative Research 87.

[134] DiCicco-Bloom and Crabtree, 'The qualitative research interview' (2006) (n 132).

However, the method also runs the risk of relying on a verbal account of a phenomenon on matters that are central to the thesis. Likewise, data obtained through interview are prone to bias and was observed with some interviewees, especially mid-level executives. In that instance, attempts were made to triangulate the interview data with other accounts or reports and check its internal consistency during interpretation and analysis.[135] For instance, transport officials claimed that a dedicated bus lane (priority pass) was created on a busy route from Mexico Square (city centre) to Jemo (a new residential suburb) to avoid congestion experienced during peak-hours.[136] However, during field observation, it was found that parked cars, open roadside drains, and leftover objects have blocked its intended use, and buses preferred to share the other lanes. A caveat here is that personal experience and expert opinions were given value, but contexts were not taken as spoken rather triangulated with other evidence during the analysis.

The interview was conducted for a maximum duration of 50 minutes, and the vast majority of it was audio-recorded under the prior consent of the participants. In a few instances where participants refused to be recorded or showed discomfort or nervousness with the recording, only interview notes were taken, which was immediately transcribed to maintain the integrity and accuracy of the data. To protect the confidentiality of the data and identity of the participants, the interviewees' identities were anonymised throughout the discussion, and references were made only to the institution or category of the institution the interviewee represents.[137] This was done not to offer clues about their office or position, which might lead to tracking of their real identity due to the small number of individuals involved in the subject area under inquiry.

Interview enabled us to understand car regulations through those who have direct experience and a unique perspective as a result of their experience.[138] The role of different actors, perception about mitigation strategies and instruments, instrument making process

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[135] Johann Mouton and HC Marais, *Basic Concepts: in the Methodology of the Social Sciences* (5th ed. HSRC Publishers 1996) 92.

[136] Interview with an official at the MoT (Ministry of Transport) (MoT-01) (Addis Ababa, Ethiopia 22 July 2019); Interview with Federal Transport Authority (FTA) official (FTA-01) (Addis Ababa, Ethiopia 8 August 2019).

[137] Dana Lynn Driscoll, 'Introduction to Primary Research: Observations, Surveys, and Interviews' in Charles Lowe and Pavel Zemliansky (eds) *Writing Spaces: Readings on Writing* (Parlor Press, 2011 Vol 2) 156.

[138] Ashley Castleberry and Amanda Nolen, 'Methodology Matters - Thematic analysis of qualitative research data: Is it as easy as it sounds?' (2018) 10 Currents in Pharmacy Teaching and Learning 807, 807-8.

etc are reflected upon. As the participants represent diverse groups of societies with various background, the interview brought their personal account of transport regulation and mobility solutions as a member of the community. Webley reiterates the importance of participants' experience and perspective and the effectiveness of interviews to garner 'data on individuals' perceptions or views and the reasoning underlying the responses [and] an insight into individuals' experiences.'[139]

*b) Participants*

The interviewees were drawn from institutions that fall in one of the three broader groups – regulatory agency, business and researcher. The vast majority of the participants were employees of government institutions. The regulatory agency is a government institution of different levels with multiple roles such as policy design and execution, standard-setting and regulation, prepare basic infrastructure design and standards etc. These included finance, environment, customs, transport, road, trade and industry departments and agencies. However, some agencies in Ethiopia, such as the Ethiopian Petroleum Supply Enterprise (EPSE) have dual roles in the system – as a regulator, it sets the fuel quality, and as an enterprise, it imports and supplies the country's fuel consumption. Participants from these regulatory agencies provided the nuances of past and present policy-making and decision-making processes and revealed executive capacities both in the design and implementation of mitigation policies. Furthermore, they provided the justifications for the actions and inactions of government agencies and revealed the short- to mid-term plans of the country in different areas.

The second groups of interviewees represent the service/goods provider sector, which includes both government enterprises (e.g. bus operators and railway enterprise) and private firms (e.g. car importers and manufacturers, parking operators). It has generated data on their operational capacity, lobbying power, participation in policy design, and understanding of climate change and business model for future innovation. Finally, a few independent researchers that have expertise in Ethiopian climate mitigation broadly and transport mitigation, in particular, were also interviewed.

[139] Webley, 'Qualitative Approaches to Empirical Legal Research' (2010) (n 119) 937.

Of all the three groups, a total of 31 participants were interviewed. They rank from Directors to Experts in public offices and owners and managers of businesses and enterprises. The research participants were selected through a combination of strategic and purposive sampling, which were later complemented with a snowball sampling during the fieldwork. Based on the literature and document reviews, a list of institutions and individuals and their responsibilities were mapped and prepared in a spreadsheet from which the lists of institutions for interview were selected. An indicative list of specific individuals and units within these institutions relevant to the topic under investigation were identified and attempted to communicate them through email and arrange a tentative schedule for the interview before travelling to Ethiopia. However, more participants and institutions were identified during the fieldwork from institutions and participants themselves. Additional information was obtained from the Ethiopian Investment Commission, Federal Transport Authority, and Charities and Societies Agency to refine lists of businesses, NGOs and experts further. Within the identified institutions, its public relations office was contacted to learn about its institutional structure and to confirm and identify key-informant participants.

Many institutions are involved in the infrastructure development aspect of transport, but very few institutions and individuals in the formulation of regulatory policy and mitigation strategy. In the absence of a business directory or central repository of experts, businesses and institutions operating in the subject area, identifying these institutions and individuals was difficult. However, the snowball approach led to other institutions and resource persons who otherwise were difficult to trace. For instance, an environmental consultancy firm that has conducted transport emission inventory for Ethiopia was identified by other interviewees.

A closely related method widely used in ethnography and other qualitative studies including in socio-legal inquiry and employed in this thesis, is observation. Observation involves participation and observation of a context and phenomena and conversation with the people in their natural setting. [140] Observations taken for this research were limited to a few contexts - a smart car-parking facility, dedicated bus lanes, traffic congestion, and fleet

[140] Marc Simon Thomas, 'Teaching Sociolegal Research Methodology: Participant Observation' (2019) 1 Law and Methods - Special Issue on Active Learning and Teaching in Legal Education, 4. See also Kathleen Musante DeWalt and Billie R DeWalt*, Participant Observation: A Guide for Fieldworkers* (Rowman Altamira, 2002) 4.

behaviour in Addis Ababa. Nevertheless, it has provided invaluable information to understand car regulation, parking regulation and road traffic management in Addis Ababa.

The smart car parking facility and on- and off-street parking sites around it provided a unique opportunity to understand the allocation of lands and urban planning decisions taken by Addis Ababa city administration in the wake of increased motorisation. The parking facility revealed primary data regarding the operation of the facility, the interaction between operators and clients, the limitations of the facility and the challenge of technology use that parking operators and officials had not revealed. The other field observation was conducted by taking a public bus-trip from Mexico Square to Jemo, Addis Ababa (about 7 km), to experience a dedicated bus lane the city administration has created along the corridor as a temporary congestion relief measure to improve bus travel time. Along with the interview, these observations have strengthened the data set for understanding the transport context and implementation challenges in road transport.

Finally, the bulk of data collected through the interview and observation were analysed through content analysis to get its real meaning and results are analysed and presented in descriptive and interpretative forms. A content analysis here is understood as an analytical method to systematically transform a large amount of transcribed data obtained through interview and observation into a highly organised key result and abstraction to get its latent meaning during interpretation.[141] This involves transcribing and understanding data; condensation; formulating codes; developing categories and themes; analysing the results; and interpretation.[142] Although the steps are crucial, content analysis is also described as an intuitive and flexible process where each step could be revisited and repeated as we go along with the data.[143] For instance, used-car emerged as a separate theme from the interview and were added to the predetermined themes.

[141] Hsiu-Fang Hsieh and Sarah E. Shannon, 'Three Approaches to Qualitative Content Analysis' (2005) 15(9) Qualitative Health Research 1277, 1278; Christen Erlingsson and Petra Brysiewicz, 'Commentary: A hands-on guide to doing content analysis' (2017) 7 African Journal of Emergency Medicine 93, 94.

[142] Erlingsson and Brysiewicz (2017) (n 141) 94-95.

[143] Hsieh and Shannon, 'Three Approaches to Qualitative Content Analysis' (2005) (n 141) 1283.

### *c) Limitations of the interview*

Generally, Ethiopia has a ‘poor information environment’ where data availability and utility are limited by the nature of governance, bureaucracy and business environment.[144] Lefort claimed that ‘few ruling parties have surrounded themselves with such a wall of secrecy and opacity’ as Ethiopian ruling elites.[145] Often information requests are met with suspicion and sometimes denied not only in government but also in private businesses. For instance, some experts and officials refused to be interviewed, and others referred the matter to lower-level officials and employees (e.g. Ministry of Finance and Economic Cooperation, Ethiopian Road Authority, and Ministry of Trade and Transport). Hence, the interviewed individuals were not the only potential participants that would have provided valuable data to the research.

Likewise, further interviews in the following three groups of institutions/individuals - NGOs, researchers and car manufacturers - could have provided supplementary data for the thesis. The attempt to interview researchers was rebuffed after discussions with three research institutions, i.e. Ethiopian Academy of Sciences, Addis Ababa University (AAU), and Institute of Environment, Forestry and Climate Change Research could not lead to anyone. Ethiopian Academy of Sciences (EAS) hosts the Ethiopian Panel on Climate Change and secretariat during the preparation of the first assessment report for Ethiopia. However, the assessment report was discontinued after its first report due to funding. That could have filled some of the gaps in data and identify further issues to be addressed and further refute the design approach and instrument choices discussed in the thesis. The absence of experts working in environmental issues of the transport sector was an indication of the underdevelopment of policy instruments and understanding of the dynamics in the sector.

Similarly, NGOs that operate in climate change subjects are more attracted to agriculture, forestry and energy areas, and all on adaptation. Although the prohibitive law and government crackdown that restricted the establishment and operation of civic societies in advocacy subjects had contributed to the situation, it was also an indication of normalising

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[144] Philipp Rode, Biruk Terrefe and Nuno F. da Cruz, ‘Cities and the governance of transport interfaces: Ethiopia’s new rail systems’ (2020) 91 Transport Policy 76, 81; See also Ariel Ahram and J Paul Goode, ‘Researching Authoritarianism in the Discipline of Democracy’ (2016) 97(4) Social Science Quarterly 834, 841.

[145] Rene Lefort, ‘The theory and practice of Meles Zenawi: a response to Alex de Waal’ (2013) 112 (448) African Affairs 460, 461.

the transport problems in Ethiopia. Most of the civic societies that operate in Ethiopia are either international NGOs or those funded by international donors and partners. Hence, the absence of coordinated civic societies' engagement in Ethiopia is the manifestation of the engagement in the international discourses and interests of donors that operate in DCs. Civic societies play a central role in the design of regulatory instruments, oversight of the implementation of the instruments and voice of communities at different levels. Civic societies that represent community voices could have provided a vital perspective to the scope and extent of transport challenges, impact of motorisation, and viability of strategies discussed in the thesis.

In the industrial representatives, companies were participating in car assembling businesses and attempted to include them in the interview. However, the business environment has become confidential and competitive, and many refused to participate in the research after showing initial interest. This would have generated further insight into the subject, such as their readiness to launch and consolidate the leapfrogging path, especially in the EV sector.

## 1.6 Conclusion

This chapter lays out the justification for investigating mitigation strategies in the road transport sector for Ethiopia. Besides, it provides the foundation, framework and methodologies of study that enable us to systematically navigate through the literature and empirical data to find answers to the different research questions. Having presented the premises and direction of the thesis, the substantive discussion can now begin with a critical discussion on the road transport emissions trajectory and strategies and institutions put in place. This forthcoming chapter provides the environmental context, exposes the limitations of current mitigation strategies, and elucidates why it is important to reinforce it with additional instruments.

# Chapter 2
# Road Transport Emissions and Mitigation Strategies in Ethiopia

## Introduction

Preceding the 2015 Paris UN Framework Convention on Climate Change (UNFCCC) Conference, countries were required to define their plan for addressing climate change beyond 2020 in an (intended) nationally determined contributions (I/NDC).[1] Reviews of the submitted NDCs revealed that the current commitments are not ambitious enough and would likely lead to global warming beyond the 2°C target of the Paris Agreement.[2] Optimism, however, grows as the ratchet mechanisms of the Paris Agreement requires parties to continually update, possibly raise, ambitious targets every five years (the first being in 2020), and would be complemented by new technologies.[3] The Paris Agreement differs from its predecessor by calling each nation to contribute its share in stabilising atmospheric GHG emissions irrespective of their level of economic development. This 'bottom-up' approach that requires member states to declare their commitment based on their own analysis of the country's potential encouraged Ethiopia to commit itself to emissions reduction.

[1] UNFCCC, 'Further advancing the Durban Platform - Decision 1/CP.19'- Report of the Conference of the Parties on its 19th session, held in Warsaw from 11 to 23 November 2013; UNFCCC, Lima Call for Climate Action - Decision 1/CP.20 - Report of the Conference of the Parties on its 20th session, held in Lima from 1 to 14 December 2014.

[2] Dereje Azemraw Senshaw and Jeong Won Kim, 'Meeting conditional targets in nationally determined contributions of developing countries: Renewable energy targets and required investment of GGGI member and partner countries' (2018) 116 Energy Policy 433; IPCC, Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (In Press 2018) [IPCC Special Report on the impacts of global warming of 1.5°C]; UNEP, *Emissions Gap Report 2018* (United Nations Environment Programme, Nairobi 2018).

[3] UNFCCC, 'Paris Agreement – Decision 1/CP.21' – Report of the Conference of the Parties on its 21st session, held in Paris from 30 November to 13 December 2015, Article 4.3; Niklas Höhne and others, 'The Paris Agreement: resolving the inconsistency between global goals and national contributions' (2017) 17(1) Climate Policy 16.

Ethiopia has been an active participant of climate change forums and negotiations since its early days.[4] It ratified the UNFCCC in 1994 and the Kyoto protocol in 2005,[5] conducted its initial GHG emission and sinks inventory (1994), submitted its First and Second National Communications and continues to engage in multiparty negotiations in the climate regime.[6] Ethiopia contributes only 0.3% of global GHGs, but its agriculture-dependent economy has already felt the impact of climate externalities.[7] Accordingly, Ethiopia has responded to such climate change threats by formulating an ambitious multipurpose plan of action called Carbon Resilient Green Economy (CRGE) strategy in 2011.[8] CRGE envisages to build a green economy, stabilise GHG emission, and attain middle-income status by 2025. The strategy has served as the parent document for the preparation of its Nationally Determined Contribution (NDC) submitted to UNFCCC.[9]

This chapter presents a critical review of Ethiopia's current road transport emissions, mitigation strategies, emissions mitigation targets, and climate governance put in place to achieve the target. It thus begins by evaluating the ambitiousness and attainability of its commitment based on strategies adopted and the current stage of implementation. This will be followed by discussions on the performance of specific strategies such as the expansion of public transport, vehicle efficiency improvement and non-motorised transport (NMT). Analysis of climate governance and structural frameworks are provided at the end. Later chapters are built on this chapter by looking, first, at the broader cultural context of transport in the country and the political context of national policy and law in this field,

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[4] EPCC, First Assessment Report - An assessment of Ethiopia's policy and institutional frameworks for addressing climate change (Ethiopian Panel on Climate Change, Ethiopian Academy of Sciences, Addis Ababa 2015) 21 (EPCC, AR1 Policy and Institutional). EPCC was established mirroring IPCC in 2014 under the Ethiopian Academy of Sciences. It has published its first and only assessment report in 2015.

[5] UNFCCC ratification Proclamation No 97/1994, 31th May 1994; Kyoto Protocol Ratification Proclamation No. 439/2005, 21st February 2005.

[6] EPCC, *AR1 Policy and Institutional* (2015) 21 (n 4).

[7] Torben K. Mideksa, 'Economic and distributional impacts of climate change: The case of Ethiopia' (2010) 28(2) Global Environmental Change 278; Ethiopia, *Ethiopia's Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC)* (2015) 141 <https://unfccc.int/resource/docs/natc/ethnc2.pdf> accessed 11 June 2020; Tadesse Alemu and Alemayehu Mengistu, 'Impacts of Climate Change on Food Security in Ethiopia: Adaptation and Mitigation Options: A Review' In Paula Castro and others (eds) *Climate Change-Resilient Agriculture and Agroforestry* (Springer 2019).

[8] Ethiopia, Ethiopia's Climate-Resilient Green Economy (CRGE) strategy, (Addis Ababa, September 2011) [CRGE Strategy].

[9] Federal Democratic Republic of Ethiopia, 'Intended Nationally Determined Contribution' (Ethiopian INDC, 2015) 11 <http://www4.unfccc.int/ndcregistry/PublishedDocuments/Ethiopia%20First/INDC-Ethiopia-100615.pdf> accessed 7 June 2018.

followed by more specific aspects of the country's mitigation commitments under the Paris Agreement, such as the regulation of cars among other things.

## 2.1 Emission Increases and Commitments from Transport

### *2.1.1 Mitigation commitment*

Global anthropogenic GHG emissions continue to grow, and the transport sector accounted for 10% of the annual increase between 2000 and 2010.[10] Without further aggressive and sustained mitigation policies being implemented, transport emissions could reach around 14 to 20 Gt CO2eq/yr by 2050 from 7.9 GtCO2eq in 2016.[11] Furthermore, the transport sector continues to record faster emissions growth than any other sector and increased by 2.5% annually between 2010 and 2015, and will continue until 2050.[12] A further look into the industry reveals that road vehicles account for 80% of this increase, and hence could contribute a significant mitigation share.[13]

Geographically, studies suggest that more GHG emissions will come from developing countries (DCs) than developed.[14] An International Energy Agency (IEA) report indicated that a decrease in emissions across the industrialised world and China is matched with modest growth in India and Southeast Asia and a more rapid rise in sub-Saharan Africa (SSA).[15] Although OECD countries had three times as many vehicles as non-OECD countries in 2002, the later will have overtaken by over 200 million vehicles by 2030.[16] The Intergovernmental Panel on Climate Change (IPCC) projected that population growth, changes in demography (e.g. urbanisation), lifestyle, economic development and increase in personal income and travel demand would push transport emissions from non-OECD

[10] IPCC, Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press 2014) [IPCC, AR5-WGIII] 7.

[11] ibid 8 & 46; World Resources Institute, 'Climate Analysis Indicators Tool - Global Historical Emissions' (2017) <www.climatewatchdata.org/ghg-emissions> accessed 26 May 2020; Sudhir Gota and others, 'Decarbonising Transport to Achieve Paris Agreement Targets' (2019) 12 Energy Efficiency (2019) 363, 370.

[12] IEA, Energy technology perspectives 2017: Catalysing energy technology transformation's (Paris, IEA Publications 2017) 84; IPCC, Special Report on the impacts of global warming of 1.5°C (2018) 142 (n 2); Gota and others 'Decarbonising Transport to Achieve Paris Agreement Targets' (2019) (n 11) 370.

[13] IPCC, *AR5 WGIII* (2014) (n 10) 605; Felix Creutzig and others, 'Transport: A roadblock to climate change mitigation?' (2015) 350(6263) Science 911.

[14] See generally IPCC, *AR5 WGIII* (2014) (n 10).

[15] IEA, 'Energy and Air Pollution: World Energy Outlook special report' (2016) <https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlookSpecialReport2016EnergyandAirPollution.pdf> accessed 06 February 2018.

[16] IPCC, *AR5 WGIII* (2014) (n 10) 604-605.

countries to surpass OECD emissions by 2050.[17] Ethiopia is a textbook example of a country where all these factors converge: 2.5% per annum population growth, 10% average GDP growth for a decade, an industry growing over 17% per annum, urbanisation at 5.4% per year.[18] More importantly, Ethiopia is a landlocked country that heavily relies on road transport for many of its activities.

By June 2015, Ethiopia was only the twelfth nation and the first least developed country (LDC) to submit its INDC to the UNFCCC secretariat.[19] Ethiopia's 150 Mt CO2e annual and 1.8 ton per capita GHG emission in 2010 is one of the lowest in the world.[20] In a business as usual (BAU) scenario, emissions would more than double and surpass 400 Mt CO2e and per capita emissions reach 3 tons by 2030. Ethiopian NDC, however, commits to limit emissions to below 145 Mt CO2e by 2030, amounting to 64% decrease from the BAU emission and limiting the per capita emission to 1.1 ton.[21] This ambitious commitment covers seven prioritised sectors - livestock, soil (crop production), forestry, industry, energy, transport and housing/building.[22]

*Table 2-1 Ethiopia GHG emission for 2010 and 2030*

| **Sector** | **Actual emission (2010)** | | **Emission projection (BAU) by 2030** | | **Reduction potential from BAU by 2030** | |
|---|---|---|---|---|---|---|
| | Mt CO2e | Share of total (%) | Mt CO2e | Share of total (%) | Mt CO2e | % of reduction |
| **Livestock** | 65 | 42 | 125 | 31 | 50 | 13 |
| **Soil/Crop Production** | 12 | 9 | 60 | 15 | 40 | 10 |
| **Forestry** | 54 | 37 | 90 | 23 | 130 | 33 |
| **Industry** | 4 | 3 | 70 | 18 | 20 | 5 |

[17] Ibid 612, 641 & 952.

[18] Ministry of Industry (FDRE), Ethiopian Industrial Development Strategic Plan (2013-2025) (Addis Ababa, September 2013) 44; World Bank, 'Ethiopian Urbanization Review: Urban Institutions for Middle Income Ethiopia' (2015); Ethiopia, Growth and Transformation Plan II (GTP II) (2015/16-2019/20) (National Planning Commission, Addis Ababa May 2016) (Ethiopia, 'GTP II'); African Development Bank, OECD and UNDP, 'African Economic Outlook 2017: Entrepreneurship and Industrialisation' (2017).

[19] Gebru Jember Endalew and Brianna Craft, 'Ethiopia's effective climate diplomacy: lessons for other nations' (The International Institute for Environment and Development (IIED) Briefing, October 2016) <http://pubs.iied.org/17381IIED> accessed 10 May 2018. Accordingly to UN, there are currently 47 countries on the LDCs list that have the lowest income, lowest level of human assets and the highest economic vulnerability. UN Department of Economic and Social Affairs Economic Analysis <www.un.org/development/desa/dpad/least-developed-country-category.html> accessed 27 August 2020.

[20] Ibid.

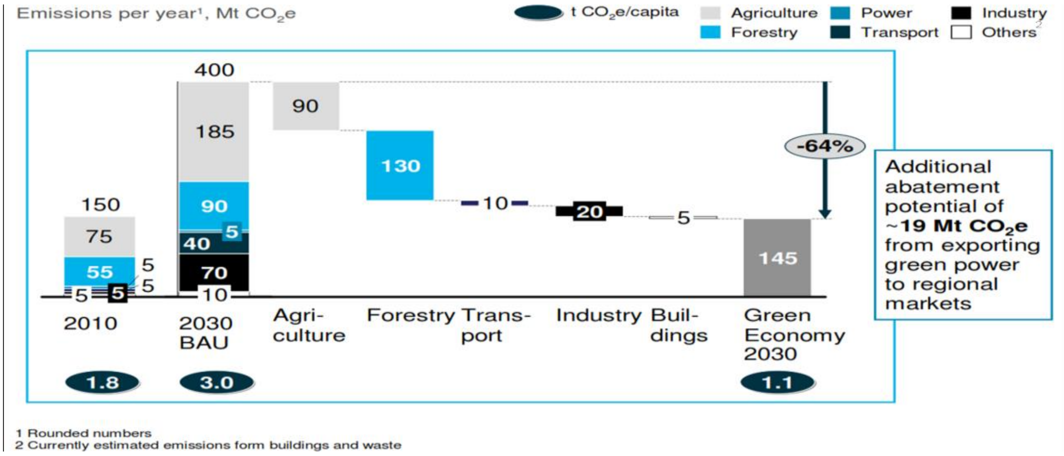
[21] Ethiopian 'INDC' (2015) (n 9).

[22] Ibid.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Transport** | 5 | 3 | 40 | 10 | 10 | 3 |
| **Housing (Building)** | 5 | 3 | 10 | 3 | 5 | 1 |
| **Power generation** | 5 | 3 | 5 | 1 | 0 | 0 |
| **Total** | **150** | **100** | **400** | **100** | **255** | **64** |

Source: Computed from CRGE (2011)

*Figure 2-1 Ethiopian NDC target*




Source: Ethiopian INDC (2015)

In a BAU scenario, emissions will more than double by 2030 across all sectors except for power. The highest increase is expected to come from industry (13 fold) and transport (7 fold) sectors while housing (construction) will only double. The transport sector emits 5 Mt CO2e or 3% of the country's total GHG in 2010, where road transport takes the lion share with 70% and air transport with 23% (Table 2-1). However, in the BAU scenario, emissions from the transport sector would reach 40 Mt CO2e by 2030.[23] However, with mitigation measures on road and rail transport, Ethiopia plans to stabilise the emissions from transport to only 30 Mt CO2e by the same year.[24]

### *2.1.2 Optimism and critique*

Donors and international institutions praised Ethiopia's CRGE and NDC for being ambitious and setting an excellent example for other developing countries (DCs) to emulate.[25] Climate

[23] *CRGE Strategy* (2011) (n 8) 14-16.

[24] Ibid 13. Although the air transport accounted 23% of transport's emissions, mitigation reduction targets and strategies excluded the air and water transport modes.

[25] Manifested through the signing of a partnership agreement with six countries soon after the announcement. Lima Declaration. Ethiopia and climate partners joint communique — Lima Declaration (Lima 10 December 2014) <https://www.regjeringen.no/globalassets/upload/kld/kl/klima-og-skogprosjektet/141210limadeclaration-signed.pdf> accessed 26 February 2018.

Action Tracker (CAT) rated Ethiopia's mitigation target along with a few other NDCs' as '2°C compatible' and enough to contribute a fair share of global effort but short of the Paris Agreement's 1.5°C limit.[26] Out of the 33 NDCs reviewed by CAT, only Gambia and Morocco were rated better than Ethiopia. Given the fact that CAT's assessment has completely excluded land use, land-use change and forestry (LULUCF) for all countries due to data uncertainty, Ethiopia's rank was commendable. Similarly, a study on emissions reduction commitments from the land sector described Ethiopia's target as both ambitions and transparent.[27] In another comparative study of INDCs of Ethiopia, Kenya and Democratic Republic of Congo, Selvakkumaran and Silveira found that Ethiopia's target was more ambitious than the rest.[28] Furthermore, they found that as the least developing country and with a desire of achieving middle-income status by 2025, its ambition of pursuing a low-carbon development path with renewable energy sources was admirable. In a nutshell, although they are very few, reviews done on both economic wide and sector-specific commitments signify the ambitiousness of Ethiopia mitigation targets.

However, sectoral and economy-wide targets depicted in the preceding section reveals that the transport sector will relatively struggle to stabilise emissions. The emissions reduction target from the transport (25% reduction from BAU scenario) is lower than the economic wide (64%) target, and the least intensive of all the sectors (28% from industry, 50% from housing, 40% from livestock, 67% from the soil and 145% from forestry). In 2010, 88% of Ethiopia's GHG emissions came from the agriculture sector, and conceivably more mitigation potential are present. However, if the current mitigation target is met by 2030, transport would account for about 20% of the country's emissions from its current 3% share.[29] That will make transport the third-highest GHG emitter, next to livestock and industry, and expose the country to emissions trap.

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[26] Climate Action Tracker (CAT), 'Ethiopia' <http://climateactiontracker.org/countries/ethiopia.html> accessed 6 June 2020.

[27] Kalifi Ferretti-Gallon and Doug Boucher, 'The Land Sector in the Second Wave of INDCs: Intended Climate Contributions of China, Canada, Ethiopia, and Morocco' (Union of Concerned Scientists September 2015) <http://www.ucsusa.org/sites/default/files/attach/2015/09/ucs-land-sector-in-second-wave-of-indcs-2015.pdf> accessed 26 February 2018.

[28] Sujeetha Selvakkumaran and Semida Silveira, 'Exploring synergies between the intended nationally determined contributions and electrification goals of Ethiopia, Kenya and the Democratic Republic of Congo (DRC)' (2018) Climate and Development 1.

[29] Ethiopian 'INDC' (2015) (n 9).

The review indicates that Ethiopia needs to ratchet measures to containing emissions from transport. Delaying mitigation measures to future time will increase the comparable cost of mitigation and affects the country's capacity in the future.[30] Moreover, future emissions level and mitigation successes are dependent on the transport infrastructure and system the country designs now, when emissions are lower. Thus, Ethiopia should accelerate building a low-carbon transport system and utilise its potential such as the zero-emissions from the power sector.[31]

Studies show that not only Ethiopia but other countries would struggle to stabilise emissions from the transport sector, with the road being the prominent one. In the EU, even if emissions from energy fell in 2016, it has significantly increased from the transport sector.[32] Similarly, for the first time in 40 years, transport has become the biggest emitter in the US overtaking electricity generation.[33] A review of 163 NDCs indicated that only 23 NDCs (including Ethiopia) proposed specific emissions reduction targets while a similar number of NDCs proposed indirect mitigation targets (not expressed in emissions) such as increasing the modal share of public transport.[34] However, almost all NDCs submitted (99.5%) have set commitments for the energy sector, which in most instances include transportation.[35] The omission of explicit reference to transport emissions targets in NDCs could be attributable to the absence of data, uncertainties in future technology and cost, priorities to other sectors and preference to set economy-wide target.[36]

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[30] IPCC, Synthesis Report - Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, Geneva, Switzerland 2014) 18-19.

[31] Selvakkumaran and Silveira, 'Exploring synergies between INDC and electrification goals' (2018) (n 28).

[32] EEA, 'Approximated European Union greenhouse gas inventory: Proxy GHG emission estimates for 2016' (2017) <https://www.eea.europa.eu/themes/climate/approximated-greenhouse-gas-emissions/approximated-greenhouse-gas-emissions-in-2016> accessed 05 February 18.

[33] US Energy Information Administration (EIA), 'Monthly Energy Review for January 2018' <https://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf> accessed 20 February 2018.

[34] Edina Lohr and others, 'Transport in NDCs: Lessons learnt from case studies of rapidly motorising countries' (GIZ and Ricardo Energy and Environment, 2017) 9 <www.international-climate-initiative.com/fileadmin/Dokumente/2017/171115_Publikation_EN_TransportInNDCs.pdf> accessed 16 June 2020. See also Sudhir Gota and others, 'Nationally-Determined Contributions (NDCs) offer opportunities for ambitious action on transport and climate change' (Partnership on Sustainable Low Carbon Transport October 2016) 17 <www.ppmc-transport.org/wp-content/uploads/2015/06/NDCs-Offer-Opportunities-for-Ambitious-Action-Updated-October-2016.pdf> accessed 27 May 2020.

[35] Senshaw and Kim, 'Meeting conditional targets in NDC' (2018) (n 2).

[36] Gota and others, 'NDCs Offer Opportunities for Ambitious Action' (2016) (n 34); Gota and others 'Decarbonising Transport to Achieve Paris Agreement Targets' (2019) (n 11).

Another review of NDCs indicated that among the 13 NDCs that set transport emissions mitigation targets, only two of them (Burkina Faso, and Trinidad and Tobago) had clear reduction targets that are more intensive than their economy-wide target.[37] Certainly, differences in the base year, computation methods and data type make comparing targets of different countries very difficult. However, on its face value, Ethiopia's target of reducing transport emissions by 25% from the BAU scenario by 2030 is relatively less intensive than seven of the 13 countries in the group. This may not necessarily mean that Ethiopia's target is less ambitious as other assumptions and opportunities subtle to it could differ.

On the other hand, it is also imperative to see if Ethiopia can achieve the mitigation targets it set. Financial constraint is one of the immediate challenges, and the NDC mentioned that success is contingent on the availability of international support.[38] However, it does not distinguish between the unconditional (to be achieved by its capacity) and conditional (on external support) emissions reduction targets.[39] A study found that international assistances play a major role in meeting emissions reduction commitment due to the 'premature market conditions and lack of budget of developing countries.'[40] As noted below, Ethiopia has not raised adequate international finance, and hence the proposed mitigation measures, more importantly, the capital intensive transport mitigation activities are delayed. Thus, the current target of reducing transport emissions by 25% from BAU is likely to be missed.

In the following sections, we will explore the type of mitigation strategies proposed, their comprehensiveness, respective abatement potential and implementation stage. In addition to the CRGE and NDC, the discussion analyses current policy dynamics observed both in the climate mitigation and transport sectors.

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[37] Gota and others, 'NDCs Offer Opportunities for Ambitious Action' (2016) (n 34).
[38] Ethiopian 'INDC' (2015) (n 9) 2 & 9.
[39] Ferretti-Gallon and Boucher, 'The Land Sector in the Second Wave of INDCs' (2015) (n 27); ibid.
[40] Senshaw and Kim, 'Meeting conditional targets in NDC' (2018) (n 2) 442.

## 2.2 Transport Emission Reduction Strategies

### *2.2.1 General overview*

Ethiopia was one of the first DCs to design multipurpose climate policies where mitigation measures were linked with the country's development programmes.[41] The Ethiopian government believes that mitigation measures are 'a pathway for not only delivering on GHG emissions abatement but also contributing to Ethiopia's sustainable development programmes and poverty reduction.'[42] It reiterates that a low carbon growth path increases the availability of clean transport (e.g. rail, electric vehicles, NMT), reducing oil dependency and expanding efficient, cheaper and safer transport.[43] Thus, most of the emissions mitigation strategies are also chosen for their co-benefits on enhancing transport accessibility and other socio-economic benefits.

Globally, different mitigation strategies and instruments are executed depending on the country's situation and environmental goals. Based on their nature and governance requirements, these mitigation instruments could be grouped into five: public expenditure (government provision of public goods), direct regulatory tools (command and control), economic instruments (taxes, subsidies, emissions trading etc), information programmes and voluntary agreements.[44] None are, however, believed to be a 'one fits all tool' nor are they comprehensive alone.[45] Hence, a combination of strategies and instruments are chosen to optimise the emissions-reducing potential and avoid trade-offs and perverse effects of measures.[46]

The major transport mitigation strategies are indicated in the NDC and the CRGE strategy documents. Like most NDCs, Ethiopia's NDC does not detail the mitigation strategies nor the instruments, and references are only very general where words and phrases are thrown across the document that signifies the intended measures.[47] For examples, phrases like

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[41] Susannah Fisher, 'Low-carbon resilient development in the least developed countries: Emerging issues and areas of research' (IIED Issue Paper 2013) <pubs.iied.org/pdfs/17177IIED.pdf> accessed 28 April 2018.

[42] *ETHIOPIA'S Second National Communication to UNFCCC* (2015) 142 (n 7).

[43] Ethiopia, 'CNCRE Mission Statement: How Ethiopia is Responding to Climate Change to Build a Carbon Neutral Climate Resilient Economy, undated' 17.

[44] IPCC, *AR5 WGIII* (2014) (n 10) 1156; EPCC, *AR1 Policy and Institutional* (2015) 52 (n 4).

[45] Ibid.

[46] Füsun Ülengin and others, 'Policy developments for the reduction of climate change impacts by the transportation sector' (2018) 61 Transport Policy 36.

[47] Lohr and others, 'Transport in NDCs' (2017) (n 34).

'leapfrogging to modern and energy-efficient technologies', avoiding 'fossil fuel dependence' and 'traffic congestion', removing 'fossil fuel subsidy', 'investment in improved transportation systems (e.g. railway)' and 'urban planning' are used in an apparent reference to the transport sector.

However, the CRGE, the parent document for the NDC, describes the detailed account of the assumptions, strategies and mode of execution. Accordingly, the major transport mitigation strategies come under four categories: improving the public transport system in Addis Ababa, improving vehicle efficiency, changing the fuel mix with locally produced biofuels, and construction of electric rail network for freight transport (Table 2-2). Although the CRGE identified other mitigation strategies such as promoting e-commerce, scooters and bicycling, they were side-lined only for future considerations claiming limited abatement potential and enforcement challenges.[48] However, recently NMT strategies have been enacted both at the national and Addis Ababa city level that envisage improving the much-neglected walking and cycling modes and could contribute to the mitigation effort.[49]

A glance at these strategies and their abatement potential reveals that 75% of the mitigation targets would be achieved largely through public expenditure (infrastructure development), 24% through direct regulation and the remaining through market instruments (Table 2-2). Economic instruments and information and voluntary schemes have barely featured in the CRGE. However, some of the strategies would be more effective when complemented with economic and information instruments. For instance, a fuel standard could be supplemented with tax reforms on fuel-efficient vehicles and mandatory labelling requirements. Similarly, incentives for electric vehicles could only thrive if charging infrastructures are developed through public expenditure, and complemented with public awareness on its utility.

The thesis argues that the developmental state political economy Ethiopia chose to follow influences its policy choices, and has led public expenditure to become the single most important mitigation instrument. The Ethiopian Panel on Climate Change (EPCC) report also

[48] *CRGE Strategy* (2011) (n 8) 177-78; EPCC, *AR1 Policy and Institutional* (2015) (n 4).

[49] AA, 'Non-Motorised Transport Strategy 2019-2028' (Addis Ababa City Administration Road and Transport Bureau 2018); MoT, 'Ethiopia Non-Motorised Transport Strategy 2020-2029' (Ministry of Transport, Addis Ababa, 2020).

recognised the limited place given to economic and information instruments and the reluctance to execute innovative and new mitigation instruments.[50] Hence, the policy overlooked the abatement potential and socio-economic benefits of other instruments, and disregarded the contribution of private sectors and communities in the mitigation process. The impacts of the political economy and the public expenditure on the transport sector are explored further in the upcoming chapter.

### *2.2.2 Integration – Avoid-Shift-Improve (ASI)*

As indicated in the preceding chapter, the best transport strategy is one that aims at all the 'avoid, shift and improve' goals of transport emissions mitigation.[51] Hence, mitigation measures should be diverse and designed to increase the efficiency (improve) of vehicles and carbon intensity of fuels, shift modal from high to low-carbon intensive and minimise transport demand (avoid).[52] However, all of the strategies proposed in the CRGE fall under the 'shift' and 'improve' and none under the 'avoid' categories (Table 2-2). Such imbalances undermine and underestimate the mitigation potential and socio-economic co-benefits of other measures, especially 'avoid' strategies that the country could utilise.

Nevertheless, Ethiopia is not the only one with such a technology-oriented 'improve' strategy dominating its policy spaces.[53] Globally, evidence reiterates that transport mitigation policies are dominated by the 'improve' strategies with no proven impact that these measures will yield a better result than the 'shift' and 'avoid' strategies.[54] A review of 163 NDCs found that 63% of the transport mitigation measures are 'improve' strategies while the 'shift' and 'avoid' strategies account about 29% and 8% respectively.[55] However, such a technology-oriented approach is being challenged for closing the policy space for 'avoid' and 'shift' strategies that could result in long term behavioural changes.[56] Scholars

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[50] EPCC, *AR1 Policy and Institutional* (2015) (n 4) 68.

[51] Felix Creutzig and others, 'Towards demand-side solutions for mitigating climate change' (2018) 8 Nature Climate Change 260, 262; Gota and others, 'Decarbonising Transport to Achieve Paris Agreement Targets' (2019) (n 11) 363. See also Chap 1.

[52] Creutzig and others, 'Transport: A roadblock to climate change mitigation?' (2015) (n 13).

[53] Gota and others, 'NDCs Offer Opportunities for Ambitious Action' (2016) (n 34) 16.

[54] Gota and others, 'Decarbonising Transport to Achieve Paris Agreement Targets' (2019) (n 11).

[55] GIZ, 'Sectoral implementation of Nationally Determined Contributions (NDCs): transport' (2017) <https://www.transparency-partnership.net/sites/default/files/u2618/giz2017-en-ndcs-sectoral-implementation-transport.pdfhttp://www.giz.de/fachexpertise/downloads/giz2017-en-ndcs-sectoralimplementation-transport.pdf> accessed 05 June 2020.

[56] Felix Creutzig and others, 'Beyond Technology: Demand-Side Solutions for Climate Change Mitigation' (2016) 41 Annu. Rev. Environ. Resour. 173; Luis Mundaca, Diana Ürge-Vorsatz and Charlie Wilson, 'Demand-

also argue that many of the 'shift' and 'avoid' strategies that could result in behavioural and structural changes have higher mitigation potential and greater co-benefits than assumed.[57] For instance, in an urban setting where the majority of the daily trips are covered by walking and cycling, it was a missed opportunity for the CRGE and NDC to omit NMT as a mitigation strategy early in the process.[58]

After the publication of the CRGE, other sectoral policy documents such as the transport sector CRGE and the NMT strategies were prepared in recent times that have enshrined additional features and mitigation strategies.[59] The transport sector CRGE provided additional strategies and instruments but has not transformed the foundation of the main CRGE strategy that prioritise technology and public expenditure oriented measures. Besides, it has not differentiated between short-term and long-term measures and was short of determining future paths and timeline for implementation of the strategies. By far, the NMT strategies have brought new understanding that, at least at a policy level, the mitigation potentials and socio-economic co-benefits of NMT modes (Shift strategies) are recognised.

Halfway into the policy target year of 2030, the planned strategies are at a different stage of implementation. The government has attempted to integrate CRGE initiatives into its five-year Growth and Transformation Plan II (GTP - 2015-2020) and executed some of the strategies.[60] However, implementation lags behind its target due to many reasons, including capacity and failing to effectively mainstream CRGE into sectoral programmes and plans.[61] The discussions below provide a critical review of the major strategies (public transport, vehicle and fuel efficiency improvement and NMT), their emissions abatement potential, assumptions considered for their effective and efficient operation, and loopholes in the design.

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side approaches for limiting global warming to 1.5 °C' (2019) 12 Energy Efficiency 343; Gota and others 'Decarbonising Transport to Achieve Paris Agreement Targets' (2019) (n 11) 379.

[57] Felix Creutzig, 'Evolving narratives of low-carbon futures in transportation' (2016) 36 Transport Reviews 341; Ibid.

[58] Getu Segni Tulu, M Hadgu and AG Tarekegn, 'Bicycling in Addis Ababa, Ethiopia: Opportunities and challenges' (2019) 4(2) Journal of Sustainable Development of Transport and Logistics 50.

[59] MoT, 'Ethiopia's Climate Resilient Transport Sector Strategy' (Ministry of Transport, Addis Ababa, 2018); MoT, *Ethiopia NMT Strategy* (2020) (n 49).

[60] Interview with an expert at CRGE Facility (MOFEC-01) (Addis Ababa, Ethiopia, 25 July 2019).

[61] Interview with an expert in an environmental consulting firm (EC-01) (Addis Ababa, Ethiopia, 8 August 2019).

## 2.3 Public Transport

### *2.3.1 Status of urban public transport*

The effect of public transport on emissions is two-fold – it has lower per capita carbon emissions and stimulates commuters to abandon or minimise private car use.[62] Equally, with smart infrastructure design and seamless integration with other modes of transport, mass transit has a significant potential for leapfrogging into a lower carbon transport system as experienced in some emerging economies (China, Bogota, Curitiba).[63] Investment in mass transport (bus, BRT, LRT and Metro) services are also believed to stimulate development, foster environmental protection (climate mitigation and improve local air qualities) and enhance social equity in DCs.[64]

In Ethiopia, due to the lower rate of motorisation, urban commuters significantly use public transport and NMT. A study in Addis Ababa found that walking accounts the majority (54%) of the daily trips followed by public transport (31%) and lastly private cars.[65] Panel data is not readily available to see the change in modal shares over time and during the increase in motorisation over the last decade. However, all things being equal, a further rise in motorisation and deteriorating conditions in the public transport realm would risk shifting the modal share in favour of private cars. In high-income countries, mass and active transports are considered as a 'Shift' strategy, but it should be primarily 'preserving' or 'maintaining' the existing modal shares for Ethiopia, at least in the short-term. This requires, inter alia, public investment in creating the enabling infrastructure to make mass transport viable, attractive and safe for commuters.[66]

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[62] John K Stanley, David A Hensher and Chris Loader, 'Road transport and climate change: Stepping off the greenhouse gas' (2011) 45(10) Transportation Research Part A: Policy and Practice 1020; Reena Tiwari, Robert Cervero and Lee Schipper, 'Driving CO2 reduction by Integrating Transport and Urban Design strategies' (2011) 28 Cities 394.

[63] Taotao Deng and John D Nelson, 'Bus Rapid Transit implementation in Beijing: An evaluation of performance and impacts' (2013) 39 Research in Transportation Economics 108; Fiona Ferbrache, 'The value of bus rapid transit in urban spaces' in Fiona Ferbrache (ed), *Developing Bus Rapid Transit: The Value of BRT in Urban Spaces* (2019) 1.

[64] Soo Chen Kwanab and Jamal Hisham Hashim, 'A review on co-benefits of mass public transportation in climate change mitigation' (2016) 22 Sustainable Cities and Society 11.

[65] AA NMT Strategy (2018) (n 49).

[66] Lee Chapman, 'Transport and climate change: a review' (2007) 15 Journal of Transport Geography 354, 357.

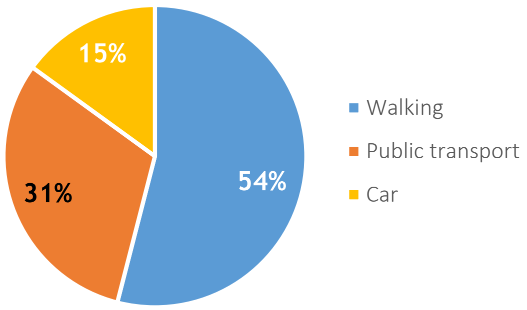


*Figure 2-2 Addis Ababa Modal Share*

In Addis Ababa, public transport consists of a conventional bus, LRT, shared mini- and midi-bus taxi and private taxi. [67] The LRT is available only in Addis Ababa and while the rest are common in all secondary cities. It is very common to see people queuing for all forms of public transport especially in the rush hours. Although they provide valuable service to the short and medium distance travellers and have a significant share in the transport system, the taxi and mini-bus networks are 'chaotic'.[68] Its reliability, quality, safety and comfort have deteriorated over time partly due to the use of old vehicles and absence of central operational and management system.[69] Even then, it is much preferred than the bus services which are predominantly used by long-distance travellers and low-income groups.

Unlike the taxi and mini-midi-bus services, city bus services are run by city councils and subsidised by public expenditure.[70] Yet Addis Ababa's bus service is stifled with operational inefficiencies and characterised as very poor, uncomfortable and unattractive by ridership. Besides its average 40 minutes waiting time, 48 minutes travel time and 15 km/h speed make it the last option to use.[71] According to an official of a bus operator, the introduction of express bus service, public servant transport service and private bus service in recent

[67] Anbessa City Bus Service Enterprises (ACBSE) and Public Service Employee's Transport Service Enterprise widely operate in Addis Ababa and report to MoT. In addition, Addis Ababa city administration operates the Sheger Mass Transport Service Enterprise. Similar state owned city bus services operate in other major cities.

[68] Yves Pedrazzini, Stéphanie Vincent-Geslin and Alexandra Thorer, 'Violence of Urbanization, Poor Neighbourhoods and Large-Scale Projects: Lessons from Addis Ababa, Ethiopia' (2014) 40(3) Built Environment 394, 401.

[69] Elena Givental, 'Addis Ababa Urbanism: Indigenous Urban Legacies and Contemporary Challenges' (2017 9(1) Journal of Geography and Geology 25.

[70] Interview with an official at Sheger Mass Transport Service Enterprise (MT-01) (Addis Ababa, Ethiopia 27 August 2019).

[71] Clelie Nallet, 'The Challenge of Urban Mobility: A Case Study of Addis Ababa Light Rail, Ethiopia' (2018) Notes de l'Ifri, Ifri, 17 <https://www.ifri.org/sites/default/files/atoms/files/nallet_urban_mobility_addis_ababa_2018.pdf> accessed 29 May 2018.

years has eased the pressure on the Anbessa City Bus Service.[72] Yet the overcrowding, inefficiency and unreliability of city bus services contribute to the shift to private cars. Besides its capacity has not matched the growth of urban population and demand for decent urban mobility.

Bus services share the same lane with other motorists. Thus, enhancing the capacity of bus services requires more than opening new routes and purchasing additional buses which the city administration is often engaged with. All things being equal, an integrated approach such as city planning and land use management, stimulating leapfrogging paths, integration of modes and regulation of motorisation are needed. Thus, the problem needs a transformative change in the whole public transport operation in the cities.

### *2.3.2 BRT and LRT*

The multifaceted problem of urban transport, especially in Addis Ababa, is characterised by both infrastructure and system deficiencies.[73] The CRGE prioritised implementation of light rail transit (LRT) and bus rapid transit (BRT) in the capital Addis Ababa both to enhance transport services and mitigate emissions.[74] LRT and BRT are calculated to have annual abatement potential of 0.1 Mt $CO_2e$ and 0.04 Mt $CO_2e$ respectively by 2030. LRT was constructed as the national flagship project and closely monitored by the Prime Minister.[75] The first phase of LRT extends 34 km in two routes with about 150,000 ridership per day.[76] As the first sub-Saharan metro line, it was singled out by media across the world as one of the biggest successes in the country’s economic growth and infrastructure ambitions.[77]

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[72] Interview with an official at Sheger Mass Transport Service Enterprise (MT-01) (2019).

[73] Ethiopia, ‘Transport Policy of Addis Ababa’ (Ministry of Transport, 2011, Ethiopia) <www.motr.gov.et/home/-/asset_publisher/Mp3AXIFgG9ut/document/id/580374> accessed 6 April 2018.

[74] *CRGE Strategy* (2011) (n 8).

[75] Philipp Rode, Biruk Terrefe and Nuno F da Cruz, ‘Cities and the governance of transport interfaces: Ethiopia’s new rail systems’ (2020) 91 Transport Policy 76, 87.

[76] Ethiopian Rail Corporation (ERC), ‘Addis Ababa Light Rail Transit’ <https://erc.gov.et/AddisAbaba-LRT> accessed 04 June 2018.

[77] When inaugurated, it has caught the attention of major printing and digital media across the globe like CNN, BBC, the Economics, the Guardian, New York Times, Washington Post etc. Sub-Saharan Africa gets its first metro: Addis Ababa has opened the first part of a new light rail system, *the Economics (*Sep 22nd 2015) <https://www.economist.com/news/middle-east-and-africa/21665199-addis-ababa-has-opened-first-part-new-light-rail-system-sub-saharan-africa> accessed 7 May 2018; Addis Ababa gets sub-Saharan Africa's first light-rail network, *the Guardian,* (Friday 25 Sep 2015) <https://www.theguardian.com/cities/2015/sep/25/addis-ababa-first-sub-saharan-light-rail-network> accessed 7 May 2018.

LRT was also hoped to significantly improve the deteriorating mobility condition of Addis Ababa. However, the LRT is far from being a perfect solution to Addis Ababa transportation problems - short of connecting much of the city, always packed on peak hours and experience long waiting times.[78] Yet LRT is praised for its social equity effect as it is often used by the lower and middle-income groups who cannot afford the cost of other modes (mini-bus and private car), especially for long-distance trips.[79] Besides, users are satisfied with the LRT (80% satisfaction) more than the conventional bus services partly due to its relatively cheaper cost and shorter travel time.[80]

As the first system in the country, LRT is surrounded by many technical, operational and design problems. Virtually, LRT operates as a stand-alone transport system with no integration with the other modes and feeder routes and services to the LRT.[81] LRT was led and coordinated from the top and operated by the federal government's Ethiopian Railways Corporation (ERC) with little involvement from city officials and planners.[82] As a result, its integration with other transport modes and city activities and its interface with other road users is poor.[83] For instance, LRT is blamed for the increased car cruising in search of turns and exits, increased traffic congestion, unfavourable and crowded pedestrian crossing, and disfiguring city landmarks with its overpass along the corridors. Ethiopian Railway Corporation also admitted that 'there is no harmony and that we have to organise infrastructure for integration'.[84] Such absence of coordination and integration was also manifested in the institutional set up whereby planning and execution activities of various transport modes were accomplished by different agencies with no or little coordination between them.[85]

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[78] Nallet, 'The Challenge of Urban Mobility' (2018) (n 71).

[79] Ibid; Taslim Alade, Jurian Edelenbos and Alberto Gianoli, 'Frugality in multi-actor interactions and absorptive capacity of Addis-Ababa light-rail transport' (2020) 9 Journal of Urban Management 67, 73ff.

[80] Nallet, 'The Challenge of Urban Mobility' (2018) (n 71) 30.

[81] Ibid.

[82] ERC, 'Climate Finance Project: Climate Finance Investment Plan' (Climate Focus and Carbon Africa for Ethiopian Railways Corporation, 7 June 2017); Rode, Terrefe and Cruz, 'Cities and the governance of transport interfaces:' (2020) (n 75) 87; Biruk Terrefe, 'Urban layers of political rupture: the 'new' politics of Addis Ababa's megaprojects' (2020) Journal of Eastern African Studies.

[83] Eden Atsbeha Teklemariam and Zhongwei Shen, 'Determining transit nodes for potential transit-oriented development: Along the LRT corridor in Addis Ababa, Ethiopia' (2020) Frontiers of Architectural Research https://doi.org/10.1016/j.foar.2020.03.005

[84] Nallet, 'The Challenge of Urban Mobility' (2018) (n 71) 20.

[85] ibid 21.

The cost of constructing the LRT infrastructure and operational system is prohibitively expensive to replicate anytime soon. Besides on land use and cost grounds, experts and city officials criticise the federal government for commissioning LRT over the long-awaited BRT that the city was prepared for.[86] BRT also requires a higher upfront investment to construct the necessary infrastructure and operational system, but less than LRT or metro and leads to enormous cost savings in the long term both for commuters and cities.[87] As a service, BRT has a faster speed, higher capacity, reliability, convenience and quality to commuters than a conventional bus system. A review of BRT in DCs also found significant cost savings, social equity impacts due to enhanced access, reduced time and cost of travel, lower emissions, increased health and traffic safety to the lower-income segments of the community.[88]

Yet despite many rhetorics and completing a feasibility study to launch it across seven lines, the BRT has not been operationalised.[89] Evidence suggests that if it gets the political support, proper BRT could provide a relatively more effective service (less cost and similar service) than LRT.[90] Full or proper BRT as opposed to BRT-Lite, however, requires full integration of the system, using high technology, distinct lane, quality vehicles, traffic signal priority etc.[91] BRT also has a potential to transform the public transport system through innovative systems, use of technology and integrating it with other modes which are further discussed in Chapter 8 below.

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[86] Interview with a project manager at Addis Ababa Transport Project Management Office (TPMO) (TPMO-02) (Addis Ababa, Ethiopia 24 July 2019); Rode, Terrefe and Cruz, 'Cities and the governance of transport interfaces:' (2020) (n 75) 87.

[87] Taotao Deng and John Nelson 'Recent Developments in Bus Rapid Transit: A Review of the Literature' (2011) 31(1) Transport Reviews 69, 86; Creutzig and others, 'Transport: A roadblock to climate change mitigation?' (2015) (n 13); Nallet, 'The Challenge of Urban Mobility' (2018) (n 71); Interview with a project manager at Addis Ababa TPMO (TPMO-02) (2019).

[88] Heleen de Coninck, 'Climate Technology & Development Case study: Bus Rapid Transit' (Radboud University Nijmegen, February 2013); Christoffel Venter, Gail Jennings, Darío Hidalgo and Andrés Pineda, 'The equity impacts of bus rapid transit: A review of the evidence and implications for sustainable transport' (2018) 12(2) International Journal of Sustainable Transportation 140.

[89] Yorgos Voukas and Derek Palmer, 'Sustainable transportation in East Africa: The Bus Rapid Transit evolution in Addis Ababa, Ethiopia' (Conference CODATU XV 'The role of urban mobility in (re)shaping cities', Addis Ababa, Ethiopia 22 to 25 October 2012).

[90] Dorina Pojani and Dominic Stead, 'Sustainable Urban Transport in the Developing World: Beyond Megacities' (2015) 7 Sustainability 7784; Jonathan Levine and others, 'Apples to apples: Comparing BRT and light rail while avoiding the "BRTLite" trap' (2018) 69 Transport Policy 20.

[91] Ibid.

The government has also identified the construction of freight electric rail network as one of the four economy-wide strategies for fast-track interventions both for mitigating emissions and stimulating the economy in the CRGE.[92] Although about two-third (8.9 Mt CO2e) of the mitigation in the transport sector was planned to be achieved through expanding freight electric rail network (5196 km), only a little more than a quarter of the target have been commissioned in ten years. Due to shortage of finances, the planned rail networks to the south, west and north of the country are unlikely to be commissioned soon. This delay will impact the mitigation target and would require other mitigation measures to over-perform. However, it might also open the opportunity to explore other strategies that would redress the missed chances in abating freight transport emissions.

Generally, although the government has tried to use its public expenditure power to expand and improve low carbon public transport, these capital intensive measures have not changed the public transport mayhem or increased its coverage nor has it stabilised the increase in car ownership. The higher rate of urbanisation, urban sprawl, infrastructure design and planning problems, and transport service operational inefficiency are to be blamed for that. Thus, the deteriorating public transport service is a challenge for Ethiopia's mitigation plan and a reason for commuters to shift to the private car.[93] In addition to modernising its operation, more economic use of public expenditure (e.g. NMT expansion), integration of transport measures with urban planning and exploring the leapfrogging potentials could be a way forward.

Public transport is inherently capital intensive but has significant carbon mitigation potential and socio-economic benefits. However, existing service is surrounded by many technical deficiencies such as its integration with other modes, knowledge transfer and the absence of real-time information for users that made its operation inefficient and unreliable.[94] For instance, the LRT could be taken as an example where technologies are imported with little attention to the knowledge transfer and adapting its design and operation to the country's situation. This thesis argues that some of these public transport

[92] *CRGE Strategy* (2011) (n 8).

[93] Interview with manager of used car import and sales company (CI-02) (Addis Ababa, Ethiopia 27 August 2019).

[94] Nallet, 'The Challenge of Urban Mobility' (2018) (n 71) 26.

modes are a leapfrogging path and should be designed as part of the whole transport system and in a manner that reduces car use.

## 2.4 Vehicle Efficiency Improvement and Fuel Mix

### *2.4.1 Vehicle efficiency improvements*

As discussed more fully in the later chapters, the road transport sector is one of the least environmentally regulated sectors in the Ethiopian legal regime. Ambient air quality, vehicular emission and vehicle quality standards, and age limits for vehicles are absent. The specifications for vehicle production and importation do not indicate the environmental requirements.[95] Hence, the vehicle stock is dominated by high emitting used-vehicles and ageing fleets (60% of the vehicles on the road are older than 15 years).[96] Furthermore, system inefficiency and low maintenance and service practices have made such vehicles to be environmentally and economically damaging.[97]

With an annual abatement potential of 3 Mt CO2e by 2030, fuel-efficient standards (FES) is mentioned as a priority instrument under the CRGE.[98] Only second to the electric rail network, FES was expected to contribute a fourth of the transport sector's overall GHGs mitigation potential.[99] CRGE proposed a step by step implementation scheme where decreasing import duties on fuel-efficient vehicles would come before the implementation of FES in 2015.[100] However, executing these measures were overly delayed: the government has not started preparing the FES yet while a reduced tax rate for fuel-efficient vehicles was introduced only in 2020.[101] A study by Addis Ababa Institute of Technology (AAIT), however, claimed that any effort of setting FES should be preceded by a national ambient air standard

[95] Interview with an expert in the Federal Transport Authority (FTA-02) (Addis Ababa, Ethiopia 25 July 2019).

[96] Yilak Akloweg, Yoshitsugu Hayshi & Hirokazu Kato, 'The effect of used cars on African road traffic accidents: a case study of Addis Ababa, Ethiopia' (2011) 15(1) International Journal of Urban Sciences 61, 66; AAIT, 'Final Report on Pilot Global Fuel Economy Initiative Study in Ethiopia' (Addis Ababa Institute of Technology, Addis Ababa 2012) 128.

[97] See generally AAIT, 'Fuel Economy Study in Ethiopia' (2012) (n 96).

[98] *CRGE Strategy* (2011) (n 8) 178.

[99] Ibid.

[100] Ibid 177.

[101] Excise Tax Proclamation No 1186/2020.

that would serve as a reference for the former.[102] The first environmental pollution control law of 2002 has long required the formulation of ambient air quality but with no vain.[103]

Furthermore, the AAIT and the EPCC reports proposed technology standards that would further assist the attainment of fuel standards and trap other pollutants. These include technology (product) standards for pollution abatement systems like catalytic converters (similar to Euro III emission standard).[104] Banning the importation of used vehicles older than 5 or 8-10 was also proposed both to conform to the technical requirements and FES.[105] In addition, EPCC's report recommends replacing old vehicles of more than 15 years (fuel economy of less than 8 km/litre) with new vehicles (fuel economy of 12-15 km/litre) for city trips.[106]

Amending the country's fuel sulphur specification from 1000 ppm for gasoline and 5000 ppm for diesel to just 50 ppm was also proposed by the EPCC report.[107] Studies revealed that in addition to polluting the air, the higher sulphur content in the fuel decreases the efficiency and operating lifetime of new emission abatement technologies (e.g. catalytic converters).[108] After a cost-benefit-analysis, AAIT revealed that the economic cost of decreasing sulphur from 500 to 50 ppm in diesel is only about 0.05 USD per litre. The initial cost of this shift might seem higher but could be off-set by a decrease in lifetime maintenance costs and fuel economy.[109] Moreover, as environmental standards get more stringent across the world, technology and market opportunities will suppress the price of low sulphur fuels.

CRGE also envisaged the adoption of electric vehicles (EVs) as another mitigation strategy. Hence, it was estimated that increasing the fleet share of hybrid electric vehicles (HEVs) and plug-in electric vehicles (PEVs) to 13.0% and 2.2%, respectively, would have a combined

[102] AAIT, 'Global Fuel Economy Initiative Study in Ethiopia' (2012).

[103] Environmental Pollution Control Proclamation No. 300/2002, Art 6.

[104] AAIT, 'Fuel Economy Study in Ethiopia' (2012) (n 96) chaps. 5 & 6; EPCC, First Assessment Report - Working Group II- Climate Change Impact, Vulnerability, Adaptation and Mitigation VI: Industry, Transport and Infrastructure (Ethiopian panel on Climate Change, Ethiopian Academy of Sciences, Addis Ababa 2015) [EPCC, AR1 Industry, Transport and Infrastructure] 69-71.

[105] Ibid.

[106] EPCC, *AR1 Industry, Transport and Infrastructure* (2015) (n104) 54.

[107] ibid 71.

[108] AAIT, 'Fuel Economy Study in Ethiopia' (2012) (n 96) 128 and 147.

[109] Ibid.

annual abatement potential of 0.09 Mt CO2e by 2030.[110] It also stated that higher penetration of EVs could be achieved if domestic production of EVs takes off. However, as explored later in the upcoming chapters, higher penetration of EV requires incentive packages to trigger vehicle choice shift where higher initial cost is the concern for buyers, technology innovation to enhance its operational efficiency and charging infrastructures.[111]

When implemented, FES, age restriction and product standards will bring about multifaceted social, economic and environmental benefits such as reducing local air and noise pollution, decreasing traffic accident, minimising the lifetime cost of a vehicle, and improving hard currency balances.[112] Vehicle efficiency improvements through car regulation are discussed in greater details in the forthcoming chapters (5 to7) and the discussion under this section will be used as a foundation.

### *2.4.2 Biofuel – mitigation potential and sustainability*

Introducing biofuel (bioethanol and biodiesel) is another fuel-efficiency improvement strategy estimated to have an abatement potential of 0.9 Mt CO2e by 2030.[113] Ethiopia launched a biofuel strategy in 2007 and then established a biofuel unit within Ministry of Mining and Energy, launched a task force for promoting biofuel crops (mainly castor and *jatropha*) to local and foreign investors, and then started leasing out vast lands to companies.[114] It then put an ambitious target of producing 35 million litres of ethanol and biodiesel by 2015 into its five-year development plan, Growth and Transformation Plan (GTP).[115] Ethiopia has been producing ethanol and blending it with gasoline since 2008 initially at 5% (5% ethanol and 95% gasoline) which was later increased to 10% (E10).[116] The

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[110] *CRGE Strategy* (2011) (n 8) 175.

[111] AAIT, 'Fuel Economy Study in Ethiopia' (2012) (n 96)126-27; IPCC, *AR5 WGIII* (2014) (n 10) 614; Creutzig and others, 'Transport: A roadblock to climate change mitigation?' (2015) (n 13).

[112] Abera Kume and others, 'Magnitude and variation of traffic air pollution as measured by CO in the City of Addis Ababa, Ethiopia' 2010 24(3) Ethiopian Journal of Health Development 156; Akloweg, Hayshi and Kato, 'The effect of used cars' (2011) (n 96).

[113] *CRGE Strategy* (2011) (n 8)

[114] Ministry of Mines and Energy, Biofuel Development and Utilization Strategy of Ethiopia (Addis Ababa, Ethiopia September 2007); Martha Negash and Johan FM Swinnen, 'Biofuels and food security: Micro-evidence from Ethiopia' (2013) 61 Energy Policy 963, 965; Martha Negash and Olivia Riera, 'Biodiesel value chain and access to energy in Ethiopia: Policies and business prospects' (2014) 39 Renewable and Sustainable Energy Reviews 975.

[115] MoFED, 'Growth and Transformation Plan 2010/11 -2014/15' (Ministry of Finance and Economic Development, Nov 2010) [GTP I] 120.

[116] Zenebe Gebreegziabher and others, 'Profitability of Bioethanol Production: The Case of Ethiopia' (2017) 26(1) Ethiopian Journal of Economics 101, 103.

geographical coverage of the blended fuel, though, remained only around the capital due to low volume and irregularity of ethanol supply.[117] Although the production capacity of existing sugar plants is estimated to be around 20 million per annum, production remained much lower than that.[118]

Biofuel production is contentious in many respects. Biofuel or biofuel blended with diesel or gasoline is considered as a low carbon alternative to fuel because of the limited emissions during combustion which could as well be off-set by 'the absorbed CO2 during the growth of the plants for biofuel'.[119] It has been claimed that 'a vehicle using E10 (10% biofuel blend) would emit around 2% less CO2 than one using E5 (petrol with up to 5% bioethanol) for the same distance travelled.'[120] Proponents also claimed that biofuel production has co-benefits of reducing air pollution, enhancing energy security, saving hard currency, creating job opportunity for rural communities and increasing agricultural productivity.[121]

However, current technology allows optimal use of biofuel only when it is blended with conventional fossil fuels and operated in an ICE vehicle. This leaves biofuel to be a short- to mid-term solutions for reducing emissions from cars as major markets are accelerating the phase-out of ICE cars the latest by 2050.[122] However, biofuel could still be relevant to non-road and other types of vehicles (e.g. coaches, trucks, off-road machines, aviation, maritime etc) where the transition to low carbon technology is relatively slower.

The GHG mitigation role of biofuel is also contentious. Many have argued that the emissions during combustion are only part of the problem and a lifecycle assessment of biofuel production is needed to determine its overall carbon intensity. Lifecycle assessment

[117] Interview with an expert at Ministry of Minerals, Petroleum and Natural Gas (MBF-01) (Addis Ababa, Ethiopia 14 August 2019).

[118] Ibid; Sugar Corporation, 'Ethiopian Sugar Industry Profile' (Addis Ababa, May 2019); Elias W Gabisa, Cecile Bessou and Shabbir H Gheewal, 'Life cycle environmental performance and energy balance of ethanol production based on sugarcane molasses in Ethiopia' (2019) 234 Journal of Cleaner Production 43, 47.

[119] Kazuhiko Takeuchi and others (eds), Biofuels and Sustainability: Holistic Perspectives for Policy-making (Springer, 2018) 2.

[120] UK, 'The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy' (Department for Transport, 2018) 36.

[121] Takeuchi and others, *Biofuels and Sustainability* (2018) (n 119). National Bank of Ethiopia's (NBE) Annual Fiscal Report from 2008 to 2016 shows that fossil fuel on the average takes 17% of import values with the maximum of 23.8% in 2008/9 and minimum 8% register in 2015/16 mainly due to global fuel price collapse. NBE, Annual Report <www.nbe.gov.et/publications/annualreport.html> accessed 23 May 2018.

[122] CCC, 'Reducing UK Emission: 2018 Progress Report to Parliament' (Committee on Climate Change, July 2018) 49 <www.theccc.org.uk/publication/reducing-uk-emissions-2018-progress-report-to-parliament> accessed 10 Dec 2019.

requires considering the carbon footprints of every stage of the supply chain – feedstock production, transport and distribution, biofuel production, transportation and use.[123] If so lifecycle assessment of GHG emissions of some biofuel such as corn-ethanol equals emissions from gasoline combustion.[124] However, sugarcane-based bioethanol and 'second-generation' biofuels (produced from non-food crops, residue or waste materials) have higher lifecycle GHG emissions savings than biofuels produced from annual crops like maize, corn and soybean.[125]

Likewise, in Ethiopia, research found positive results on the environmental and socio-economic sustainability of bioethanol production from the sugar-cane by-product. Research on bioethanol's environmental performance through the lifecycle assessment has identified that the pre-harvest cane trash burning (agriculture stage) was the major source of GHG emissions in the bioethanol production process.[126] As these emissions are accounted for in the sugar production and not separate to ethanol production, the researchers concluded that the lifecycle emissions of bioethanol's production are much lower than gasoline combustion.[127] Similarly, after comparing the cost of production and price of bioethanol and gasoline in 2011/12, other studies concluded that the bioethanol production from molasses was economically competitive and feasible.[128]

However, both the CRGE and Biofuel strategy envisaged expansion of biofuel production beyond the limited supply from sugar cane factories into crops on marginal land.[129] Although the government announced the cost-effectiveness, presence of favourable climate and government support for biodiesel production, attempts made to produce biodiesel from jatropha and castor beans have failed to thrive for environmental, economic

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[123] Arnold W Reitze, 'Biofuel' in Daniel Farber and Marjan Peeters (eds), *Climate Change Law* (Elgar, 2016) 455.

[124] Q Yang and G Q Chen, 'Greenhouse gas emissions of corn–ethanol production in China' (2013) 252(C) Ecological Modelling 176.

[125] Takeuchi and others, *Biofuels and Sustainability* (2018) (n 119) 4 & 67; Annette Cowie and others, 'Environmental risks and opportunities of biofuels' in Yves Le Bouthillier and others (eds) *The Law and Policy of Biofuels* (Edward Elgar, 2016).

[126] Gabisa, Bessou and Gheewal, 'Life cycle environmental performance and energy balance of ethanol' (2019) (n 118) 48.

[127] Ibid.

[128] Gebreegziabher and others, 'Profitability of Bioethanol in Ethiopia' (2017) (n 116) 117; ibid.

[129] Biofuel Strategy (2007) (n 114); *CRGE Strategy* (2011) (n 8) 172.

and ecological reasons.[130] Thus, biodiesel feedstocks production in Ethiopia has raised ethical and sustainability issues including land suitability, biodiversity encroachment, forest clearance, land-use rights prejudices and food-crop field displacement.[131] Yet again, both the large scale and out-growers plantations of castor and Jatropha crops have produced insufficient yields to make it economically and socially viable investment.[132]

Another concern is the absence of comprehensive legal and institutional frameworks to protect the ethical and sustainable production of biofuel.[133] The enthusiasm of companies and the government, partly due to the global fossil fuel price hikes in 2007/08, has led to the allocation of prime agriculture lands, forests and other important biodiversity conservation areas to biofuel production in a non-transparent deal and in contravention of the country's laws.[134]

Hence, apart from bioethanol production from sugar cane and other by-products, biofuel production is not feasible either on environmental or socio-economic grounds. Perhaps the poor land management and competition with food crops and resulting local and international pressure have forced the Ethiopian government to downsize its enthusiasm for biodiesel development.[135]

## 2.5 Non-Motorised Transport (NMT)

NMT has not featured in the CRGE nor the NDC. But the government has recently enacted NMT strategies aimed at stimulating its use and improve the infrastructure.

[130] Biofuel Strategy (2007) (n 114); Anna Locke and Giles Henley, 'Scoping report on biofuels projects in five developing countries' (Overseas Development Institute (ODI), London, May 13, 2013); Mengistu Assefa Wendimu, Jatropha potential on marginal land in Ethiopia: Reality or myth?' (2016) 30 Energy for Sustainable Development 14.

[131] Hilawe Lakew and Yohannes Shiferaw, 'Rapid Assessment of Biofuels Development Status in Ethiopia' (MELCA Mahiber, Addis Ababa Ethiopia, September 2008).

[132] ABN, ESCP and Gaia, 'Biofuels - A Failure for Africa' (2010) 2 <http://worldfamilyonline.org/wp-content/uploads/2011/11/Biofuels-FailureForAfrica.pdf> accessed 30 June 2020; Negash and Riera, 'Biodiesel value chain and access to energy in Ethiopia' (2014) (n 114) 983.

[133] ABN, ESCP and Gaia, 'Biofuels - A Failure for Africa' (2010) (n 132) 3; Oskar Englund and Goran Berndes, 'The roles of public and private governance in promoting sustainable bioenergy' in Yves Le Bouthillier and others (eds), *The Law and Policy of Biofuels* (Edward Elgar 2016) 53; Gebreegziabher and others, 'Profitability of Bioethanol in Ethiopia' (2017) (n 116) 118.

[134] Lakew and Shiferaw, 'Biofuels Development Status in Ethiopia' (2008) (n 131); Negash and Riera, 'Biodiesel value chain and access to energy in Ethiopia' (2014) (n 114) 976; Brigitte Portner, 'Frames in the Ethiopian Debate on Biofuels' (2013) 3 Africa Spectrum 33, 42.

[135] Interview with an expert at Ministry of Minerals, Petroleum and Natural Gas (MBF-01) (2019); Negash and Riera, 'Biodiesel value chain and access to energy in Ethiopia' (2014) (n 114).

### *2.5.1 Mitigation potential and opportunities*

Well-designed NMT is immune from many of the modern transport problems such as congestion, the unpredictability of travel times, and health and environmental effects.[136] NMT is also known to have a significant climate mitigation value in different contexts. In Bogota, Colombia, with a population of 6.7 million, the 3.3% modal share of cycling were found to avoid 151 tons of CO2 per day and 55,000 tons of CO2 per year.[137] In an earlier study on Dutch cities where cycling accounts 14% to 36% modal share, cycling brought a per capita saving of 34 – 143 kg CO2 per year.[138] Similarly, in the South African city of Cape Town, city officials assessed that an increase of cycling modal share from 1% to 8% would save 3.26 million tons of CO2 over 15-years which amounts to 58 kg of CO2 saving per person per year.[139] Upgrading Nairobi's NMT infrastructures and increasing its modal share from 40% to 43% was anticipated to result in 7% CO2 saving, and decrease in petrol and diesel use by around 8% and 5% respectively.[140]

Similar studies and baseline data are absent in Ethiopia, and the new NMT strategies did not assess the mitigation potential of the proposed measures. However, comparing the above figures from other cities with mitigation strategies adopted in Ethiopia reveals the enormous potential of NMT. For instance, Addis Ababa's multi-million dollar LRT project with its 34 km corridor was estimated to save 100,000 tons of CO2 per year.[141] This is only double the mitigation potential of a 3.3% modal share of cycling in Bogota and half the mitigation potential of an 8% modal share of cycling in Cape Town. Certainly, increasing the modal share of cycling in Addis Ababa with its more than 5 million population and other cities will have a significant mitigation effect.

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[136] Katherine Pérez and others, 'The health and economic benefits of active transport policies in Barcelona' (2017) 4 Journal of Transport & Health 316; Becky P Y Loo & Alhassan Siiba, 'Active transport in Africa and beyond: towards a strategic framework' (2019) 39(2) Transport Reviews 181.

[137] Roel Massink, Mark Zuidgeest, Jaap Rijnsburger, Olga L. Sarmiento and Martin van Maarseveen, 'The Climate Value of Cycling' (2011) 35 Natural Resources Forum 100.

[138] Mark Zuidgeest, Mark Brussel, Yang Chen, Roel Massink and Martin van Maarseveen, 'A Comparative Analysis of the Climate Value of Cycling in Dutch Cities' (Association for European Transport 2011) <https://aetransport.org/public/downloads/937LN/5157-514ec60883b0f.pdf> accessed 23 June 2020.

[139] UN Environment, 'Calculating the potential climate value of Non-Motorised Transport projects in African Cities' (UN Environment, Nairobi 2019) <www.unep.org/Transport/SharetheRoad> accessed 23 June 2020.

[140] Ibid.

[141] *CRGE Strategy* (2011) (n 8) 172.

Besides its mitigation potential, NMT is known to improve the health and socio-economic wellbeing of communities.[142] Perhaps, its multiple economic and social co-benefits make NMT a pro-poor strategy: the cheapest mode of transport, enhance mobility of suburbs which otherwise are inaccessible with other modes and enhance connectivity with social and economic opportunities.[143] Likewise, a report found that shifting current Addis Ababa's trips covered by walking and motorisation to cycling could save cost and time, enhance personal safety and improve the health of commuters.[144] As traffic congestion has already begun to be a significant problem for Addis Ababa, NMT could also reduce travel time if used for short-distance trips.[145]

NMT is already a major means of transport in Ethiopia both in urban and rural settings.[146] In regional cities which have a favourable plain topography and a lower rate of motorisation (eg Dire Dawa, Hawassa, Bahir Dar, Mekelle, etc), cycling was widely practised and made up to 90% of the vehicle trips.[147] A panel data is missing to compare the change in modal share over time, particularly over the last few years where researchers argued that a significant number of NMT users have shifted to motorcycle and three-wheeled taxis.[148] Like in most other cities in DCs, NMT use is declining in Ethiopia, mainly due to income growth, unfavourable NMT infrastructure and resulting safety concerns.[149]

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[142] Eric Morris and Erick Guerra, 'Mood and mode: does how we travel affect how we feel?' (2015) 42(1) Transportation 25.

[143] Elliot Fishman, Simon Washington and Narelle Haworth, 'Bike Share: A Synthesis of the Literature' (2013) 33(2) Transport Reviews 148; John Pucher and Ralph Buehler, 'Cycling towards a more sustainable transport future' (2017) 37(6) Transport Reviews 689.

[144] Tulu, Hadgu and Tarekegn, 'Bicycling in Addis Ababa' (2019) (n 58) 53.

[145] Abel Kebede and Girma Gebresenbet, 'Mapping out goods flow to Addis Ababa city, Ethiopia, and it impact on environment' (2017) 25 Transportation Research Procedia 1008.

[146] AA NMT Strategy (2018) (n 49) 4; Tulu, Hadgu and Tarekegn, 'Bicycling in Addis Ababa' (2019) (n 58) 56.

[147] MoT, *Ethiopia NMT Strategy* (2020) (n 49) 6; Interview with an official at Federal Transport Authority (FTA) (FTA-03) (Addis Ababa, Ethiopia 8 August 2019); Belew Dlagnew Bogale, 'The importance and challenges of low-cost mobility modes for sustained socio-economic and environmental development in cities of Africa: Comparative analysis of bicycle transport in Bahir Dar and Hawassa cities in Ethiopia' (Conference CODATU XV. The role of urban mobility in (re)shaping cities, Addis Ababa. Ethiopia, 2012); Gebrechristos Nuriye, SSA Jafri and Melesse Asfaw, 'Trends and factors affecting the use of non-motorised modes of transportation in Hawassa City, Ethiopia' (2014) 6(5) Civil and Environmental Research 103.

[148] Nuriye, Jafri and Asfaw, 'Trends and Factors Affecting the Use of NMT' (2014) (n 147); MoT, 'Existing conditions for pedestrians and cyclists in Ethiopia' (Ministry of Transport, UNEP and Institute for Transportation and Development Policy (ITDP) Addis Ababa, Ethiopia, June 2019).

[149] UN Environment, 'Global Outlook on Walking and Cycling 2016: Policies & realities from around the world' (UN Environment, Nairobi 2016) <www.unep.org/Transport/SharetheRoad> accessed 24 June 2020.

### *2.5.2 NMT policies*

When it comes to public policy, NMT is misunderstood to have a limited impact compared with capital intensive infrastructures like road expansion and mass transit.[150] For instance, the fact that most Ethiopians walk or bike was taken for granted for so long, and policy measures have ignored the importance of improving the low-quality infrastructure. Hence, although most of the existing paved roads were constructed in the last decade, 88.4% of the roads in Addis Ababa do not have pedestrian footpaths, and none of them have bike lanes or marks.[151] Instead, road construction and other urban development projects have consumed walking and recreation spaces, thereby accelerating the fast deteriorating walking and cycling practices.[152]

In many circumstances, modifying existing urban infrastructure to include NMT features (e.g. bicycle lanes) can be achieved at little cost.[153] A cost-benefit study of the provision of NMT infrastructures in the form of traffic calming measures and construction of cycle tracks and footpaths in Addis Ababa found that it would generate the highest benefits to communities and is ‘economically viable’.[154] It argued that the benefits of these measures such as reduced accident and fatality and enhanced speed and comfort for pedestrians and cyclists outweigh the costs incurred on the infrastructure expansion.[155] However, sound policies were missing for years.

Designing a tailored policy for promoting NMT is a recent global phenomenon, especially in DCs.[156] NMT started to feature in Ethiopian policy spaces since the 2011 Transport Policy of Addis Ababa. This policy stated that expanding pedestrian walkway and bicycle networks are key strategies for easing traffic, ensuring safety and promoting its use.[157] However, the stipulations were too broad to implement, institutional responsibilities were not devolved

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[150] Adriana Ortegon-Sanchez and Daniel Oviedo Hernandez, ‘Assessment of the potential for modal shift to non-motorised transport in a developing context: Case of Lima, Peru’ (2016) 60 Research in Transportation Economics 3.

[151] Getu Segni Tulu and others, ‘Injury severity of pedestrians involved in road traffic crashes in Addis Ababa, Ethiopia’ (2017) 9 Journal of Transportation Safety & Security 47.

[152] AA NMT Strategy (2018) (n 49) 6.

[153] Creutzig and others, ‘Transport: A roadblock to climate change mitigation?’ (2015) (n 13) 912.

[154] Dipti Ranjan Mohapatra, ‘Feasibility of Non-Motorised Transport Facilities in Addis Ababa City of Ethiopia: An Economic Analysis’ (European Academic Research Vol. II, Issue 10/ January 2015) 13347.

[155] Ibid 13367.

[156] UN Environment, ’Global Outlook on Walking and Cycling 2016’ (2016) (n 149) 12ff.

[157] AA Transport Policy (2011) (n 73) 21, 23ff.

to specific agencies, and local administrations and implementation of these strategies were ignored for long. Even the CRGE strategy claimed that e-commerce, scooters and bicycling are not of immediate concern due to their alleged limited abatement potential or enforcement challenges.[158]

Nevertheless, the transport sector CRGE identified promoting and improving 'walking and cycling links to and between high-density growth centres' as a key mitigation strategy and set general performance targets.[159] Moreover, it set to improve the perception of NMT accessibility, increase the modal share of walking and cycling in urban areas to 35% (measured in terms of trip legs), increase 'the average distance travelled by walking per person over five years of age to 1.3 km per day', and increase 'the number of cyclist movements at defined survey points.'[160] Yet again it was short of detailing its abatement potential, identifying specific activities and how the improvements could be achieved. Hence, it was unable to induce a deliberate plan of action to change the course of action, garner political will and improve the infrastructure deficit.

The policy space has recently expanded with a standalone strategy. With the support of the UNEP and Institute for Transport Development of Policy (ITDP), Addis Ababa city issued its NMT Strategy in 2018 followed by a national NMT Strategy in 2020.[161] The national strategy identified five major features of the NMT: the absence of complete pedestrian realm, absence of cycling facilities, lack of bicycle rentals, poorly managed on-street parking and road safety. The strategies recognised that car-oriented development has consumed playing, recreation and public spaces and resulted in hazardous streets dangerous for walking and cycling.[162] Furthermore, streets are not equipped with the necessary facilities such as pedestrian crossings, traffic calming features, kerb ramps and tactile paving to allow quality walking and universal access to it.[163] Hence, the strategies envisaged attaining an equitable allocation of urban space and roads.[164] However, it requires key policy decisions

[158] *CRGE Strategy* (2011) (n 8) 177-78; EPCC, *AR1 Policy and Institutional* (2015) (n 4).
[159] MoT, 'Ethiopia's Climate Resilient Transport Sector Strategy' (2016) (n 59) 10.
[160] Ibid, 12, 15 and 16.
[161] MoT, *Ethiopia NMT Strategy* (2020) (n 49).
[162] AA NMT Strategy (2018) (n 49) 6.
[163] Ibid 8; MoT, *Ethiopia NMT Strategy* (2020) (n 49) 7.
[164] AA NMT Strategy (2018) (n 49) 5; MoT, *Ethiopia NMT Strategy* (2020) (n 49) 1.

and coordination among different organs to reclaim streets from car-oriented activities and private encroachment.

One such effort is the plan to establish pedestrian precincts or car-free corridors in what it calls 'high-priority locations' of Piazza, Megenagna, Merkato and Churchill South which are characterised by a high volume of pedestrians.[165] Such car-free corridors encourage interactive and safe walking and cycling corridors. Besides sound parking management through rationalisation of on-street parking, a market based on-street parking fee, defining rules, and robust implementation of it will also free spaces for more productive and healthy activities.[166]

The NMT strategy reiterated that the promotion of NMT, along with the expansion of efficient public transport, is a potential GHGs mitigation and energy use reduction measure.[167] Accordingly, it set a ten-year plan and target to expand and promote NMT in 11 secondary cities and Addis Ababa.[168] For Addis Ababa the target was, inter alia, to increase the modal share of NMT (to 60% or above), reduce car use and improve road safety.[169] For this, the Addis Ababa NMT Strategy proposed a detailed street design and management, traffic calming features, two metres wide pedestrian walkways, crosswalks, and cycling paths.[170]

The Addis Ababa strategy proposed to start a bicycle sharing system in central areas such as Mexico, Meskel Square, Bole, and Urael/Atlas.[171] An entry-level bike-sharing scheme should target schools and other service centres, connectivity to mass transport systems and terminals. This is planned to benefit low-income groups and students as last-mile connectivity to public transport, short distance trips and those who want to explore the city. However, besides expanding the infrastructure, boosting the confidence of commuters and families require coordinated, sustained and tailored promotional and marketing engagement, and fighting the cultural barrier that associate NMT with poverty.

[165] AA NMT Strategy (2018) (n 49) 14-15.
[166] Ibid 26-27; MoT, *Ethiopia NMT Strategy* (2020) (n 49) 42-43. See also Chapter 6 on parking regulation.
[167] MoT, *Ethiopia NMT Strategy* (2020) (n 49) 17.
[168] ibid 19.
[169] AA NMT Strategy (2018) (n 49) 10; ibid 20.
[170] AA NMT Strategy (2018) (n 49).
[171] ibid 20 & 24.

### *2.5.3 Regulatory instruments*

Besides enacting the NMT strategy, success is contingent on many other things such as establishing the institutional base, building technical skills at a local level, defining the business model, and designing additional regulatory instruments.[172]

The upfront cost of acquiring bikes and maintenance costs are found to be major barriers for owning a bike especially for the lower-income groups and youths who historically use bikes.[173] That was partly due to the multiple taxes imposed on bikes and the absence of local manufacturing of the same. For a long time, bicycles and other cycles were subject to cumulative import duty and taxes of 54.8% which comprises of customs duty (20%), VAT (15%), surtax (10%) and withholding tax (3%).[174] However, the new customs tariff and excise tax have exempted bicycles and other cycles from customs duty and excise tax.[175] Even then, financial support and tax reliefs are required for lower-income groups and students to encourage early movers and risk-takers.

Furthermore, Ethiopia does not have a tailored traffic regulation that ensures the safety and security of pedestrian and cyclists except the conventional traffic regulation laws that leans towards motorised transport. Reckless driving and intimidation are common that will further curtail people from cycling, especially during peak hours.[176] Hence, pedestrians and cyclists are exposed to a disproportionate level of risk on health and life - 80% of the traffic accident causalities in Addis Ababa and 55% at the national level are pedestrians.[177] Stronger legal protection for cyclists, especially in mixed traffic zones, and traffic calming systems in walking and bike corridors are some of the measures that could help to build

[172] Interview with an expert at Addis Ababa Transport Projects Management Office (TPMO) (TPMO-01) (Addis Ababa, Ethiopia 30 July 2019); UN Environment, 'Global Outlook on Walking and Cycling 2016' (2016) (n 149) 35.

[173] Tulu, Hadgu and Tarekegn, 'Bicycling in Addis Ababa' (2019) (n 58) 51.

[174] ASYCUDAA, 'Ethiopian Tariff Rates' (2012) (Unpublished, Ethiopian Customs Commission, Ethiopia); ECC, General Rules For The Interpretation Of The Harmonized System (2012) (Ethiopian Customs Commission) 55.9

[175] Excise Tax Proclamation No 1186/2020; MoFEC, 'Customs Tariff Amendment No. 8 Based on the 2017 Version of the Harmonised System' (July 2019, Addis Ababa).

[176] Interview with an official in the MoT (Ministry of Transport) (MoT-01) (Addis Ababa, Ethiopia 22 July 2019). See also Mohammed Seid, Aklilu Azazh, Fikre Enquselassie and Engida Yisma, 'Injury characteristics and outcome of road traffic accident among victims at Adult Emergency Department of Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia: a prospective hospital based study' (2015) 15(10) BMC Emerg Med .

[177] Addis Ababa City Administration, 'Addis Ababa Road Safety Strategy Implementation Plan, 2018-2030' (Addis Ababa, Ethiopia 2017) 8; MoT, 'Existing conditions for pedestrians and cyclists in Ethiopia' (2019) (n 148) 18.

confidence in the system. Existing traffic law only requires wearing helmets but is silent in many other situations such as wearing reflective clothes at low visibility conditions to minimise the risks of accidents.

Although recent changes are witnessed on the desire to invest in physical infrastructure, creating a functioning NMT system, building management capabilities, mainstreaming the strategies to sectoral plans and creating functional coordination has yet to be achieved. In this regard, as indicated in the preceding chapter, NMT could be a potential leapfrogging path for urban mobility and decouple transport demand from carbon emissions. Such is the case when an innovative business model is designed that will stimulate the private sector and technology solutions to contribute. ICT supported bike-sharing schemes with a user-firm interface are used worldwide and could be adapted to local needs. They create jobs for local businesses, ensure the sustainability of cycling, enhance the accessibility of the system, enable tracking bikes' location and thereby minimise theft, allow users to locate parking, and produce the data for future policy decisions.

However, such strategic decisions and a functioning NMT system require a stronger and capable institutional structure. Unfortunately, NMT matters are currently coordinated under a small unit within transport offices that are overwhelmed with other activities and not empowered to make strategies decisions.[178] As presented below, the institutional setup has restricted the ability to design and execute mitigation strategies in the transport sector.

## 2.6 Climate Governance

### *2.6.1 Institutional set up for transport mitigation*

The capacity and systemic integration of institutions, narrowly defined to mean formal government/non-government entities, is vital for the success of the transport strategies. The IPCC assessed that despite the growing number of climate-related legislation and policies in DCs, the capacity to design and execute instruments, mainstream and integrate activities, and learn and adapt to changing circumstances constrained the attainment of

[178] Interview with an expert at FTA (FTA-03) (2019); Interview with an expert at Addis Ababa TPMO (TPMO-01) (2019).

climate objectives.[179] Hence, institutional dynamic and capacity should be enhanced to respond to the growing threat and complexities of climate change.[180]

Of all the institutions at the federal level, the Ministry of Transport (MoT) and Federal Transport Authority (FTA) are highly involved in designing and executing transport mitigation strategies.[181] This is partly due to the public expenditure nature of mitigation strategies adopted in Ethiopia. MoT chaired the CRGE Transport sectoral technical committee (STC) that provided national data on emission level and calculated the abatement potentials of different strategies.[182] The statutory powers given to MoT include, inter alia, to 'identify and implement measures that mitigate the impact of transport infrastructure and services on the environment and the climate'. [183] Similarly, FTA is empowered to prepare and execute 'standards relating to the smoke, gas, vapour and the like emitted from the exhaust pipes of vehicles.'[184] Although it broadly falls under the duties of MoT and FTA, there was no specific mention of the development of NMT infrastructure and service in the legislation. MoT's empowerment over broader and general but specific to climate change tasks demonstrate the change in the understanding of climate threats over time and promise to act. Indeed, the long lists of statutory powers given to MoT and FTA demonstrate that if there is a political will, there are institutions to design and execute the necessary regulatory instruments.

Besides, the Environment, Forest and Climate Change Commission (EFCCC) is empowered to formulate policy and legislation and monitor environmental performances across the country.[185] EFCCC is an example of institutional instability that has experienced more than five significant restructurings since its establishment as Environmental Protection Authority (EPA) in 1995.[186] The Commission is generally empowered to 'coordinate actions on

[179] IPCC, *AR5 WGIII* (2014) (n 10) Chap. 15.

[180] Rebecca Adler and others, 'Approach to monitoring and evaluation of institutional capacity for adaptation to climate change: The case of the United Kingdom's investment to Ethiopia's climate-resilient green economy' (2015) in D Bours, C McGinn and P Pringle (eds.), *Monitoring and evaluation of climate change adaptation: A review of the landscape. New Directions for Evaluation* 61–74.

[181] Interview with an official in the MoT (MoT-01) (2019); Interview with an official in the FTA (FTA-01), (Addis Ababa, Ethiopia 8 August 2019).

[182] *CRGE Strategy* (2011) (n 8) 165.

[183] Definition of Powers and Duties of the Executive Organs of the Federal Democratic Republic of Ethiopia Proclamation No 1097/2018 [Executive Organs Establishment Proclamation] Art. 21(2) and (5).

[184] Transport Proclamation No. 468/2005, Art 7(1)(h).

[185] Executive Organ Establishment Proclamation No 1097/2018, Art 32(3) and 33(3).

[186] Environmental Protection Authority Establishment Proclamation No 9/1995.

soliciting the resources required for building a climate-resilient green economy', and propose incentives or disincentives to promote environmental observance.[187] However, it has barely involved in designing or monitoring transport mitigation strategies and was overshadowed by transport offices.[188]

Understandably, institutional capacity to design and execute mitigation strategies other than infrastructure development is relatively weak. That is so true, especially in designing and executing more complex instruments like economic instruments and integrating activities spread across different offices. For instance, tax and custom related matters fall under the jurisdiction of fiscal departments but could be initiated by transport, energy or environmental departments. Similarly, the environmental department determines environmental standards but would be in consultation with transport and energy departments that ultimately executes and monitors its implementation. Yet that coordination is currently lacking. The widespread institutional instabilities characterised by amalgamation and division, establishment and dissolution, and the reshuffling of powers and responsibilities within the executives might have affected CRGE's slow progress.

### *2.6.2 Stakeholders and local community*

The participation of stakeholders (civil society, local community, media etc) including local government entities during the designing and implementation of CRGE is questionable.[189] Reports indicated that consultation for CRGE was not extensive and was essentially built on previous consultations done for the GTP.[190] Furthermore, even if the government claimed that it had engaged local experts to the extent possible, the design process heavily relies on

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[187] Environmental Pollution Control Proclamation No.300/2002, Art 10; Definition of Powers and Duties of the Executive Organs of the Federal Democratic Republic of Ethiopia Proclamation No. 916/2015, Art. 30(1)(d &k).

[188] Interviews with an official (EFCCC-01) and expert (EFCCC-02) in Environment, Forest and Climate Change Commission (EFCCC) (Addis Ababa, Ethiopia 11 July 2019).

[189] Lindsey Jones and Elizabeth Carabine, 'Exploring political and socio-economic drivers of transformational climate policy: Early insights from the design of Ethiopia's climate resilient green economy strategy, (2013) (Overseas Development Institute [ODI] Working Paper, London) <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8617.pdf> accessed 27 May 2018) 10-13.

[190] Amelie Cesar and Anders Ekbom, 'Ethiopia Environmental and Climate Change Policy Brief' (Sida's Helpdesk for Environment and Climate Change 2013); World Bank, 'Ethiopia: (Intended) Nationally Determined Contributions (I)NDC' (2016) <http://spappssecext.worldbank.org/sites/indc/PDF_Library/et.pdf> accessed 20 April 2018. World Bank revealed the absence of stakeholders, community, parliament, and inter-ministerial consultation during the preparation of INDC.

the technical inputs of external consultants and research institutes, like the South Korean initiated Global Green Growth Initiative (GGGI), with very few involvements of Ethiopian experts from selected ministries and research institutions.[191] There is not any evidence to show the participation of stakeholders and local communities in the formulation process. A study conducted in 2014 around the central Rift Valley area of the country revealed that very few people heard about the CRGE, and it was from radio.[192] Another report also indicated that the knowledge and awareness of climate change issues among the CRGE units established at regional and district level were not strong.[193]

Similarly, civil societies and media played little role in the process. The sluggish democratisation process in Ethiopia has retarded the development of civil societies and media to stir discourses on policy matters and raise community awareness in general. Although the situation is changing under PM Abiy's administration, the ruling party considered civil societies as a threat to the system and tightened the playing ground since the widely contested 2005 election and political unrest.[194] The restrictions included prohibiting international NGOs from participating in advocacy activities, requiring local NGOs that engage in advocacy activities to raise 90% of their resources from within the countries, and restricting administrative expenses of all NGOs only to 30% of their budget.[195] Only civil societies that execute development related works operated in relative ease. Others had left the country or were forced to rebrand or switch their activities to less proscribed areas.[196] Hence, government policies and decisions were rarely questioned and made to be the subject of mainstream discourse.

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[191] Interview with an expert in an environmental consulting firm (EC-01) (2019); *CRGE Strategy* (2011) (n 8) iii; Jones and Carabine, 'Exploring political and socio-economic drivers' (2013) (n 189); Christopher John Paul and Erika Weinthal, 'The development of Ethiopia's Climate Resilient Green Economy 2011–2014: implications for rural adaptation' (2018) Climate and Development 1.

[192] Paul and Weinthal, 'The development of Ethiopia's CRGE' (2018) (n 191).

[193] Zewdu Eshetu and others, 'Climate finance in Ethiopia' (Overseas Development Institute (ODI), London and the Climate Science Centre, AAU Addis Ababa 2014) 31.

[194] Sisay Alemahu Yeshanew 'CSO Law in Ethiopia: Considering its Constraints and Consequences' (2012) 8(4) Journal of Civil Society 369; Kendra E Dupuy, James Ron and Aseem Prakash, 'Who survived? Ethiopia's regulatory crackdown on foreign-funded NGOs' (2014) 22(2) Review of International Political Economy 419.

[195] Charities and Societies Proclamation Proclamation No. 621/2009.

[196] Dupuy, Ron and Prakash, 'Who survived?' (2014) (n 194).

Such restrictions were extended to media and freedom of speech.[197] The 2008 media law and 2009 anti-terrorist law exposed journalists to an arbitrary arrest, prolonged detention, intimidation and systemic censorship.[198] Such actions had frightened independent media outlets and subdued critical voices on sensitive policy matters and administrative decisions.[199] In the 2018 World Press Freedom Index, Ethiopia ranked 150 out of 180 countries.[200] Thus, the public was left only with untrustworthy state-controlled media that rarely question government actions.[201] Although most of these laws have been changed under PM Abiy's administration to provide relative freedom of media and civic society, it is yet to nurture transparent discourses and trigger public engagement on policy and development programmes. As will be revealed in the later chapters, low involvement of stakeholder influences the regulatory design and execution.

Besides CRGE and climate policy framing were considered as the personal business of the late PM Meles, a passionate climate change activist.[202] He chaired the Ministerial Technical Committee (MTC), closely monitored its implementation and brought foreign consultants to spearhead the architect.[203] His government's political commitment earned him global support which in turn helped him to galvanise global support to his green programmes.[204] Little has been revealed to evaluate the progress in partnership and financial flows after Meles's unexpected death in August 2012. Yet respondents revealed that the weak execution of mitigation strategies demonstrates that performances are well below the target.[205]

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[197] Iginio Gagliardone, 'New media and the developmental state in Ethiopia' (2014) 113(451) African Affairs 279.

[198] Freedom of the Mass Media and Access to Information Proclamation No. 590/2008; Anti-Terrorism Proclamation No.652/2009; Lovise Aalen and Kjetil Tronvoll, 'The End of Democracy? Curtailing Political and Civil Rights in Ethiopia' (2009) 36(120) Review of African Political Economy 193; Henok Abebe Gebeyehu, 'Freedom of Expression and the Ethiopian Anti-Terrorism Proclamation: A Comparative Analysis' (2016) 5 Haramaya Law Review 87.

[199] Mesenbet A Tadeg, 'Freedom of Expression and the Media Landscape in Ethiopia: Contemporary Challenges' (2016) 5(1) University of Baltimore Journal of Media Law & Ethics 69.

[200] Reporters Without Borders, <https://rsf.org/en/ethiopia> accessed 13 June 2018.

[201] Terje S Skjerdal, 'Development journalism revived: The case of Ethiopia' (2011) 32(2) Ecquid Novi: African Journalism Studies 58.

[202] Paul and Weinthal, 'The development of Ethiopia's CRGE' (2018) (n 191).

[203] Jones and Carabine, 'Exploring political and socio-economic drivers' (2013) (n 189).

[204] Ibid.

[205] Interview with an expert in an environmental consulting firm (EC-01) (2019).

Thus, the top-down approach taken during the preparation of both NDC and CRGE, the delay in institutionalising the strategies and supporting it with specific instruments have further delayed its execution and mainstreaming.[206] It largely remained as a high-level policy initiative that has not been complemented with meticulous sectoral plans (until very recently) and statutory enforcement tools.[207]

## 2.7 Conclusion

Ethiopia designed its initial mitigation strategy in 2011 and remained in force albeit with some additional sectoral strategies prepared recently. Many have considered Ethiopia's mitigation target as ambitious, but little was done to assess and evaluate the effectiveness of the mitigation strategies envisaged to achieve the goal. This chapter tries to fill that gap, by critically evaluating the transport sector mitigation strategies and the flaws and gaps in it.

The country identified specific sectoral mitigation strategies such as the execution of green transport technologies, like an electric train, biofuel and hybrid and electric vehicles, and fuel-efficient standards. The strategies prioritised public expenditure measures followed by direct regulation with little contribution from other policy instruments like information and economic instruments. Moreover, the measures lacked comprehensiveness in utilising the mitigation potential where 'shift' strategies were completely overlooked (e.g. NMT) until very recently. Furthermore, the widespread institutional instabilities within the executives and the absence of developed civil society and community participation affected the mitigation process.

The current strategies were chosen principally for their socio-economic benefits such as improving transport services than its climate mitigation potential. Hence, they are mostly capital intensive measures that the state would execute with little involvement of stakeholders. As would be seen in detail in the coming chapter, such developmental state-oriented measures consider state intervention as the major catalyst of change and direct regulation as the major instrument. Thus, halfway into the implementation of CRGE, most

[206] Cesar and Ekbom, 'Ethiopia Environmental and Climate Change Policy' (2013) (n 190).

[207] Fisher, 'Low-carbon resilient development' (2013) (n 41); Paul and Weinthal, 'The development of Ethiopia's CRGE' (2018) (n 191).

of the planned mitigation strategies have not been executed, and Ethiopia is likely to miss its mitigation targets.

Many things have changed since the CRGE was prepared almost a decade ago. Our understanding of the climate, the nature of transport services, interaction with competing social forces, evidence on the effectiveness of mitigation strategies etc have improved. However, the discussions above exposed the gaps in adapting to such changing circumstances and design timely responses. Unfortunately, the lessons and challenges faced in executing the mitigation strategies are not well documented, informed policy decisions and used as evidence to design better strategies for road transport. This thesis attempts to fill such a gap.

Leapfrogging to low-carbon technologies was thought to be the leading strategy for the transport sector. However, apart from the construction of Addis-Djibouti freight railway and Addis Ababa LRT, and as can be revealed in the coming chapters, Ethiopia is on the course of catching up with the carbon-intensive transport systems that high-income countries have gone through. Furthermore, the government executes other programmes that have a perverse impact on transport emissions. In the presence of increasing emissions from road transport, the government has continued to invest in road development programmes more than other low-carbon modes. With the view of understanding the triggers of such carbon-intensive transport modes, the next chapter discusses the road expansion programme – its socio-economic arguments and the impact on the mitigation target.

*Table 2-2 The Transport Sector Abatement Strategies*

| No | Planned abatement (reduction) strategies | Abatement potential (Mt CO2e by 2030 | Instrument type indicator | Result matrix analysis | Implementation Stage |
|---|---|---|---|---|---|
| ***I. Improving public transport system in Addis Ababa*** | | **0.1 Mt CO2e** | | | |
| 1 | Bus Rapid Transit (BRT) | 0.04 | Public Expenditure | Shift | Under construction |
| 2 | Light Rail Transit (LRT) | 0.1 | Public Expenditure | Shift | Operational |
| ***II. Improving vehicle efficiency*** | | **3.1 Mt CO2e** | | | |
| 3 | Fuel-Efficient Standard (FES) (vehicle standards, fuel quality standards) | 3.1 | Regulatory approach + Market Instruments + Information inst | Improve | Not started |
| ***III. Changing the fuel mix*** | | **1.0 Mt CO2e** | | | |
| 4 | Biofuel (biodiesel and ethanol) mix | 0.9 | Public Expenditure + Market Instruments | Improve | Ethanol produced but not biodiesel |
| 5 | Hybrid vehicles | 0.09 | Market Instruments + Information inst | Improve | Law enacted 2020 |
| 6 | Plug-in electric vehicles | 0.04 | Market Instruments + Public Expenditure + Information inst | Improve + Shift | Law enacted 2020 |
| ***IV. Constructing electric rail network for freight transport*** | | **8.9 Mt CO2e** | | | |
| 7 | Electric rail network | 8.9 | Public Expenditure | Shift | Partly operational (a fifth of the target) |
| ***V. Less potential strategies*** | | | | | |
| | *Encouraging non-motorised transportation (e-commerce, scooters, bicycle)* [f] | *Not specified* | Public Expenditure + Information Inst | Avoid | Pilot projects underway |
| | *Changing roads from gravel to asphalt and establishing dry ports* [f] | *Not specified* | Public Expenditure | Improve | Under execution |
| **Total** | | **13.2 but adjusted to 12.2** | | | |

Source: Computed from CRGE (2011)

# Chapter 3
# Socio-Economic Conditions of Ethiopian Road Infrastructure

## Introduction

The Carbon Resilience Green Economy (CRGE) strategy was prepared to pursue 'a sustainable model of growth' through stimulating investments in green developments and reach a middle-income country by 2025.[1] It reiterated that the conventional development path (that Ethiopia wanted to avoid) would result in adverse environmental impacts and was financially unsustainable.[2] As discussed in the introductory chapter, and developed in the preceding one, 'leapfrogging to the newest and best technology rather than reproducing each evolutionary stage undergone by already-developed economies' is mentioned as a major strategy in the transport sector.[3] However, very little was executed in fostering leapfrogging paths, and it remained well behind the targets.

Instead, Ethiopia has mainly focused on expanding its road network significantly in the past two decades and more specifically in the last decade. The Ethiopian government continues to invest a large sum of money to road development claiming that it will stimulate economic growth, enhance the accessibility of services and economic opportunities, lift disadvantaged and marginalised areas and foster regional integration.[4] This effectively leaves the country in pursuit of the conventional development path than a green model.

This chapter presents a critical review of the drivers of Ethiopia's road infrastructure development and the mixed reaction to road's socio-economic importance and sustainability. On the one hand, development and economics scholars, supported by national and multilateral development institutions, tend to emphasise the positive economic impact of road expansion in the region such as contributing to alleviating the widespread poverty and stimulating economic transformations.[5] In contrast, ethnographic

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[1] Ethiopia, Climate-Resilient Green Economy (CRGE) strategy, (Addis Ababa September 2011) [CRGE Strategy] 1.

[2] Ibid.

[3] ibid 19-20.

[4] ERA, 'Road Sector Development Program: 21 Years Performance Assessment' (Ethiopian Road Authority, Addis Ababa, 2019) 51.

[5] Semen Bekele and Tadele Ferede, 'Economy Wide Impact of Investment in Road Infrastructure in Ethiopia: A Recursive Dynamic CGE Approach' (2015) 5(2) EJBE 187.

works and social equity advocates are less impressed with the current approach and challenged its disruptive characteristics.[6] The chapter also explores the regional nature of Ethiopian road and its alleged contribution to regional integration agenda.

## 3.1 History and Current Paradigm of Road Development

### *3.1.1 The Developmental state political economy*

Ethiopia experienced its first massive road infrastructure development during the Italian occupation (1936-1941) when Mussolini tried to create an empire by 'exporting to the colonies the whole machinery of its own civilisation'.[7] During the time, beyond their economic importance, roads were used as a political instrument. They were meant to function as a display of fascist's civilisation, to create a conducive living environment for Italian settlers and to open expeditious military control.[8] A total of 2,741 km were completed by 1938 including those linking the country to its Red Sea coasts, thereby significantly reducing transport cost and travelling times.[9] After that, attempts made by the successive Imperial (1941-1974) and socialist (1974-1991) governments of Ethiopia resulted in little progress in expanding the road network over the years. [10]

After the overthrowing of the socialist government in 1991, the new government significantly changed the road policy. With over 85% of its population categorised as rural and dependent on subsistence agriculture,[11] the government hoped to use infrastructure development to stimulate the country's growth potential.[12] The transition in the 1990s came at the time when other African states were shaken by their stagnant economic situation and the introduction of 'Washington Consensus'. Ethiopia, however, opted to

[6] Penny Harvey and Hannah Knox, 'The Enchantments of Infrastructure' (2012) 7(4) Mobilities 521.

[7] Gian Luca Podestà, 'Building the Empire: Public Works in Italian East Africa (1936-1941)' (2013) 70 ENTREPRISES ET HISTOIRE 37, 39.

[8] Ibid 43.

[9] Ibid. When Italy entered World War II, the second phase of the road development were frozen.

[10] World Bank, 'Staff Appraisal Report: Ethiopia Road Rehabilitation Project' (Infrastructure Operations Division Eastern Africa Department, Report No. 11249-ET, October 29, 1992) 2 <http://documents.worldbank.org/curated/en/221381468032097471/pdf/multi-page.pdf> accessed 10 February 2018.

[11] Vivien Foster and Elvira Morella, 'Ethiopia's Infrastructure: A Continental Perspective' (AICD Country Report, World Bank, March 2010) <https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-5595> accessed 17 April 2018.

[12] Francis Nguendi Ikome and Robert Tama Lisinge, 'The political economy of infrastructure development in Africa: an assessment of the NEPAD Presidential Infrastructure Champion Initiative (PICI)' (2016) 50(2) Canadian Journal of African Studies 255.

pursue a developmental state political economy that heavily relies on state investment.[13] That was deeply entrenched in the belief of the late PM Meles Zenawi who saw the 'neo-liberal' Washington Consensus (WC) as a dead end as was the 'predatory state' of Africa's post-colonial decades (the 1960s to 1980s) and pursued an active and strong state intervention to unlock development.[14] Perhaps Meles was not alone to criticise the development strategies of post-colonial Africa. Issa Shivji characterised the 1960s and 1970s as Africa's 'era of developmentalism' while 1980s as a 'lost decade' in an apparent reference to the continent's economic stagnation.[15] Easterly and Levine also referred to these three decades as 'Africa's Growth Tragedy'.[16] African economic stagnation reached its climax in the 1980s and paved the way for another economic restructuring of which Meles is critical.

Endorsed in the late 1980s, the Washington Consensus (WC) described ten economic reform policies that are desirable in developing countries (DCs) to fulfil the demands of Western donors.[17] WC later became the guiding economic policy of many African countries that forced massive structural adjustments like economic liberalisation and privatisation.[18] Its importance and approach were, however, challenged by many scholars and politicians, among whom was late PM Meles.[19] Williamson, the architect of the WC, later claimed that the WC was misinterpreted to mean neoliberalism or market fundamentalism, inappropriately used as universal policy prescriptions[20] and diffused to Sub-Saharan Africa

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[13] Christopher Clapham, 'The Ethiopian developmental state' (2018) 39(6) Third World Quarterly 1151.

[14] Alex De Waal, 'The Theory and Practice of Meles Zenawi' (2012) 112(446) African Affairs 148; René Lefort, 'The Theory and Practice of Meles Zenawi: A Response to Alex Dewaal' (2013) 112(448) African Affairs 460. See also Elsje Fourie, 'Ethiopia and the search for alternative examples of development' (Paper Presented at BISA: Africa and International Studies WG on 29/04/2011) <www.open.ac.uk/socialsciences/bisa-africa/files/bisa-2011-fourie.pdf> accessed 15 May 2018.

[15] Issa Shivji, Accumulation in an African Periphery: A Theoretical Framework (Mkuki na Nyota, Tanzania, 2009) 1.

[16] William Easterly and Ross Levine, 'Africa's Growth Tragedy: Policies and Ethnic Divisions' (1997) 112(4) Quarterly Journal of Economics 1203.

[17] John Williamson, 'A Short History of the Washington Consensus' (2009) 15 Law and Business Review of the Americas 7.

[18] See also Shivji, *Accumulation in an African Periphery* (2009) (n 15) ch 1.

[19] Joseph Stiglitz and Dani Rodrik are few of these prominent scholars. Dani Rodrik, 'Goodbye Washington Consensus, Hello Washington Confusion? A Review of the World Bank's Economic Growth in the 1990s: Learning from a Decade of Reform' (2006) 44(4) Journal of Economic Literature 973; JE Stiglitz, 'The Post Washington Consensus Consensus' (Initiative for Policy Dialogue, 2007). <http://policydialogue.org/files/publications/papers/Ch_4.pdf> accessed 10 May 2018.

[20] John Marangos, 'The Evolution of the Anti-Washington Consensus Debate: From 'Post-Washington Consensus' to 'After the Washington Consensus'' (2008) 12(3) Competition and Change 227; Williamson, 'A Short History of the Washington Consensus' (2009) (n 17).

(SSA) countries often under foreign pressure through conditionality of loan in exchange for policy reform.[21] After decades of suffering of African nations in the hands of WC advocates, notably Western powers and financers, on 25 May 2004 James Wolfensohn, President of the World Bank pronounced that 'the Washington Consensus has been dead for years' and replaced by other policies.[22] Later on, UK's PM Gordon Brown, in his G20 summit opening speech on April 2009, had admitted that 'the old Washington consensus is over'.[23]

Meles rejected both the state-dominated models of the post-colonial era and market fundamentalism approach of WC.[24] He claimed that post-colonial African statehood was characterised by pervasive rent-seeking, a swollen bureaucratic state, limited growth potential and much of its wealth under state control but used for personal ends.[25] Meles argued that the neo-liberal model has failed to transform these states and address the structural bottlenecks that caused rent-seeking, but envisaged replacing a swollen state with night watchman state.[26]

In his draft thesis work, Meles claimed that 'developing countries face formidable market failures and institutional inadequacies which create vicious circles and poverty traps, which can only be addressed by an activist state.'[27] Meles was also sceptical that the free-market model would bring the required technological accumulation badly required in the

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[21] John Williamson, 'The Washington Consensus as Policy Prescription for Development' (A lecture in the series "Practitioners of Development" delivered at the World Bank on January 13, 2004) 11 <https://piie.com/publications/papers/williamson0204.pdf> accessed 10 June 2019; Sarah Babb, 'The Washington Consensus as transnational policy paradigm: Its origins, trajectory and likely successor' (2013) 20(2) Review of International Political Economy 268.

[22] Cited in Simon Maxwell, 'The Washington Consensus is Dead! Long Live the Meta-Narrative!' (ODI WP 243. London: Overseas Development Institute, 2005)) <www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/2476.pdf> accessed 15 May 2018.

[23] Robert Winnett, Andrew Porter, Edmund Conway and Jon Swaine, 'G20 summit: Gordon Brown unveils $1.1 trillion global recession fight-back' *The Telegraph* (London, 02 Apr 2009) <www.telegraph.co.uk/finance/g20-summit/5094824/G20-summit-Gordon-Brown-unveils-1.1trn-global-recession-fight-back.html> accessed 15 May 2018.

[24] Daniel Mains, 'Governing three-wheeled motorcycle taxis in urban Ethiopia: States, markets, and moral discourses of infrastructure' (2017) 44(2) American Ethnologist 263, 265.

[25] Easterly and Levine, 'Africa's Growth Tragedy: Policies and Ethnic Divisions' (1997) (n 16); Jeffrey D Sachs and Andrew M Warner, 'Sources of Slow Growth in African Economies' (1997) 6(3) Journal of African Economies 335; James A Robinson, 'When Is a State Predatory?' (CESifo WP No. 178, Centre for Economic Studies and Ifo Institute (CESifo), Munich 1999) <http://hdl.handle.net/10419/75563> accessed 20 May 2018.

[26] Meles Zenawi, 'States and Markets: Neoliberal Limitations and the Case for a Developmental State' in Akbar Noman and others (eds), *Good Growth and Governance in Africa* (OUP 2011) 141.

[27] Meles Zenawi, 'African Development: Dead Ends and New Beginnings' (Preliminary Draft dissertation) 9. <www.meleszenawi.com/wp-content/uploads/2012/11/African_Development-Dead_Ends_and_New_Beginnings_by_Meles_Zenawi.pdf> accessed 27 March 2018.

development process of African countries. More importantly, he criticised the neoliberal approach as responsible for creating a massive gap in infrastructural investment, crippling the prospects of economic growth in Africa, and hence can no longer be relied upon.[28] Hence, he argued that only a strong and activist state could efficiently redirect and allocate resources for long term developmental goals and stimulate value creation behaviour in private firms.[29] This was particularly emphasised in the development of the non-price market determinants such as infrastructure, human and social capital, market information and technology. It is essentially an argument of 'getting the basics right' prior to seeking the 'right price' from an imperfectly suited market infrastructure.[30]

### *3.1.2 Road development within the developmental state system*

A true reflection of Meles' active state policy is manifested in Ethiopia's road development. Beginning from its 1990s national planning document to the recent Growth and Transformation Plan II (GTP), Ethiopia continued to commit itself to road infrastructure expansion more than anything. The first sectoral road program, Road Sector Development Program (RSDP), was launched in 1997 where road rehabilitation and systemic reform were prioritised and was followed by series of five years programs (RSDP I: 1997-2002; RSDP II: 2002-2007; RSDP III: 2007-2010; RSDP IV: 2010-2015; RSDP V: 2015-2020). The road sector road map and plan were prepared and integrated into the economy-wide national plans. For instance, reiterating the country's deepening poverty level, skewed population distribution, weak spatial integration and predominantly rural settlement, the countries

[28] Meles Zenawi, Keynote Address to the 6th African Economic Conference on "Green Economy and Structural Transformation in Africa" (Addis Ababa, Ethiopia October 25, 2011) <www.unenvironment.org/environmentalgovernance/PerspectivesonRIO20/HEMrMelesZenawi/tabid/55724/Default.aspx> accessed 27 March 2018.

[29] Donald Kaberuka, 'Meles Zenawi and economic transformation in Africa' (Inaugural lecture at the launching of the Meles Zenawi Foundation by President of African Development Bank, Addis Ababa, Ethiopia, January 29, 2015) <https://www.afdb.org/fileadmin/uploads/afdb/Documents/Generic-Documents/Speech_–_AfDB_President_Donald_Kaberuka_-_Inaugural_lecture_at_the_launching_of_the_Meles_Zenawi_Foundation_-_Addis_Ababa__Ethiopia_–_January_29__2015.pdf> accessed 25 April 2018.

[30] Teshome Adugna, 'Review: Meles's Development Paradigm and Its Impacts on Economic Transformation in Ethiopia' (2012) 1(11) Global Advanced Research Journal of Management and Business Studies 384.

Plan for Sustainable Development to Eradicate Poverty (PASDEP) promised to enhance household welfare through improved road development.[31]

As a result of these large road infrastructure investments over the years, Ethiopian road networks have shown an increase in length and quality. The road network has expanded from 26,550 km in 1997 to 126,773 km in 2018 while the road density per 1000 $km^2$ area has increased from 24.1 km in 1997 to 115.2 km in 2018.[32] Similarly, over the same period, road density (km/1000 population) has moved from 0.46 km to 1.27 km.[33] Ethiopia is finalising its RSDP V (2015-2020) program that had planned to construct a further 16,746 km of federal and 90,000 km of regional and district rural roads.[34] The ambitiousness of this later plan is apparent: in only five years it planned to construct nearly the same length of road that it has constructed in the past 80 years (1935-2015). Ethiopia was not the only country with such ambitious plan of expanding road networks where global road length is expected to increase by 60% between 2010 and 2050 and nine-tenths of the global increase will be accounted in DCs.[35]

Even if road development was one of the government's priority since the 1990s, the magnitude has been intensified after 2010. Road network growth was limited to 2.05% per annum over the periods 1951-1973 and slightly improved during the socialist Derg regime (1974 – 1991) to 6.2%.[36] However, it has shown a significant increase of 9.35% and 16% per annum between 1991-2009 and 2010-2015, respectively.[37] A notable contribution to recent years rise in the road network growth was the low-cost all-weather woreda (district) road construction that was started in 2010.[38] In 2016, out of the country's total road network,

[31] Ethiopia, 'Sustainable Development and Poverty Reduction Program (SDPRP)' (Addis Ababa 2002) 73-83; Ethiopia, 'Plan for Sustainable Development to Eradicate Poverty (PASDEP)' (2005) 130-136; Ethiopia, 'Growth and Transformation Plan I (GTP I)' (2010) 68-69; Ethiopia, 'GTP II' (2015) 173-174; and its road sector development plans of Road Sector Development Program (RSDP) and Universal Rural Road Access Program (URRAP) 2010.

[32] ERA, '21 Years Performance Assessment' (2019) (n 4) 4.

[33] Ibid 5.

[34] ERA, 'Road Sector Development Program V (RSDP V) (2015-2020)' (Ethiopian Road Authority Addis Ababa October 2015).

[35] William F Laurance and others, 'A global strategy for road building' (2014) 513 Nature 229.

[36] Ibrahim Worku, 'Road Sector Development and Economic Growth in Ethiopia' (2010) 29(2) Ethiopian Journal of Economics 101.

[37] ERA, 'Road Sector Development Program: 19 Years Performance Assessment' (Ethiopian Road Authority, Addis Ababa October 2016).

[38] ERA 'Universal Rural Road Access Program (URRAP)' (Ethiopian Road Authority, Addis Ababa 2010) 12. These are low-cost rural roads connecting kebeles with no specific but flexible and adaptable design. Yet it is

about 42.5% were these types of roads.[39] The initiative called Universal Rural Road Access Program (URRAP) had the objective of enhancing motorised accessibility by connecting more than 15,602 rural kebeles (lowest administrative unit) through affordable all-weather roads.[40] Moreover, this type of road will continue dominating the country's road network as 90,000 km were planned to be constructed between 2015 and 2020.

Despite the large road infrastructure investments over the past two decades, Ethiopia remains on the bottom of global rankings in road quality and size parameters, i.e. road network, density, and accessibility. For instance, Ethiopia's road density of 115.2 km/1000 km$^2$ is still the lowest compared to the lower-middle-income countries (260 km/1000 sq.km).[41] Not surprisingly, the Rural Access Index (RAI) was 21.6% in 2016 signifying that only around 22% of the rural population had access to a 'decent' road within a 2km distance of them.[42] However, the 2019 government report put the RAI to a 64% referring that the road network, irrespective of its quality, has reached 126,773 km.[43]

## 3.2 International Support to Road Investment

### *3.2.1 International support*

Road development essentially requires a considerable capital investment. Cash spent for the implementation of the road programmes over 19 years (1997 to 2016) reached ETB 335.8 billion where 83% came from internal sources: government (75.5%), the Road Fund (5.8%) and community (1.3%).[44] The remaining 17% were pooled from the international community where the World Bank (6%), China (3.7%), EU (2.7%) and African Development Bank (AfDB) (2.5%) provided the lion share.[45] To put it in a context, in 2013/14 fiscal year Ethiopia dedicated 3.7% of its GDP, which makes about 20% of its annual and 33% of its

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often a 4.5 to 6 meters wide earths surfaced road for mixed traffic of vehicle, pedestrian, carts, bicycles and animals etc.

[39] Ibid.

[40] ERA, 'RSDP V' (2015) (n 34). With a reported 65% of success, 46,810 kms have been constructed across the country with a cost of $1.5 (1.7) billion (ETB 28 -32 billion) until 2015.

[41] ERA, '21 Years Performance Assessment' (2019) (n 4).

[42] Priyanka Kanth and Michael Geiger, 'What Studies in Spatial Development Show in Ethiopia-Part II' (World Bank, 09/21/2017) <https://blogs.worldbank.org/africacan/what-studies-in-spatial-development-show-in-ethiopia-part-ii> accessed on 26 October 2017.

[43] ERA, '21 Years Performance Assessment' (2019) (n 4) 52.

[44] Ibid 7. In today's USD value ETB 335.8 billion could be more than USD 20 billion. See also ERA, '19 Years Assessment' (2016) (n 37) 2.

[45] ERA, '21 Years Performance Assessment' (2019) (n 4) 27. It is also noted that some counties have disbursed the money through multi-lateral financial institutions like World Bank.

capital budget, to road sector more than any other low-income country.[46] Compared to its education and health sectors expenditure, which sat at about 4% and 1.3% of the GDP respectively in the same year, road sector is being heavily invested in.[47]

Although the developmental state political economy is at a crossroads due to the current reform in Ethiopia, public expenditure has continued to dictate the economy and the ambitiousness of road development has not eased. In the 2019/20 budget year, the road was only second to education and took 12% of the annual budget and 20% of the federal government's budget.[48]

The trends show that both expenditure in absolute terms and the number of external financers are expanding so as the share of investment by the Ethiopian government and China. A significant amount of road finance comes from foreign sources in the forms of grant, loan and technical assistance.[49] A loan for a project often covers the capital expenditures leaving the government to bring a matching fund for operational costs which ranges from 15-25% of the total cost. Even if China is dominating that discourse over recent years, Western donors continued to contribute a massive amount of capital.[50] Ethiopia's geopolitical importance to the West in fighting terrorism and piracy, and as a regional catalyst of peace and prosperity with its massive involvement in the peacekeeping mission and reconciliation process (Somalia, Sudan and now South Sudan) made it ostensibly

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[46] Bekele and Ferede, 'Economy Wide Impact of Road Investment' (2015) (n 5). Overall, Ethiopia is spending 10% of its GDP on infrastructure development.

[47] World Bank, 'Ethiopia Public Expenditure Review 2015' (Washington, DC: World Bank Group, 2016) 4.

[48] 'Ethiopia's 2019-20 Budget' (CEPHEUS Research and Analytics, July 10, 2019) <https://cepheuscapital.com/wp-content/uploads/2019/01/Budget-Review-FY-2019-20.pdf> accessed 07 July 2020.

[49] Disaggregated data are hardly available to indicate how much of these funds were grant as contracts are often treated confidentially. IMF, OECD and Paris Club encourage donors to make 25-35% of project financing in a grant form, and China claimed that 25% of its finance is given in a grant form. See Jean-Pierre Cabestan, 'China and Ethiopia: Authoritarian affinities and economic cooperation' (Translated by N Jayaram, China Perspective, No. 2012/4; 53-62. 2015) 58 <http://chinaperspectives.revues.org/6041> accessed 15 March 2018.

[50] *The Economist*, Chinese Loans to Africa: Credit limit (KAMPALA April 30th 2016) <www.economist.com/news/finance-and-economics/21697856-new-data-suggest-china-lends-less-africa-commonly-assumed-credit> accessed 09 May 2018; Lucas Atkins and others, 'Challenges of and opportunities from the commodity price slump' (CARI Economic Bulletin #1. CARI, Johns Hopkins University 2017); Aaron Maasho, 'Africa Should Avoid forfeiting Sovereignty to China over loans-Tillerson' *Reuters* (London, March 8, 2018) <https://uk.reuters.com/article/uk-usa-africa/africa-should-avoid-forfeiting-sovereignty-to-china-over-loans-tillerson-idUKKCN1GK118> accessed 09 May 2018.

favoured by the principal Western donors.[51] Ethiopia's prominence in the global agenda has also been aided by the weakness and political instability of its East African neighbours' that the Western powers cannot rely on. Eritrea and Somali were accused of aiding or hosting terrorism and piracy activities than assisting the countermeasures, Sudan was subjected to USA's sanctions for long and trapped by the prolonged civil war, and it was beyond the capacity of the tiny but relatively stable Djibouti.[52]

Donors also have 'shared ideologies' with Ethiopia in its ambition of achieving development goals[53] and steady economic growth despite their criticism of the democratic 'backslide' (process) and economic model (state-driven) Ethiopia chose to follow.[54] Clapham writes that Ethiopia has been 'unquestionably brilliant' in placing itself in a 'highly advantageous position within the global and continental networks' to become a massive recipient of international aid.[55] The late PM Meles was central to that movement where he presented himself as an intelligent, charming, visionary and intellectual character in global politics and economic discourse.[56] Hence, even if Ethiopia has not become 'donors' darling', it has exploited the situation to become one of the world's largest aid recipient country, for instance, the 4th largest official development assistance (ODA) recipient country in 2015.[57] However, Ethiopia effectively resisted imposed policy reforms by controlling its own development strategy while still luring the aid money.[58]

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[51] Romilly Greenhill, Annalisa Prizzon and Andrew Rogerson, 'The Age of Choice: Developing Countries in the New Aid Landscape' (ODI WP 364, London 2013) <www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8188.pdf> accessed 10 June 2018; Clapham, 'The Ethiopian developmental state' (2018) (n 13) 6-7. See also Fantu Cheru 'Emerging Southern powers and new forms of South–South cooperation: Ethiopia's strategic engagement with China and India' (2016) 37(4) Third World Quarterly 592.

[52] Christopher Clapham, 'Post-war Ethiopia: The Trajectories of Crisis' (2009) 36(120) Review of African Political Economy 181.

[53] Qaiser M Khan and others, 'Improving basic services for the bottom forty percent: lessons from Ethiopia' (World Bank Group, Washington, DC 2014) <http://eprints.lse.ac.uk/59516/> accessed 18 December 2017.

[54] Dereje Feyissa, 'Aid negotiation: the uneasy "partnership" between EPRDF and the donors' (2011) 5(4) Journal of Eastern African Studies 788. See also DFID Ethiopia, 'Climate High-Level Investment Programme (CHIP)' (Business Case-DFID Ethiopia, August 2012) 7 <https://devtracker.dfid.gov.uk/projects/GB-1-202597> accessed 17 May 2018.

[55] Clapham, 'Post-war Ethiopia (2009) (n 52) 189.

[56] Greenhill, Prizzon and Rogerson, 'The Age of Choice' (2016) (n 51).

[57] Clapham, 'Post-war Ethiopia' (2009) (n 52); OECD, 'Development Aid at a Glance: Statistics by Region' (2017 edn) <http://www.oecd.org/dac/stats/documentupload/World-Development-Aid-at-a-Glance.pdf> accessed 17 May 2018.

[58] Alastair Fraser and Lindsay Whitfield 'The Politics of Aid: African Strategies for Negotiating with Donors' (Oxford: Global Economic Governance Programme WP 2008/42, 2008) <www.geg.ox.ac.uk/publication/geg-wp-200842-politics-aid-african-strategies-dealing-donors> accessed 10 June 2018; Fourie, 'Ethiopia and the

### *3.2.2 The growing involvement of China in road financing*

In recent times, Chinese financial muscle and absence of conditions (policy and political) while disbursing loans has been gladly welcomed by Ethiopia as it has by other African countries.[59] China has become the primary catalyst and financial source for most of Ethiopian, also African, road infrastructure development. In 2007, China chose Ethiopia as one of four African partners (together with Angola, DRC, and Nigeria) allowed to obtain soft loans from Chinese state-owned financial institutions. The terms of these loan agreements are often confidential, but Ethiopian road financing is reported to come through loans with concessional terms that include grants and loans - low interest, with a seven-year grace period, maturity date at the end of 20 years and a grant component of over 25%.[60] Overall, the transport sector accounts for about 31% of Chinese development assistance in Ethiopia only second to the energy sector that takes about 52%.[61] In return, Chinese construction companies execute nearly 70% of road construction in Ethiopia.[62] Chinese firms are supported by these concessional loans and are often selected through 'non-competitive negotiation processes', and a 'significant share of the goods and services embodied in a project' are usually sourced from China.[63] Data collected by China Africa Research Initiative (CARI) at Johns Hopkins University for 2000-2015 reveals that Ethiopia was only second to Angola as a recipient of Chinses loan.[64]

Ethiopia is one of the beneficiaries of the Chinese 'One Belt, One Road Initiative' (OBORI/BRI) that has aimed at integrating major regions and continents mainly through

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search for alternative examples of development' (2011) (n 14); Greenhill, Prizzon and Rogerson, 'The Age of Choice' (2016) (n 51).

[59] Machiko Nissanke and Marie Söderber, 'The Changing Landscape in Aid Relationships in Africa: Can China's Engagement Make a Difference to African Development?' (UI papers series, Stockholm Sweden 2011/2) <http://eprints.soas.ac.uk/13323/1/Nissanke-Soderberg-_UI_paper.pdf> accessed 17 May 2018.

[60] Cabestan, 'China and Ethiopia' (2015) (n 49) 56-58; John Hurley, Scott Morris and Gailyn Portelance, 'Examining the debt implications of the Belt and Road Initiative from a policy perspective' (2019) 3(1) Journal of Infrastructure, Policy and Development 139

[61] Gedion G. Jalata, 'Development Assistance from the South: Comparative Analysis of Chinese and Indian to Ethiopia' (2014) 3(1) Chinese Studies 24, 31.

[62] David H. Shinn, 'Ethiopia and China: When Two Former Empires Connected' (2014) 11 International Policy Digest; Cheru, 'Emerging Southern powers' (2016) (n 51) 600. See also Ana Cristina Alves, 'China's 'win-win' cooperation: Unpacking the impact of infrastructure-for-resources deals in Africa' (2013) 20(2) South African Journal of International Affairs 207.

[63] David Dollar, 'China's Engagement with Africa: From Natural Resources to Human Resources' (Brookings Institute Series 7, New York, 2016) 62.

[64] Atkins and others, 'Challenges and opportunities from the commodity price slump' (2017) (n 50).

inland and maritime infrastructure investments.[65] Due to its proximity to China and along the major international maritime corridor, Ethiopia along with other East African neighbours of Djibouti and Kenya are on the spotlight of the initiative.[66] Earlier projects such as the Addis Ababa-Djibouti railway and Addis-Adama express road were constructed as part of the initiative and investments are expected to grow.[67]

Many, however, question the sustainability of Chinese investment in Africa and whether it aims to feed Chinese economic demands like raw materials, market and other business interest.[68] Compared with other African countries like Angola, Nigeria, South Africa, Ghana or Sudan, Ethiopia is devoid of raw materials or other wealth sources to export to China.[69] It was claimed that unlike its role in other African countries (infrastructure for a natural resource),[70] China has partnered in manufacturing and construction sectors, and more importantly in providing finance for projects in Ethiopia for market[71] and 'diplomatic support'.[72] Hence, the economic and trade cooperation with Addis Ababa is a means rather than an end in itself. Among China's reasons are Addis Ababa being the seat of the African Union's (AU's) and United Nations Economic Commission for Africa (ECA); its growing regional and continental diplomatic clout partly due to its historical role of stimulating Pan Africanism;[73] its strategic location, especially at the source of Blue Nile and the meeting point of the predominantly Muslim North and Christian Southern Africa; and its political stability, the government's authoritarian character and similarities in their political

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[65] Bhaso Ndzendze and David Monyae, 'China's belt and road initiative: linkages with the African Union's Agenda 2063 in historical perspective' (2019) 11(1) Transnational Corporations Review 38; Mesafint Tarekegn Yalew and Guo Changgang, 'China's 'Belt and Road Initiative': Implication for Land Locked Ethiopia' (2020) 12(2) Insight on Africa 175.

[66] Toyo Amegnonna Marcel Dossou, 'The impact of China's one belt one road Initiative in Africa: the Evidence from Kenya' (Southwestern University of Finance of Economics in China, MPRA Paper No. 90460, 2018) <https://mpra.ub.uni-muenchen.de/90460/10/MPRA_paper_90460.pdf> accessed 3 July 2020; Hurley, Morris and Portelance, 'Examining the debt implications of the BRI' (2019) (n 60) 148.

[67] Yalew and Changgang, 'China's BRI'(2020) 12(2) (n 65).

[68] Alves, 'China's 'win-win' cooperation' (2013) (n 62).

[69] Monika Thakur, 'Building on Progress? Chinese Engagement in Ethiopia' (The South African Institute of International Affairs (SAIIA) Occasional Paper 38, China in Africa Project, July 2009) <www.saiia.org.za/occasional-papers/building-on-progress-chinese-engagement-in-ethiopia> accessed 10 May 2018; Cabestan, 'China and Ethiopia' (2015) (n 49) 53; Michael Mitchell Omoruyi Ehizuelen, 'More African countries on the route: the positive and negative impacts of the Belt and Road Initiative' (2017) 9(4) Transnational Corporations Review 341.

[70] Ibid.

[71] Françoise Nicolas, 'Chinese Investors in Ethiopia: The Perfect Match?' (2017) Notes de l'Ifri, Ifri.

[72] Seifudein Adem, 'China in Ethiopia: Diplomacy and Economics of Sino-optimism' (2012) 55(1) African Studies Review 143; Clapham, 'The Ethiopian developmental state' (2018) (n 13).

[73] Adem, 'China in Ethiopia' (2012) (n 72).

economy approach (state's economic centrality).[74] Nonetheless, economic reasons such as Ethiopia's position as the second-most populous country on the continent after Nigeria and the size of its developmental needs are also reasons for the strong relationship.[75] Others mention the special Eastern Industrial Zone, established solely by Chinese manufacturers, as an indication that Chinese interest also includes supplying Ethiopian market with industrial products by using Ethiopia's cheap labour.[76]

The long term impact of growing Chinese involvement in African infrastructure development is contentious. Anthony argued that even if Chinese infrastructure development around the coast of East Africa 'resembles a colonial pattern' of accessing the inner of the resource bases, it is driven by market forces and interests within Africa.[77] Similarly, after studying the century-long Sino-Ethiopian engagement, Seifudein Adem found 'general convergence of interests' between China and Ethiopia, although long-term consequences of the current partnership are uncertain.[78] Consequences wise, Alves also argue that although it is making a vital contribution to the economic take-off, Chinese infrastructure-for-resource types of deals are flawed with critical shortcomings in negotiation and execution in favour of China.[79] On the other hand, by referring to late Chinese entry into Africa amid a decades-long decline in African fortunes associated with Washington Consensus, the nature of support for Africa's development endeavours and respect for African nations, Sautman and Hairong argue that China-Africa engagement is distinctive and the 'lesser evil than the West'.[80] A common concern of the researchers, therefore, is the long term impact of the relationship and its sustainability.

[74] ibid; Jalata, 'Development Assistance from the South' (2014) (n 61) 34; Cabestan, 'China and Ethiopia' (2015) (n 49) 53.

[75] Jalata, 'Development Assistance from the South' (2014) (n 61) 33; Cabestan, 'China and Ethiopia' (2015) (n 49) 53 & 59. In deed about two-third of Chinese capital investment is in the construction sector and the size of their investment in the manufacturing sector is by far negligible but growing. In 2010 Chinese companies have established Eastern Industrial Zone, 35 kms away from Addis and fully populated with Chinese manufacturing industries. Their involvement in garment, leather and shoe, and cement production are already felt by the market/booming, and to a lesser extent in glass, iron and automobile industries.

[76] Deborah Brautigam and Tang Xiaoyang, 'African Shenzhen: China's special economic zones in Africa' (2011) 49(1) Journal of Modern African Studies 27; Malancha Chakrabarty, 'Ethiopia–China Economic Relations: A Classic Win–Win Situation?' (2016) 7(2) World Review of Political Economy 226.

[77] Ross Anthony, 'Infrastructure and influence: China's presence on the coast of East Africa' (2013) 9(2) Journal of the Indian Ocean Region 134.

[78] Adem, 'China in Ethiopia' (2012) (n 72).

[79] Alves, 'China's 'win-win' cooperation' (2013) (n 62).

[80] Barry Sautman and Yan Hairong, 'Friends and Interests: China's Distinctive Links with Africa' (2007) 50(3) African Studies Review 75, 77.

One reason for scepticism on the Chinese investment is the business behaviour and absence of transfer of knowledge. Chinese firms are accused of importing excessive workforce, including non-skilled labourers to work in the construction works.[81] Furthermore, the companies are also accused of deploying Chinese experts in the top and middle management posts, making a strategic decision and R&D at the head office level completely closed to Ethiopian experts.[82] Hence, technology and knowledge diffusion are reported to be minimal as Chinese companies were reluctant to form a joint venture with Ethiopian counterparts and involve Ethiopian in key operational areas.[83] In this respect, Addis Ababa's light-rail transit (LRT) is mentioned as an example where the deficiency in the transfer of technical knowledge from Chinese to Ethiopian operators restricted its utility and operational efficiency.

Some are also concerned about the debt-paying capacity of the country and sustainability of such aggressive public spending over the years. Since 2015, IMF has raised Ethiopia's risk of external debt distress from 'low' to 'moderate' and finally to 'high' mainly due to the accumulated non-concessional loans and weak export performance.[84] Public debt has risen to 57% of the GDP in 2019, where external public debt account about half of this.[85] As a result, the IMF report claimed that 'Ethiopia's public investment-driven growth and development model has reached its limits'.[86] Besides other economic commentators and the public has shown concern over this foreign debt stock and the pace of acceleration over

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[81] Thakur, 'Building on Progress?' (2009) (n 69) 12; Cabestan, 'China and Ethiopia' (2015) (n 49) 61.

[82] Adem, 'China in Ethiopia' (2012) (n 72) 152-53; Cabestan, 'China and Ethiopia' (2015) (n 49) 61.

[83] Alemayehu Geda and Atenafu Gebremeskel, 'Impact of China-Africa Investment Relations: Case Study of Ethiopia' (2010 African Economic Research Consortium (AERC) Nairobi 2010); World Bank, 'Chinese FDI in Ethiopia' (World Bank Survey, 2012) <http://documents.worldbank.org/curated/en/151961468038140377/Chinese-FDI-in-Ethiopia-a-World-Bank-survey> (7 May 2018); Jalata, 'Development Assistance from the South' (2014) (n 61) 36; Getahun Zewde, 'Post 2006 Ethio-China Trade Relations: Challenges and Prospects' (2017) 3(2) Asian Research Journal of Arts & Social Sciences 1.

[84] IMF, Federal Democratic Republic of Ethiopia: Staff Report for the 2016 Article IV Consultation—Debt Sustainability Analysis (August. 30, 2016) <https://www.imf.org/external/pubs/ft/dsa/pdf/2016/dsacr16322.pdf> (7 May 2018); IMF, '2019 Article IV Consultation and Requests for Three-Year Arrangement Under the Extended Credit Facility and an Arrangement Under the Extended Fund Facility—Press Release and Staff Report' (IMF, January 2020) 4 <www.imf.org/~/media/Files/Publications/CR/2020/English/1ETHEA2020002.ashx> accessed on 2 July 2020.

[85] Ibid; NBE, '2017/18 Annual Report' (National Bank of Ethiopia) 78 <www.nbe.gov.et/publications/annualreport.html> accessed on 15 September 2019. A figure from IMF and NBE reveals that Ethiopian (external) public sector debt has grown to $ 26.4 billion in 2017 from only $5.6 billion by July 2010.

[86] IMF, '2019 Article IV Report' (2020) (n 84) 4.

recent years.[87] Sitting at the top of the creditors' ladder is China. According to some estimates, in 2011, China's share had risen to half of Ethiopia's total debt.[88] Considering its growing loan disbursement to significant infrastructure developments in recent times, Chinese loan stock might have gone further in the ladder.[89] As a result, PM Abiy was forced to negotiate 'debt reprofiling' with China, including the USD 2.5 billion loans used for the construction of Addis Ababa-Djibouti railway.[90]

Finally, even if Ethiopian road infrastructure development ambitions are internally driven, it has an international dimension as funds are obtained from international partners. Chinese interest to provide infrastructure loans (transport, power and communication) on preferential terms in exchange for its companies 'snatching' the job, and other financial institutions' (World Bank, AfDB etc) support of road infrastructure development influences government prioritisation as it does in other east African countries.[91] This raises a fundamental question on the growing loan disbursement to carbon-intensive sectors like road while the country blames the absence of international finance for delaying low-carbon infrastructures such as railway and Bus-Rapid Transit (BRT) networks. This casts doubt on the loan disbursement policy of these international partners that continue to support new road projects while several low-carbon transport projects are shelved.

On the other hand, the environmental effects of such massive road network expansion have not been discussed in policy or academic discourses. Even if the World Bank found that extreme rain events associated with climate change will expose Ethiopian roads, very little has been done to build the resilience of Ethiopian roads.[92] As the country keeps on expanding the road infrastructure to enhance transport accessibility, adaptation and mitigation features are largely unaccounted in the process. Besides new road developments are often presented as a necessity in almost all settings. Economic commentators and development partners set the agenda in a way that obscures its externalities. Thus, the

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[87] Asrat Seyoum, Budget breakdown, *The Ethiopia Reporter,* 17 June 2017 (Addis Ababa, 17 June 2017) <http://www.thereporterethiopia.com/content/budget-breakdown> accessed 17 April 2018.

[88] Cabestan, 'China and Ethiopia' (2015) (n 49) 59.

[89] Hurley, Morris and Portelance, 'Examining the debt implications of the BRI' (2019) (n 60) 150.

[90] IMF, '2019 Article IV Report' (2020) (n 84) 9.

[91] Jacqueline Klopp and George Makajuma, 'Transportation Infrastructure Integration in East Africa in Historical Context' in Martin Schiefelbusch and Hans-Ludger Dienel (eds), *Integration of Infrastructures* (Surrey: Ashgate, 2014).

[92] WB, 'Increasing Climate Resilience of the Ethiopian Road Network' (World Bank, June 2018).

socio-economic impacts of road and the promised utilities of a road as experienced in daily lives remained unexplored.

## 3.3 Socio-Economic Impacts of Road Investments

There is a growing consensus, especially among economics and development experts, on the economic importance of road infrastructure in different contexts. Nevertheless, equally, literature is exposing its disruptive character, the asymmetry between the promises and its utilities, and exacerbating inequality among different segments of a given community.

### *3.3.1 Economics of road*

Scholarly works in Ethiopia, especially in a rural setting, claimed that road investment has a positive impact on economic growth, consumption, household nutrition, market access and increase in export.[93] Research on construction of rural feeder roads in a remote community, Alefa district of Amhara region, reported a high rate of economic return even in unfavourable settings, i.e. presence of low surplus agricultural production, negligible off-farm earning opportunity and no guarantee for provision of motorised transport services.[94] Similarly, Mogues reported evidence of public expenditure on road infrastructure earning higher returns than agricultural investments.[95] Wondemu and Weiss also found substantially higher road-induced rural income growth among rural households that are in sedentary agriculture.[96] It was reported that all-weather road access increases average household income by up to 63% through enhanced labour productivity, expanded off-farm employment opportunities etc. Based on survey data from fifteen villages collected over 1989 to 2004, Dercon and others also claimed that access to all-weather roads reduced poverty by 6.9% and increased consumption growth by 16.3%.[97]

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[93] Worku, 'Road Sector Development and Economic Growth in Ethiopia' (2010) (n 36); Bekele and Ferede, 'Economy Wide Impact of Road Investment' (2015) (n 5); David Stifel and Bart Minten, 'Market Access, Well-being, and Nutrition: Evidence from Ethiopia' (2017) 90 World Development 229.

[94] David Stifel, Bart Minten and Bethlehem Koru, 'Economic Benefits of Rural Feeder Roads: Evidence from Ethiopia' (2016) 52(9) Journal of Development Studies 1335, 1352.

[95] Tewodaj Mogues, 'The Bang for the Birr: Public Expenditures and Rural Welfare in Ethiopia' (2011) 47(5) Journal of Development Studies 735.

[96] Kifle A Wondemu and John Weiss, 'Rural Roads and Development: Evidence from Ethiopia' (2012) 12(4) EJTIR 417.

[97] Stefan Dercon and others, 'The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages' (2009) 91(4) American Journal of Agricultural Economics 1007.

Similarly, road network expansion is believed to improve market access and hence enhance communities' socio-economic status. Research in the Tigray region suggested that market access as a result of road network expansion has improved children nutrition in the area.[98] Hill and Fuje also found that 'investments in roads and agglomeration have facilitated market integration in Ethiopia and have reduced the impact of weather shocks on prices'.[99] Based on panel data from 2012 to 2016, research has found that rural road development has increased household consumption by 16.1% and significantly improved household welfare and drought resilience.[100]

In a comparative study of road's contribution to rural poverty reduction in Vietnam, Zambia and Ethiopia, Bryceson and others found that road network expansion alleviated the extreme remoteness of Ethiopia's countryside.[101] However, they recommended that in rough terrain Ethiopia, such efforts should be supplemented with deepening modal choices like motorbike, bicycle and pack animals through which subsistence farmers' mobility could be enhanced. Similarly, a study in an agriculturally productive rural community of Horro Guduru Wollega province of western Ethiopia revealed that intermediate non-motorised transportation is as important as the road infrastructures are for agricultural productivity.[102] There are emerging evidences to demonstrate that non-motorised (e.g. pack animal) or two-wheel transportations that require little capital may have a greater impact on agricultural productivity for the urban poor. Rammelt and Leung also found early signs that in a poor rural context if road infrastructure development is not coupled with other policy measures, it could exacerbate economic inequalities among different segments

[98] Kibrewossen Abay and Kalle Hirvonen, 'Does market access mitigate the impact of seasonality on child growth? Panel data evidence from northern Ethiopia' (2017) 53(9) Journal of Development Studies 1414.

[99] Ruth Hill and Habtamu Fuje 'What Is the Impact of Drought on Prices? Evidence from Ethiopia' (Paper prepared for the CSAE Conference of 2018 Economic Development in Africa, Oxford, March 18–20, 2018).

[100] Shohei Nakamura, Tom Bundervoet and Mohammed Nuru, 'Rural Roads, Poverty, and Resilience Evidence from Ethiopia' (World Bank Policy Research WP 8800, April 2019) <http://documents.worldbank.org/curated/en/220781554130465463/Rural-Roads-Poverty-and-Resilience-Evidence-from-Ethiopia> accessed 6 July 2020.

[101] Deborah Fahy Bryceson, Annabel Bradbury and Trevor Bradbury, 'Roads to Poverty Reduction? Exploring Rural Roads' Impact on Mobility in Africa and Asia' (2008) 26(4) Development Policy Review 459.

[102] Sileshi Tamene and Tebarek Lika Megento, 'The Effect of Rural Road Transport Infrastructure on Smallholder Farmers' Agricultural Productivity in Horro Guduru Wollega Zone, Western Ethiopia' (2017) 52(1) AUC Geographica 89.

of a community.[103] Perhaps rural poor may not necessarily use motorised transportation even after the road infrastructure was improved due to unaffordability of the service.[104]

Apart from the rural situation, scholarly works are rare to quantify road's impact on urban life and the non-agricultural economy in Ethiopia. In one of the very few works, based on an econometrics analysis, Admasu Shiferaw and others concluded that improved road accessibility increases the towns' desirability for manufacturing firms.[105] They further argued that current road development has contributed to the relative spread of manufacturing firms beyond historic manufacturing hubs. Similarly, Franklin found that the cost and accessibility of transport services impeded unemployed youth who live in peripheral areas of Addis Ababa from getting a decent and permanent job.[106] The research concluded that unemployed youth with less financial might look less for highly sought after jobs than more in temporary and informal work.

### *3.3.2 Ethnography of road*

On the other hand, growing evidence both from Africa and other developing nations are unpacking the mystery of multi-layered interaction between road infrastructure, politics and society. Zawdie and Langford questioned the 'urban-bias' and 'top-down' nature of current road development decisions in Sub-Saharan Africa (SSA).[107] In their ethnographic study of two roads in Peru, Harvey and Knox challenged the 'enchantment' and the three promises (speed and connectivity, political integration (freedom) and economic prosperity) road holds to communities.[108] Built on Bennett's work about values in modern life, they talked about the notion of enchantment as 'a mood (not a belief or knowledge) involving a surprising encounter, a meeting with something that you did not expect and are not fully prepared to engage' to define the generic social promise and good road holds to

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[103] Crelis Rammelt and Maggi Leung, 'Tracing the Causal Loops Through Local Perceptions of Rural Road Impacts in Ethiopia' (2017) 95 World Development 1.

[104] Fredu Nega Tegebu and Edris Hussein Seid, 'Quantifying the Road Influence Zone on Socio-economic Developments in Rural Tigray, Ethiopia' (2017) 29(4) African Development Review 601.

[105] Admasu Shiferaw and others, 'Road Infrastructure and Enterprise Dynamics in Ethiopia' (2015) 51(11) The Journal of Development Studies 1541.

[106] Simon Franklin, 'Location, search costs and youth unemployment: A randomized trial of subsidized transport' (CSAE WP Series 2015-11 Oxford, 2015) <www.theigc.org/wp-content/uploads/2015/04/FranklinLocationSearchCosts.pdf> accessed 5 June 2018.

[107] G Zawdie and DA Langford, 'Influence of construction-based infrastructure on the development process in Sub-Saharan Africa' (2002) 30(3) Building Research & Information 160, 168.

[108] Harvey and Knox, 'The Enchantments of Infrastructure' (2012) (n 6).

communities.[109] After tracing the disruptive and destabilising processes through which roads come to hold the promise of transformation, they concluded that road's capacity to disappoint and generate negative consequences are dazzled with the possibilities they hold and its illusory effects.[110]

In another seminal ethnographic work, Masquelier revealed how road infrastructure and transportation in post-colonial Niger brought 'peril and possibilities' where people of rural Mawri associated road with their past colonial misery (forced labour, persecution), deadly evil spirit and lethal accidents than with sign of modernisation.[111] The disruptive nature of large road developments was also challenged from an urban context. In Dakar, Senegal, Menny found that efforts to reinvent and reposition the city through large scale construction projects inflicted in enduring disruption and exclusion that goes beyond the often articulated temporary inconveniences.[112] Menny argued that these road projects foreclosed opportunities for some Dakar residents by reinforcing inequalities.

Several studies conducted in Kenya, more importantly on Lamu Port-South Sudan-Ethiopia Transport Corridor (LAPSSET), also revealed unparalleled community and ecological interactions of road projects. A study on the Isiolo-Moyale road project narrates how 'tarmac' brought them not only enchantment, as defined by Harvey and Knox, opportunities and security, but also legitimacy to claim (challenge) power and future destiny.[113] The top-down nature of the LAPSSET projects also created 'economies of anticipation' thereby experiencing unprecedented claims and tensions in the new corridors.[114] As a result, Greiner found increasing ethnic conflict and enclosure in East Pokot

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[109] Jane Bennett, The Enchantment of Modern Life: Attachments, Crossings, and Ethics (NJ: Princeton Uni., 2001) cited in ibid, 523.

[110] Harvey and Knox, 'The Enchantments of Infrastructure' (2012) (n 6) 534. On a discussion on cars and dependency on car system see Daniel C Newman, 'Alienation and Mobility' (2016) 9(1) New Proposals: Journal of Marxism and Interdisciplinary Inquiry 28.

[111] Adeline Masquelier, 'Road Mythographies: Space, Mobility, and the Historical Imagination in Postcolonial Niger' (2002) 29(4) American Ethnologist 829.

[112] Caroline Melly, 'Ethnography on the Road: Infrastructural Vision and the Unruly Present in Contemporary Dakar' (2013) 83(3) Africa 385.

[113] Harvey and Knox, 'The Enchantments of Infrastructure' (2012) (n 6); Hassan H Kochore, 'The road to Kenya? Visions, expectations and anxieties around new infrastructure development in Northern Kenya' (2016) 10(3) Journal of Eastern African Studies 494.

[114] Clemens Greiner, 'Land-use change, territorial restructuring, and economies of anticipation in dryland Kenya' (2016) 10(3) Journal of Eastern African Studies 530, 531; Hannah Elliott, 'Planning, property and plots at the gateway to Kenya's 'new frontier'' (2016) 10(3) Journal of Eastern African Studies 511.

of Baringo County.[115] Similarly, in Isiolo areas of northern Kenya, LAPSSET brought enclosure of communal land, soaring of land price, government recognition of enclosure (issuing title), the expulsion of minorities, associating oneself with lands (emerging land rights), the revival of institutions and power claims (*dheda*).[116]

Such ethnographic studies are scarce in Ethiopia. Nevertheless, a study in an isolated rural village of Nibgee, in North-Eastern Ethiopia, revealed that community believes that absence of spatial integration protected them from past military aggressions (Italian invasion and Derg tyranny) and exploitation.[117] The agriculturally self-sufficient community argue that transport facilities will expose them to outside political control and influence further endangering their long maintained relative independence, strong communal relation and monastery, a cherished symbol of their religious and daily life. This is a typical example where communities consider road as facilitating the withering away of their control over resources and their values and customs. It is true that infrastructure as a sign of modernisation has long been advocated by the government and used to intensify its control over countryside and peripheral areas of the country.[118]

In the urban context, road developments often followed by city redevelopment and slums clearance schemes further strengthen the quest for the distributional effect of road investment. With massive government redevelopment and road construction implemented in much of the inner city of Addis Ababa, the poor are forcibly relocated to the outskirts of the city with little benefit from the development.[119] Urban plots are graded primarily based on their proximity to infrastructures and facilities, the primary being road. Those adjacent

[115] Greiner,' Land-use change' (2016) (n 114).

[116] Jason Mosley and Elizabeth E. Watson, 'Frontier transformations: development visions, spaces and processes in Northern Kenya and Southern Ethiopia' (2016) 10(3) Journal of Eastern African Studies 452; Elliott, 'Planning, property and plots' (2016) (n 114); Zoe Cormack, 'The promotion of pastoralist heritage and alternative 'visions' for the future of Northern Kenya' (2016) 10(3) Journal of Eastern African Studies 548, 549. *Dedha* is 'a council of elders who control grazing within an area called *dedha* (the word *dedha* is used to refer to both the council and the grazing area).

[117] Tefera Tarekegn and John Overton, 'Isolation as a Development Strategy: Perspectives from an Ethiopian Village' (2011) 30(2) African Geographical Review 35.

[118] See Lucie Buffavand, 'The land does not like them': contesting dispossession in cosmological terms in Mela, south-west Ethiopia' (2016) 10(3) Journal of Eastern African Studies 476; Benedikt Kamski, 'The Kuraz Sugar Development Project (KSDP) in Ethiopia: between 'sweet visions' and mounting challenges' (2016) 10(3) Journal of Eastern African Studies 568.

[119] Gebre Yntiso, 'Urban Development and Displacement in Addis Ababa: The Impact of Resettlement Projects on Low-Income Households' (2008) 24(2) EASSRR 53; Yves Pedrazzini, Stéphanie Vincent-Geslin and Alexandra Thorer, 'Violence of Urbanisation, Poor Neighbourhoods and Large-Scale Projects: Lessons from Addis Ababa, Ethiopia' (2014) 40(3) Built Environment 394.

to main roads are highly valued, and only high storey buildings are permitted to be built on it. The poor do not have the means to fulfil such city planning requirements and are expelled to other less graded suburbs, often outskirts of the city, which has inadequate infrastructure facilities. The relocated families are then subjected to loss/decline in income, poor access to quality education, health, housing and other infrastructure services, broken social network, and an increase in transport costs.[120]

The injustice is further exacerbated by the skewed land expropriation, evaluation and compensation schemes which have left many destitute only with less than half of their property's market price during land expropriations.[121] As per the Ethiopian constitution, the land belongs to the 'state and people' and individuals have only use right for limited-term in urban and for an indefinite period in rural areas.[122] That leaves the government with an extended right to expropriate any land it wanted for 'public purpose', which itself is defined vaguely and broadly.[123] When computing compensation, the value of the land is legally excluded, and only the value of properties and developments on the land, reimbursement of the lease money for the unused period and displacement costs are considered.[124] The compensation value will only become half of the market value of the property or the development made on the land.[125] Hence road is not only an infrastructure connecting spaces but defines status and where people should find themselves. Roads divide people.

In other ethnographic works, road infrastructure and automobility were further questioned for the peril it causes to pedestrians and the poor due to road crashes. In Ethiopia, those who walk, often due to the inability to owe private vehicle or access public transport, are disproportionately burdened with the multiple tasks of worrying for their safety and dignity. Questions of public safety arise when it is noted that 88.4% of roads in Addis Ababa, where, as mentioned in previous chapters, walking covers 54% of daily trips, do not have

[120] Ibid.

[121] Belachew Yirsaw Alemu, 'Expropriation, valuation and compensation practice in Ethiopia: The case of Bahir Dar city and surrounding' (2013) 31(2) Property Management 132; Muradu Abdo, 'Reforming Ethiopia's Expropriation Law' (2015) 9(2) Mizan Law Review 301.

[122] Federal Democratic Republic of Ethiopia (FDRE) Constitution, Proclamation No 1/1995, Art. 40.

[123] Brightman Gebremichael, 'Public Purpose as a Justification for Expropriation of Rural Land Rights in Ethiopia' (2016) (60(2) Journal of African Law 190.

[124] Nigussie Haregeweyna and others, 'The dynamics of urban expansion and its impacts on land use/land cover change and small-scale farmers living near the urban fringe: A case study of Bahir Dar, Ethiopia' (2012) 106 Landscape and Urban Planning 149.

[125] Alemu, 'Expropriation, valuation and compensation practice in Ethiopia' (2013) (n 121).

pavements or pedestrian footpaths.[126] Furthermore, with the increase in such an ill-fitted road network comes the unprecedented rise in road accidents, more importantly, pedestrian crashes.[127] Over 50-60% of road fatality victims in the country are reported to be pedestrians, and 85% of total injury crashes in Addis Ababa involves a pedestrian.[128] Studies in different parts of the country also found that most of these fatalities or injuries are attributable to drivers' fault, followed by vehicle and road conditions.[129] At 25.3 deaths per 100,000 populations, Ethiopia has one of the highest road traffic fatality rate more than the average for low-income countries, 24.1.[130]

However, such traffic crashes are analytically understood in diverse ways. Lamont has referred to it as 'blood price for the cost of the nation's development'.[131] In an ethnographic study of Kenyan road safety and speed governance, Lamont argued that the failed moral responsibility of those involved in legislation, governance and car ownership are accountable for the 'road carnage' and the social injustice. In contrast, locals are made to consider pedestrian crashes as a 'necessary evil' for a nation's development, or only as an accident.[132] Contrary, international institutions like the WHO and UN and African countries consider road safety as a public health issue.[133] However, to some, such 'epidemiological' explanation of road safety where road crashes are planned to be addressed principally by changing individual commuters' behaviour is another attempt to oversimplify its real injustice.[134] Doing so obscures the systemic problem of structural inequalities and

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[126] Getu Segni Tulu and others, 'Injury severity of pedestrians involved in road traffic crashes in Addis Ababa, Ethiopia' (2017) 9 Journal of Transportation Safety & Security 47.

[127] A Persson, 'Road traffic accidents in Ethiopia: magnitude, causes and possible interventions' (2008) 15(A) Advances in Transportation Studies an international Journal Section 1, 5; Ibid 48.

[128] Ibid.

[129] Fesseha Hailu Mekonnen and Sileshi Teshager, 'Road traffic accident: The neglected health problem in Amhara National Regional State, Ethiopia' (2014) 28(1) Ethiopian Journal Health Dev. 3; Abrahim Hassen and others, 'Risky driving behaviours for road traffic accident among drivers in Mekele City, Northern Ethiopia' (2014) 4(535) BMC Research Notes 1; Belachew Melese Hunde, Zeleke Dutamo Aged, 'Statistical Analysis of Road Traffic Car Accident in Dire Dawa Administrative City, Eastern Ethiopia' (2015) 3(6) Science Journal of Applied Mathematics and Statistics 250.

[130] WHO, 'Global Status Report on Road Safety 2015' (2015) <www.who.int/violence_injury_prevention/road_safety_status> accessed 5 June 2018.

[131] Mark Lamont, 'Accidents have no cure! Road death as industrial catastrophe in eastern Africa' (2012) 71(2) African Studies 174.

[132] Amiel Bize, 'Rhythm, Disruption, and the Experience of African Roads' (2016) 8 Mobility in History 28.

[133] See UN, Decade of Action for Road Safety 2011-2020, UNGA A/RES/64/255, 2 March 2010.

[134] Lamont, 'Accidents Have No Cure' (2012) (n 131); Mark Lamont and Rebekah Lee, 'Arrive Alive: Road Safety in Kenya and South Africa' (2015) 56(2) Technology and Culture 464; Bize, 'Rhythm, Disruption, and the Experience of African Roads' (2016) (n 132).

automobility that have disproportionately impacted the poor and encourages tolerance to road deaths and injuries.[135] More roads may then mean more injustices. Unprecedented attention on road development rather than the provision of public transportation, NMT and public safety are to be blamed. The paradox is unfolded then as the roads long-awaited and claimed to have enhanced accessibility of health services have also augmented the horrific tragedy of traffic crashes and fatalities.[136]

Besides '[t]he promises of speed and flexibility through automobile-based urban development has rapidly evaporated due to the growth in traffic congestion.'[137] Instead, mass transit (e.g. rail system) is found to have significantly faster speed than the general road traffic and cars.[138] Major cities in the world have understood the limitations of long years of car-oriented urban design where disproportionate investment in road and parking has deteriorated the virtues of walking and mass-transit and stifled mobility and quality of life.[139] As a result, they have started to enforce car restrictions, expand mass-transit systems and encourage NMT based mobility. Although there are recent changes in policy designs, Ethiopia has not enforced car restrictions and embraced alternative modes yet.

In summary, road projects are surrounded with multifaceted challenges and concerns, and should not be taken for granted as economically and socially desirable, or fostering social equity. Road development's high social cost through its externalities like a traffic accident, congestion, displacement, health and environmental impact associated with vehicle emissions etc are often ignored in the Ethiopian context.[140] Hence, policies that better balance the competing economic and social-environmental interests are, in principle, required, in order for the country's climate ambitions to be achievable.

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[135] Ibid.

[136] Steven Jones and others, 'Public transport and health outcomes in rural sub-Saharan Africa: A synthesis of professional opinion' (2016) 3 Journal of Transport & Health 211.

[137] Peter Newman, Leo Kosonen and Jeff Kenworthy, 'Theory of urban fabrics: planning the walking, transit/public transport and automobile/motor car cities for reduced car dependency' (2016) 87(4) Town Plan. Rev. 436.

[138] Ibid 437.

[139] Ibid 454.

[140] Claudia N Berg, Uwe Deichmann, Yishen Liu & Harris Selod 'Transport Policies and Development' (2017) 53(4) Journal of Development Studies 465.

## 3.4 Equity: Uneven Distribution of Road Infrastructure

The previous section has described the social dimension of road infrastructure. By moving further into the social equity inquiry, this section considers two aspects of the spatial distribution of roads – ethnic favouritism in road prioritisation and the situation of peripheral and disadvantaged areas.

### *3.4.1 Ethnic favouritism*

Infrastructure development could be politicised to acquire power balance or pursue social and political status.[141] Roads mediate the politics of ethnicity, in the sense that ethnicity partially determines which roads will be built first, and where and how roads will connect or disconnect citizens.[142] A study in a recently expanding urban centre of Hawassa, Ethiopia, revealed that road network construction was used to agitate Sidama nationalism and marginalise others.[143] Some also mention 'ethnic chauvinism' or 'ethnic favouritism'[144] where the far north Tigray region and construction firms controlled by the same groups have got the most out of the country's road investment.

A recent World Bank report reiterated that Addis Ababa, Oromia (central) and Tigray (north) region have a much-increased road density compared to other parts of the country (Figure 3-2).[145] Moreover, the change in road density over ten years (2006-2016) was found to be negligible in Amhara regional state, for instance, that makes up about a fourth of the county's population[146] and home to major tourist destinations[147] that should have attracted (by economic and social equity parameters) a road infrastructure boom (Figure 3-1). The report had fuelled the already growing sentiment among Ethiopians that the minority Tigray

[141] Kochore, 'The road to Kenya?' (2016) (n 113).

[142] Moussa P. Blimpo, Robin Harding and Leonard Wantchekon, 'Public Investment in Rural Infrastructure: Some Political Economy Considerations' (2013) 22(2) Journal of African Economies ii57; Robin Burgess and others, 'The value of democracy: Evidence from road building in Kenya' (2015) 105(6) American Economic Review 1817; Berg and others, 'Transport Policies and Development' (2017) (n 140).

[143] Daniel Mains and Eshetayehu Kinfu, 'Making the city of nations and nationalities: the politics of ethnicity and roads in Hawassa Ethiopia' (2016) 54(4) Journal of Modern African Studies 645, 666.

[144] Ambreena Manji, 'Bulldozers, homes and highways: Nairobi and the right to the city' (2015) 42(144) Review of African Political Economy 206.

[145] Kanth and Geiger, 'What Studies in Spatial Development Show' (2017) (n 42).

[146] Federal Democratic Republic of Ethiopia, 'Summary and Statistical Report of the 2007 Population and Housing Census: Population size by age and sex' (Addis Ababa, December 2008).

[147] The region was home to three of the nine UNESCO World Heritage sites of the country: the 13th century Rock Hewn Churches of Lalibela, Semien Mountain National Park, and Gonder (Fassil) Palace, and other popular tourist destinations of the Blue Nile Falls and Lake Tana Monasteries.

Peoples Liberation Front (TPLF) hegemony, one of the four members of the ruling coalition for 27 years until 2019, manoeuvred the system to disproportionally benefit its region, Tigray.[148]

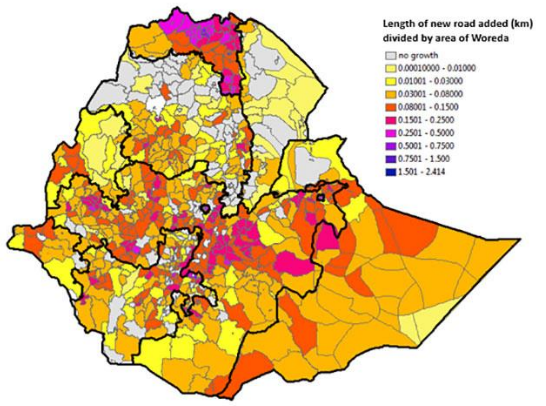


*Figure 3-1 Changes in road density and length, 2006-2016*

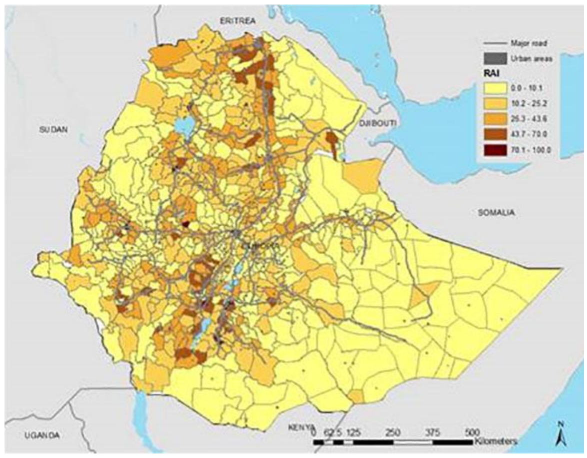


*Figure 3-2 Rural Access Index (RAI) and major roads (2016)*

Source: WB, 2017[149]

A close look at the processes adopted by the Ethiopian government in selecting and prioritising road corridors sheds light on the possible undue political interferences. The blueprint that guides road development is a five-year Road Sector Development Program (RSDP) document and is primarily executed by Ethiopian Road Authority (ERA) with the involvement of regional road offices. ERA receives road construction demands, proposals and priorities from all the regions and federal sectoral offices. Besides, ERA's planning

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[148] Matthew J McCracken, 'Abusing Self-Determination and Democracy: How the TPLF Is Looting Ethiopia' (2004) 36 Case W. Res. J. Int'l L. 183; René Lefort, 'Free market economy, 'developmental state' and party-state hegemony in Ethiopia: the case of the 'model farmers' (2012) 50(4) Journal of Modern African Studies 681, 688; Lefort, 'The Theory and Practice of Meles Zenawi' (2013) (n 14); Yeshtila Wondemeneh Bekele, Darley Jose Kjosavik and Nadarajah Shanmugaratnam, 'State-Society Relations in Ethiopia: A Political-Economy Perspective of the Post-1991 Order' (2016) 5(48) Social Sciences 1. The new PM Abiy has rebranded EPRDF coalition into a united party, i.e. 'Prosperity Party', with the inclusion of other regional ruling parties but TPLF withdrew from it.

[149] World Bank, 'International Development Association International Finance Corporation' (Multilateral Investment Guarantee Agency: Country Partnership Framework for the Federal Democratic Republic of Ethiopia for the Period FY18-FY22, Report No. 115135-ET May 22, 2017) <http://documents.worldbank.org/curated/en/613041498788104835/pdf/Ethiopia-Country-Partnership-Framework-June-5-2017-FINAL-06052017.pdf> accessed 25 February 2018.

department undertakes Transport Poverty Observatory regularly, which involves 'corridor analysis' and 'network studies'.[150]

For new roads, based on these two sets of data, a committee evaluates the proposed road project against sets of criteria where the economic potential (40%) and social equity (40%) parameters are considered.[151] Whereas for upgrading existing networks, nearly all the preliminary selection criteria - investment potential, cost of maintenance, links to export corridors, traffic level and network connectivity - are economic parameters with little equity consideration.[152] Once fund availability is sorted, ERA's recommendation is further scrutinised at Ministry of Construction and Urban Development (now Ministry of Transport) and finally deliberated on by the Prime Minister's Office in the presence of sectoral offices and regional representatives.[153] The process reveals that experts that collect field data are not involved in the final decision making, parameters used for final deliberation are unknown and prioritisation reports and decision are not published for public scrutiny. Hence, in the absence of public review and community participation and low representation of independent experts, it is difficult to disprove the interference of non-economic and social parameters in the prioritisation process.

If used well, the social equity criteria are fundamental in extending the road infrastructure to the most isolated and sparsely populated peripheral and pastoral areas of the country. However, we do not know how regional governments first decide their priorities and what parameters the high-level deliberation at the PM's office would consider. Instead, studies have frequently mentioned the top-down approach of project selection and decision making and the absence of community participation.[154]

In this regard, Shiferaw and others found a profound prioritisation problem where society's priorities are often not investigated due to political and personal reasons or are ignored and misunderstood.[155] Similarly, it was reported that communities and local authorities

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[150] Shiferaw and others, 'Road Infrastructure and Enterprise Dynamics in Ethiopia' (2015) (n 105) Online Appendix.

[151] ibid 1544; ERA, '21 Years Performance Assessment' (2019) (n 4) 9-10.

[152] ERA, '21 Years Performance Assessment' (2019) (n 4) 9.

[153] Shiferaw and others, 'Road Infrastructure and Enterprise Dynamics in Ethiopia' (2015) (n 105) Online Appendix.

[154] Asmamaw Tadege Shiferaw, Ole Jonny Klakegg and Tore Haavaldsen, 'Governance of public investment projects in Ethiopia' (2012) 43(4) Project Management Journal 52–69.

[155] Ibid.

would know about the details of road projects when execution starts, which then forces design change and contribute to time and cost overruns.[156] Decisions are made by experts and politicians alone, and design and execution plans are not open for public scrutiny.[157] Meagre community participation in the process of road design, implementation and monitoring stages were also reported in different parts of the country.[158]

Thus, road project management and transparency systems created to monitor public expenditures on road infrastructure have also become a concern.[159] The presence of responsive civil society and media could have triggered constructive public hearing to counter-balance the 'exclusive tendencies in decision making.'[160] The hostile regulatory environment against media and civil society discussed in the preceding chapter has, however, retarded critical voices on the road prioritisation, design and execution and socio-environmental pitfalls.[161] Currently, road features in the media as a developmental tool dominated by contract signing, road inauguration and delay in execution, and very rarely about its pitfalls, prioritisation and equitability issues.

### *3.4.2 Peripheral areas*

Let us take the equity issue one step further and expose that roads disproportionately favour economic opportunities than the needs of those living in the area. Based on human settlement patterns and economic activities, Ethiopia could be divided into two: populated and agrarian highlands, and sparsely populated and pastoralist (agro-pastoralist) low lands. Major urban areas and comparably diverse economic activities are witnessed in the highlands. Low land areas and frontiers of Ethiopia, which covers about 60% of the landmass and 12% of the population, are long considered as historically disadvantaged and marginalised – a problem which the regime promised to redress and help catch up with the

[156] Sintayehu Assefa, Zewudu Tefera and Murad Mohamme, 'Stakeholders Impact Analysis on Road Construction Project Management in Ethiopia: A Case of Western Region' (2015) 3(11) IJETR 115.

[157] Daniel Mains, 'Blackouts and Progress: Privatisation, Infrastructure and a Developmentalist State in Jimma, Ethiopia' (2012) 27(1) Cultural Anthropology 3.

[158] Alok Tiwari, Urban Infrastructure Research: A Review of Ethiopian Cities, (Springer Briefs in Geography 2016).

[159] Shiferaw, Klakegg and Haavaldsen, 'Governance of public investment' (2012) (n 154).

[160] Jacqueline Klopp, 'Towards a Political Economy of Transportation Policy and Practice in Nairobi' (2012) 23 Urban Forum 1, 15.

[161] Freedom of the Mass Media and Access to Information Proclamation No. 590/2008; Anti-Terrorism Proclamation No. 652/2009; Lovise Aalen and Kjetil Tronvoll 'The End of Democracy? Curtailing Political and Civil Rights in Ethiopia' (2009) 36(120) Review of African Political Economy 193.

rest of the country.[162] Highly mobile pastoral communities inhabited these vast semi-arid lands with little alternative livelihood activities and infrastructure, such as road. Programs like Promoting/ Protection Basic Services (PBS) and Pastoral Community Development Project (PCDP) that have attracted enormous support from donors like the World Bank and the UK were primarily implemented in those areas.[163] The government has also implemented the controversial Commune Development Program (CDP) in 2010-2013, which essentially was a 'resettlement' or 'villagisation' program, in the five disadvantaged regions (Gambella, Benishangul-Gumuz, Somali, Afar and Southern Nation, Nationalities and People's (SNNP)).[164]

As the fourth government resettlement program in the history of Ethiopia,[165] and envisaged 'to improve livelihoods, social services, infrastructure and building of local institutions' in the new villages/communal areas,[166] CDP scheme considers construction of road networks as its integral part. Villagisation and resettlement programs were principally promised to deliver three interrelated opportunities: better access to infrastructure and social services, and sustained livelihood activities. Nevertheless, in the absence of road facilities, none of the promised services and new opportunities in settlement sites would sustain and continually attract settlers. For example, under the Gambella region's Villagisation Program Action Plan, the construction of 195 km of road was planned before resettling the target population into the new sites.[167] Not only villagisation initiatives but commercial farming

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[162] Khan and others, 'Improving basic services for the bottom forty percent' (2014) (n 53).

[163] HRW, "Waiting Here for Death": Forced Displacement and "Villagisation" in Ethiopia's Gambella Region' (Human Rights Watch, 2012) <www.hrw.org/report/2012/01/16/waiting-here-death/forced-displacement-and-villagization-ethiopias-gambella-region> accessed 20 March 2018; Ibid.

[164] Maria Grunditz, 'Is villagisation an acceptable solution? - An analysis of villagisation programmes in Ethiopia in relation to the fulfilment of state obligations under the ICESCR and the concept of self-determination of indigenous people' (Lund University student paper, 2015). In three year time (2010-2013), they planned to resettle more than 1.4 million peoples in the first four regions as SNNP was a late addition into the plan.

[165] John M Cohen and Nils-Ivar Isaksson, 'Villagisation in Ethiopia's Arsi Region' (1987) 25(3) Journal of Modem African Studies 435, 438; Getachew Woldemeskel, 'The Consequences of Resettlement in Ethiopia' (1989) 88(352) African Affairs 359. The other three being in 1975/76, 1985/86 and 2003, the failed settlement program of 1985/86 of the Derg regime had envisaged similar objective of moving 'people into villages where it will be possible to provide the basic essential services, such as: extension, marketing, clean water, access to roads, education, and health'. Resettlement and villagisation are used interchangeably for this piece although their scopes and political implications are different.

[166] Mads Holm, 'Villagization: A case study of Ethiopia's villagization programme' (Master thesis, Aalborg University, 30 Aug 2016).

[167] Gambella Peoples' National Regional State, 'Villagization Program Action Plan (2003 EFY)', (Gambella, Ethiopia August 2002 E.C (2010)).

investors in Gambella, known for its poor road infrastructure, were also expected to construct new roads to improve accessibility.[168]

Historically, road and other infrastructure deficiencies were mentioned as the major causes for the failure of the 1970s and 1980s massive villagisation (resettlement) programs. In an ethnographical study of resettlement project of Surma people in Southwestern Ethiopia, Abbink was told that inaccessibility, absence of roads to transport people and materials, were the major causes for the 'complete failure' of the 1970s project.[169] In the same area, Abbink found that about 95% of the families had abandoned their villages and returned to their original homes during the second resettlement program of 1985/86.[170]

Similarly, a report by Human Rights Watch indicated that absence of infrastructure (access to essential services) in settlement sites have exacerbated the suffering of the indigenous community and contributed for the apparent failure of the latest villagisation program in Gambella region.[171] Another villagisation site the researcher visited in 2016, the Gewane district of Afar region, along the course of Awash River, was ultimately abandoned due to absence of essential services and incompatibility with the pastoral way of life. The laterite and makeshift road, and sandy trails that cross bushes and hills up until the villagisation site was more the result of a natural process than human designing. Settlement sites are often selected for their suitability for settlement in terms of the presence of vast plain or bushy lands and proximity to arable land, water sources and market places with the understanding that all other socio-economic infrastructures such as road will be constructed afresh.[172] When such promises fade, communities return to their previous way of life.

There are, however, some villagisation sites which are endowed with better infrastructure development including a road. These are exceptional cases and had to do with the massive government investment (e.g. sugar factory or hydroelectric power development) underway

[168] Anita Milman and Yacob Arsano, 'Climate adaptation and development: Contradictions for human security in Gambella, Ethiopia' (2014) 29 Global Environmental Change 349, 354.

[169] Jon Abbink, 'Settling the Surma: Notes on an Ethiopian Relief Experiment' (1992) 51(2) Human Organisation 174, 177.

[170] Ibid.

[171] HRW, 'Waiting Here for Death' (2012) (n 163). See also International Consortium of Investigative Journalists, 'Leaked Report says World Bank Violated Own Rules in Ethiopia' (20 January 2015) <www.icij.org/blog/2015/01/leaked-report-says-world-bank-violated-own-rules-ethiopia> accessed 23 April 2018.

[172] Woldemeskel, 'The Consequences of Resettlement in Ethiopia' (1989) (n 165).

in the areas than the villagisation program itself. Kessem sugar factory in Afar region, Omo-Kuraz sugar factory and Gibe III hydroelectric dam in Southern Omo and Kaffa provinces along the Omo River, and Grand Ethiopian Renaissance Dam in Benshangul-Gumuz could be mentioned.[173] To achieve their set economic (e.g. generate revenue and employment creation) and developmental (e.g. modernisation and improvement of livelihoods) objectives, these government projects were accompanied by massive land dispossession.[174] Paved roads were constructed along these corridors to optimise the operation of the development projects which incidentally increased access for rural communities. Development Assistance Group (DAG) Ethiopia also reported that it had received positive feedback from communities about the improved roads in Bench-Maji settlement sites on the course of Omo River.[175]

Most reports and research about villagisation mention infrastructure in general in an apparent reference to a wide range of socio-economic services like school, health, water, power, irrigation and roads. Hence, the exact impact of the poor road network on the success or failure of villagisation programs might deserve further scrutiny. When moved to new sites, communities were promised to have better access to infrastructure and other services like schools and health, and alternative livelihoods. Though the socio-cultural and economic conditions are the frequently mentioned reasons for the failure of villagisation in some sites, lack of infrastructure has worsened the situation.[176] Conversely, evidence also shows that villagisation sites with better infrastructure do better in terms of holding settlers back. The government had also admitted that poor infrastructure and inaccessibility of the villagisation sites had initially challenged the settlement programme.[177]

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[173] Kamski, 'Kuraz Sugar Development Project' (2016); OMO-KURAZ SUGAR DEVELOPMENT PROJECT, <http://ethiopiansugar.com/index.php/en/projects/kuraz-sugar-development-project> accessed 5 Feb 2018; Kessem Sugar Factor, <http://ethiopiansugar.com/index.php/en/factories/kessem-sugar-factory> accessed 5 Feb 2018.

[174] Buffavand, 'The land does not like them' (2016) (n 118); Kamski, 'Kuraz Sugar Development Project' (2016) (n 118).

[175] DAG, 'DAG Recommendations following South Omo and Bench-Maji mission' (Addis Ababa: The Development Assistance Group Ethiopia, 2015) 3.

[176] Holm, 'Villagization' (2016) (n 166) 30, 38 and 46.

[177] Government of Ethiopia, 'Reply to DAG findings and recommendations on CDP and South Omo (DAG/OU/3/2014A)' (Ministry of Finance and Economic Development, and Ministry of Federal Affairs, 18 March 2014) 3.

The villagisation sites are discussed to demonstrate the urban bias in road prioritisation and that the marginalised and peripheral areas have benefited marginally from the recent road expansion. Thus, these regions where villagisation programs were implemented still have the lowest road density of the country.[178] The 2017 World Bank report reiterated that the 'remote and economically lagging regions (Somali, Afar, Gambella, and Benshangul) see lesser increases in road density' over the years (Figure 3-1 above).[179] Although these four regions together constitute over 40% of the country's land, they account only about 13% of the road networks.[180] The absence of economic activity other than livestock rearing and low population density (account for only about 12% of the country's population) might have contributed to the low road density. Hence, despite current efforts, most of these remote villages and frontiers remain disconnected from the rest of the country.[181] However, areas endowed with better natural resources, vast arable land and all-season water (rain or stream), are seeing improving road networks.

In summary, the spatial distribution of road activities does not seem to be guided by objective criteria where community interests are prioritised. Some areas have shown a relative increase in road density while others still lag behind. Ethnic lines and resource endowment seem to play a crucial role depending on the circumstances. Road development decisions are made depending on the economic importance of the peripheral areas where resource control outweigh community interests. Communities benefit or suffer from spin-off effects of the road. As a result, road infrastructure increased not only accessibility but also exposed their resources and values for exploitation and interference.

## 3.5 Regional Context of Ethiopia's Road Infrastructure: Integration

Historically, many of the African and also East African transport infrastructures (railway and road) were conceived by colonial powers, Britain being the spearhead, for control of resources including the source of the Nile River.[182] The motives were solidifying control of the hinterland through transporting commodities and military expedition while the benefit

[178] The four regions of (Somali, Afar, Gambella, Benshangul) take only 13% of the overall road network. Yet if we add southern part of the SNNP, that might to as far as 16%.

[179] Kanth and Geiger, 'What Studies in Spatial Development Show' (2017) (n 42).

[180] Bekele and Ferede, 'Economy Wide Impact of Road Investment' (2015) (n 5).

[181] Milman and Arsano, 'Climate adaptation and development' (2014) (n 168).

[182] Klopp and Makajuma, 'Transportation Infrastructure Integration in East Africa' (2014) (n 91).

to the local was to be a spin-off effect.[183] The orientation, therefore, was 'outward-looking' rather than focusing on societal demands.[184] However, connecting its colonial territories end-to-end did not succeed for various reasons. The agenda resonates but with different motives: integration and nationalism.

### *3.5.1 Regional nature of Ethiopian road*

African regional integration through its multiple forms is top of the agenda for many multilateral, regional and national authorities including African Union's New Partnership for Africa (NEPAD) and African Development Bank (AfDB).[185] Infrastructure development, where transport takes the lion share, was believed to foster and speed up these regional integration agenda.[186] Sub-Saharan Africa (SSA) road infrastructure situation has been lamented by many as the poorest of poor and is believed to have contributed to the highest cost of doing business in the region, and a major obstacle for growth and poverty reduction.[187] Many economics and development researchers have claimed a positive effect of road development on economic growth in SSA with some calling it an efficient tool in fighting poverty.[188] Calderon and Serven also argued that it could foster long-run growth and tackle income inequality, and ultimately reducing poverty in SSA.[189] Others have also examined its importance in promoting inter-regional trade, integration and cooperation.[190]

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[183] Ibid.

[184] Economic Commission For Africa, 'Meeting of the Technical Committee on Transport and Communications of the PTA for Eastern and Southern African States' (Lusaka, Zambia, 1 to 5 November 1982).

[185] Klopp and Makajuma, 'Transportation Infrastructure Integration in East Africa' (2014) (n 91).

[186] UN Economic Commission for Africa (UNECA), 'Assessing Regional Integration in Africa (ARIA VII): Innovation, Competitiveness and Regional Integration' (Addis Ababa, Ethiopia 2016).

[187] Cesar Calderon and Luis Serven, 'Infrastructure and Economic Development in Sub-Saharan Africa' (2010) 19(1) Journal of African Economies i13, i13; Klopp and Makajuma, 'Transportation Infrastructure Integration in East Africa' (2014) (n 91); David Atkin and Dave Donaldso, 'Who's getting globalized? The size and implications of intra-national trade costs' (Cambridge WP Paper 21439, MA: NBER 2015) <www.nber.org/papers/w21439> accessed 9 Feb 2018.

[188] S Ramessur, B Seetanah and S Rojid, 'Roads and Poverty: New Evidences from Africa' (2010) 14(2) Journal of Poverty 166,166; Chengete Chakamera and Paul Alagidede, 'The nexus between infrastructure (quantity and quality) and economic growth in Sub Saharan Africa' (2017) International Review of Applied Economics.

[189] Calderon and Serven, 'Infrastructure and Economic Development' (2010) (n 187) i53-54.

[190] Kennedy K Mbekeani, 'Infrastructure, Trade Expansion and Regional Integration: Global Experience and Lessons for Africa' (2010) 19 Journal of African Economies 88; Piet Buysa, Uwe Deichmanna and David Wheele, 'Road Network Upgrading and Overland Trade Expansion in Sub-Saharan Africa' (2010) 19(3) Journal of African Economies 399; Uduak Akpan, 'Impact of Regional Road Infrastructure Improvement on Intra-Regional Trade in ECOWAS' (2014) 26(S1) African Development Review 64.

Ethiopian road infrastructure was the worst of all other SSA countries, and with no meaningful connectivity with neighbouring countries except Eritrea and Djibouti until 2010.[191] When its access to the sea vanished with the secession of Eritrea in 1993, Ethiopia accepted its total reliance on a single transit route through Eritrea instead of furthering through other neighbouring ports, such as Djibouti, Port Sudan, Berbera and Mombasa.[192] It continued unabated until the bloody Ethio-Eritrea war broke out in 1998 that has forced Ethiopia to switch to Djibouti, which still executes about 90% of its foreign trade. Ethiopia is located in one of the most volatile regions of Africa sandwiched between the failed and war-torn states of Somalia and South Sudan, and isolated red sea state of Eritrea. No doubt that this poses an unswerving challenge to a regional integration and transformation prospect in the foreseeable future. However, recently, the regional nature of Ethiopia's infrastructure development ambitions has become visible.

There was media attention when Ethiopia and Kenya signed an agreement to construct the international truck road connecting Addis Ababa with Lamu port through Moyale-Isiolo-Garsen, which is part of Kenya's LAPSSET project.[193] The ambitious LAPSSET includes road, railway and pipelines infrastructure development connecting South Sudan and Ethiopia with Lamu port of Kenya through arid and semi-arid, primarily ignored and politically delicate Northern part of Kenya.[194] The road development section between Kenya and Ethiopia has been completed on both sides. However, LAPSSET has become very controversial within Kenya.[195] In 2018, the Kenyan High Court remanded the environmental impact assessment (EIA) license of LAPSSET project to the issuing agency due to grave environmental and procedural irregularities in the design and implementation processes.[196]

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[191] Foster and Morella, 'Ethiopia's Infrastructure' (2010) (n 11).

[192] World Bank, 'Ethiopia Road Rehabilitation Project' (1992) (n 10).

[193] That agreement was signed between the then Kenyan Transport Minister Amos Kimunya and his Ethiopian counterpart Deriba Heiy in March 2012. Wanjohi Kabukuru, 'Addis plays the long game' *African Business,* (June 2013) 82.

[194] Government of Kenya (GOK), 'Vision 2030 Development Strategy for Northern Kenya and Other Arid Lands' (GOK Printer: Nairobi, 2011); Christopher Clapham, 'Can the Horn Change?' (2015) 3(12) International Relations and Diplomacy 818, 827; Mosley and Watson, 'Frontier transformations' (2016) (n 116) 453. Kenya's Vision 2030 was launched in 2006 and started to take effect starting from 2008 with the objective of attaining middle income country by 2030 while Ethiopia's Carbon Resilient Green Economy (CRGE) envisaged to achieve the same by 2025. *CRGE Strategy* (2011) (n 1).

[195] Ngala Chome, 'Land, livelihoods and belonging: negotiating change and anticipating LAPSSET in Kenya's Lamu county' (2020) 14(2) Journal of Eastern African Studies 310.

[196] Mohamed and Others v Attorney General and others (LAPSSET Case), Republic of Kenya, In The High Court Of Kenya At Nairobi, Petition No 22 OF 2012, 1st of May 2018.

The court, inter alia, questioned the adequacy of the proposed environmental and economic mitigation measures, and consultation with local community and administration. Such judicial review serves as a crucial safeguard mechanism to caution outrageous infrastructure plans that disregard environmental and community interests.

LAPSSET has become the ninth project to join the New Partnership for Africa's Development (NEPAD) Presidential Infrastructure Champion Initiative (PICI) in 2015.[197] PICI was initiated in 2010 and later endorsed by AU General Assembly to accelerate the implementation of prioritised sub-regional and regional infrastructure projects, and revitalise strong political support for infrastructure development which was long considered as an impediment to regional integration.[198] It opens up the opportunity for leaders to get international attention and support by initiating a feasible regional integration project. NEPAD facilitates high-level discussion platform, and provide both technical and financial grants for project start-ups. Beside its socio-economic importance, PICI's concept of creating 'champion head of state' by assigning the project to the head of the initiating state might also help leaders to forge political legitimacy quests or attract attention through these projects.[199]

Some of these initiatives, none are from Ethiopia, are part of the extra ambitious Trans-African Highway network recently re-initiated by African Development Bank (AfDB).[200] The Trans-African Highway, such as the Cape to Cairo (British) and Dakar to Djibouti (France) routes, had been in the agenda for over a century since the colonial period and later resurfaced in the 1970s by actors like United Nations Economic Commission for Africa (UNECA).[201] However, apart from rhetoric and symbolic representation of the aspirations to regional integration, neither the PICI nor Trans-African Highway is the immediate

[197] Ikome and Lisinge, 'The political economy of infrastructure development in Africa' (2016) (n 12) 256.

[198] Ibid; AU, 'Presidential Infrastructure Champion Initiative (PICI) Report: Connecting Africa through Political Leadership' (African Union, South Africa, 2015); UNECA, 'Assessing Regional Integration in Africa (ARIA VII): Innovation, Competitiveness and Regional Integration' (UN Economic Commission for Africa, Addis Ababa, Ethiopia 2016).

[199] Ikome and Lisinge, 'The political economy of infrastructure development in Africa' (2016) (n 12).

[200] African Development Bank, 'Review of the Implementation Status of the Trans-African Highways and the Missing Links' (SWECO International AB, and Nordic Consulting Group AB, Sweden, Stockholm, August 14th 2003. <www.afdb.org> accessed 19 April 2018.

[201] United Nations Economic and Social Council & United Nations Economic Commission for Africa, 'Current status of the Trans-African highway' (UNECA Trans- African Highway Committee, 14 - 18 June 1971 Addis Ababa, Ethiopia) <http://hdl.handle.net/10855/16417> accessed 17 May 2018; Klopp and Makajuma, 'Transportation Infrastructure Integration in East Africa' (2014) (n 91); James Clacherty, 'Highway Africa: The Trans-Africa Highway Masterplan: Of Masters, Plans and Master Narratives' (University of Basel, Urban Studies, HS 2017).

concern of governments. Hence, the success of the regional infrastructure projects is dependent on the determination of the respective nations rather than these regional initiatives.

### *3.5.2 Ethiopia's connectivity with its neighbours*

In addition to its connection with Kenya, landlocked Ethiopia has improved connection with its neighbours through roads except for mainland Somalia, and most were constructed, upgraded or paved after 2010 (Figure 3-3). In effect, Ethiopia has multiple highways connecting it with Sudan (three), South Sudan (three), Djibouti (three), Eritrea (three) and Somaliland (one) where most are completed and a few nearing completion. The fact that Ethiopia's second express highway (toll road) that was inaugurated in June 2019 stretches from the eastern industrial city of Dire Dawa to Dewelle, Djibouti signifies the attention given to the regional integration agenda.[202] Most of these road segments are intended to enhance Ethiopia's access to the sea and were accompanied with port developments in the neighbouring countries – Tadjoura and Djibouti ports in Djibouti, Assab and Massawa in Eritrea, Port Sudan in Sudan and Berbera in Somaliland.[203] For instance, the construction of Ethio-Somaliland highway was accompanied by Ethiopia's acquisition of a 19% stake in a $442 million Berbera Port development.[204] However, direct passenger transport is still informal except the one between Khartoum and Addis Ababa started in March 2017.[205]

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[202] ENA, 'Dire Dawa-Dewele Toll Road Project Inaugurated' Ethiopian News Agency (June 17, 2019) <https://borkena.com/2019/06/17/business-news-dire-dawa-dewele-toll-road-project-inaugurated/> accessed 6 July 2020.

[203] See Aaron Maasho, 'Ship docks, road upgrade planned as Eritrea, Ethiopia ties strengthen' Reuters (ADDIS ABABA, September 5, 2018) <https://uk.reuters.com/article/uk-ethiopia-eritrea-port/ship-docks-road-upgrade-planned-as-eritrea-ethiopia-ties-strengthen-idUKKCN1LL2GS> accessed 6 July 2020; Temesgen Mulugeta, 'Ethiopia, Djibouti Buttress Trade Routes' November 9, 2019 <https://addisfortune.news/ethiopia-djibouti-buttress-trade-routes/> accessed 6 July 2020.

[204] Chris Giles, 'Somaliland secures record $442m foreign investment deal' *CNN* (August 1, 2017) <http://edition.cnn.com/2017/08/01/africa/somaliland-new-gateway-africa/index.html> accessed 17 May 2018.

[205] Tesfa-Alem Tekle, 'Ethiopia and Sudan to launch land transportation service' *Sudan Tribune* (Friday 10 March 2017 Addis Ababa) <www.sudantribune.com/spip.php?article61843> accessed 17 May 2018.

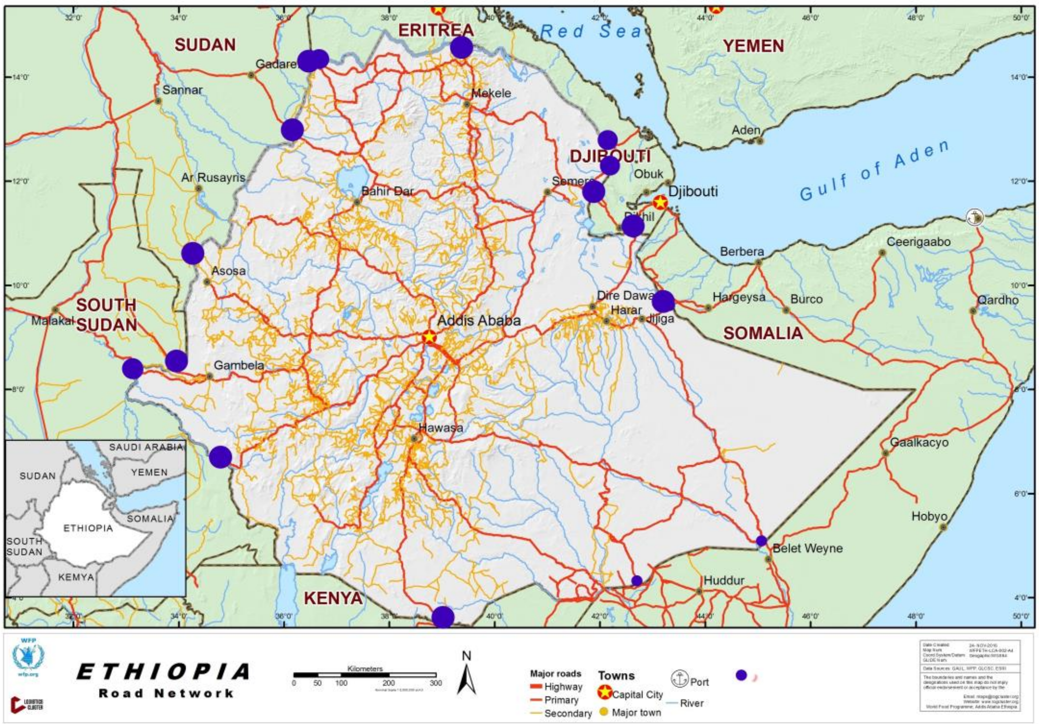


*Figure 3-3 Cross-border highway and international corridors*

Source: Updated from WFP, 2016

Regional integration has proved to be a multi-party agenda, and Ethiopia's current efforts have four different features. Prominent in the agenda are Djibouti, Sudan and Kenya that have shown strong commitment by constructing a section of the roads in their territories. However, the world's newest state of South Sudan and semi-autonomous administration of Somaliland have struggled to match Ethiopia's ambitious plans. Likewise, road connectivity to the mainland Somali in the Eastern border remains invisible owing to stagnant economic interactions, and security and political reasons. Lastly, the normalisation of relations with Eritrea has opened the chance to reopen highways that will allow Ethiopia to access the Red Sea ports of Assab and Massawa.

In addition to economic reasons, regional geopolitics and stability have defined and influenced these features. Road agreements often come as part of a broader partnership agreement that includes trade and security issues. In economic terms, Ethiopia's two bargaining chips, hydroelectric power potential and population (market), might have helped it to get concessions from its neighbours, which requires them to construct a section of the road within their territory. Besides, Ethiopia has continued to attract attention in the horn due to its military, diplomatic and more recently economic power.[206] Ethiopia also supplies cheaper hydroelectric power to Sudan and Djibouti, and grid lines are under construction to reach out to Kenya and Tanzania. Its vast population size and largest economy in the horn also mean higher demand for transit corridors for its import and export items. Although it is too early to see the impact, Ethiopia demonstrates the ambition to catch up with the regional integration agenda. Viewed differently, the regional integration through transport is presented as both necessary and desirable: a tool of political legitimacy through consolidating regional economic leadership.

However, most of these regional initiatives in the transport sector are the carbon-intensive road projects designed by central governments whose socio-economic and environmental impacts are contentious. Creating low-carbon transport corridors (e.g. rail network) along the region demands galvanising national resources and mobilising international support to cover the higher cost of the initial investment. However, this thesis argues that political support and international financing are much easier to get for the road than low-carbon transport infrastructures. As a result, railway network projects are shelved for years, and those under construction (e.g. Awash-Weldia-Mekelle) face significant funding problems.[207]

## 3.6 Conclusion

Enhancing transport infrastructure is at the heart of Ethiopian developmental state political economy. Ethiopia considers road investment as a stimulant to the country's growth potential, bringing economic benefits and supporting for other vital endeavours, such as eradicating rural poverty. Accordingly, capital, including from international sources, is heavily drawn to improve the road density and network. Such urban biased efforts have increased the accessibility of the countryside and improved Ethiopia's connectivity to its neighbours.

However, legal and sociological researchers by and large and some development researchers to a lesser degree have questioned the promised utilities of road infrastructures and its unintended negative consequences. In the contexts of sub-Saharan Africa and Ethiopia, road's disruptive character, fuelling economic inequalities and

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[206] Clapham, 'Can the Horn Change?' (2015) (n 194) 820.

[207] ERC, 'Climate Finance Project: Climate Finance Investment Plan' (Climate Focus and Carbon Africa for Ethiopian Railways Corporation, 7 June 2017).

marginalising the already disadvantage poor rural and urban population and exposing culturally intact communities for outside resource exploitation are witnessed. Moreover, the lack of transparency in the decision-making process exposed the prioritisation problems and the appropriateness of these capital intensive public expenditures.

Ethiopia's attempt to fill the transport service deficit through road construction has a perverse effect of fuelling motorisation and risk carbon lock-in transport system. However, the political support and availability of international finance stimulated road expansion over the low-carbon alternatives. Although there are few ongoing initiatives, the discussion under this and preceding chapter revealed that Ethiopia lacks the required level of political commitment to expand low-carbon transport that it has exhibited in road expansion. In effect, the long term environmental sustainability of the transport service is at risk and availability of funding for other transport modes are compromised. Road expansion has drained the country's limited resources and restricted the opportunity for other mobility solutions to flourish.

With the expansion of road infrastructure and motorisation oriented public procurement, externalities of motorisation such as emissions, air pollution, congestion and traffic accident have increased. In urban areas, the massive road expansion was undone by the rapidly increasing car numbers that has increased congestion, travel time and carbon emissions. Thus, additional instruments will be sought to regulate cars and mitigate their externalities. In the coming chapters, the type of strategies and instruments that Ethiopia could adopt to limit the growing number of cars and their emissions are presented. It starts with a comparative analysis of the regulatory instruments and the challenges of regulating cars in the more advanced economies.

# Chapter 4
# Mitigation Instruments Choice and Politics of Car Regulation

**Introduction**

Policies adopted in Ethiopia, such as aggressive road developments and pro-car public expenditure, has fuelled motorisation and carbon emissions. The latter is not a unique problem to Ethiopia but shared by many countries, although with a varying degree. Even then, 'whom' (auto industry, fuel producers and individual commuters) and 'how' (instrumental choice and intensity) to regulate unsettles all jurisdictions alike. Among the prominent factors that influence these decisions are environmental and socio-economic objectives, actors' behaviour and nature of the instrument.

In this regard, the powerful auto industry and national states where these industries are set up are the major actors. Data compiled by the International Organization of Motor Vehicle Manufacturers (OICA) for 2017-2019 revealed that production in 11 countries makes up about 80% of global passenger car production and 14 automakers produce about 80% of the global vehicle stock.[1] As expected, G20 countries alone accounted for 90% of new vehicle sales in 2013.[2] Most of the big auto industries in these countries and regions (Europe, North America and East Asia) have subsidiaries elsewhere and influence global technology adoption. Consequently, regulatory instruments enforced against these auto industries have a spillover effect on other vehicle importing and producing countries. Although both the auto production and its climate change impact are truly global matters, none of these is the subject of an international regulatory framework. Hence, all regulatory schemes remain local, or partly regional in the EU, and under the influence of these few international actors.

Choices of instruments are also affected by the very nature of the instrument and intended environmental goals. Instruments are commonly categorised as command-and-control (CAC) regulation, economic instruments (EI), self (co) regulation and soft instruments.

[1] OICA, 'Production statistics' (International Organization of Motor Vehicle Manufacturers) <www.oica.net/production-statistics/> accessed on 08 July 2020. The same figure were obtained for the years 2017-2019 where 79% and 88% of the vehicles were produced only in 10 and 15 countries respectively.

[2] Zifei Yang and others, 'On a pathway to de-carbonization: A comparison of new passenger car CO2 emission standards and taxation measures in the G20 countries' (2018) Transportation Research Part D: Transport and Environment 53.

Although the three instruments are prominent as climate policies in the transport sector – fuel-efficient standards, vehicle taxes and charges, and fuel taxes, other new instruments are increasingly being used.[3] In addition, public expenditure is also considered as one instrument whereby government influences behaviour and transport modal choices through its purchasing power.

In the history of environmental regulation, until the mid-1980s, state-centred CAC regulation was dominant, and governments were believed to possess all the necessary technicalities, capabilities and legitimacy to deal with all sorts of the environmental problem by itself.[4] However, in the past three decades, this practice has been challenged forcing the government to adopt a hybrid regulation where not only are varying instruments combined but also other stakeholders like firms, communities, civic society and financial institutions would share the regulatory burden.[5] Consequently, direct regulation was complemented and sometimes spearheaded by other instruments and numerous actors in many sectors, including transport.

This chapter intends to analyse the nature of these instruments and factors – internal and external – that affect instrumental choice decisions in the road transport sector. Hence, designing features and achievements of the most widely used instruments in the transport sector are presented by following the traditional CAC and EI divisions. Furthermore, the argument that mixes of different types of instruments perform better than a single stringent instrument is presented. With the view of understanding the external factors that influence the design of regulatory instruments, the regulatory rulemaking process in the EU and US and how the auto industry vehemently fought for a no or soft regulation are discussed.

## 4.1 Command and Control (CAC)

CAC, otherwise called ‘direct regulation’, is a conventional regulatory approach that establishes rules and/or objectives that must be fulfilled by the actors who would face

[3] Ibid.

[4] Julia Black, ‘Decentring regulation: Understanding the role of regulation and self-regulation in a ‘’Post-Regulatory’’ world' (2001) 54 Current Legal Problems 103; Carolyn Abbot, ‘Bridging the Gap: Non-state actors and the challenges of regulating new technology’ (2012) 39(3) Journal of Law and Society 329, 338.

[5] Abbot, ‘Bridging the Gap’ (2012) (n 4).

sanctions in case of non-compliance with the norms.[6] CAC was the core of the first environmental policies and continues to play a vital role in climate policies, including in the transport sector.[7] It could take different forms and target different aspects of the road transport system and actors. Among the different CAC instruments, fuel-efficiency standards (FES), carbon emission standards and vehicle ownership and use restrictions are widely used in the transport sector.

### *4.1.1 Fuel economy standards (FES) and emission standards*

FES is arguably the most widely used, effective and politically accepted climate instrument in the transport sector.[8] It was started as fuel economy measures to reduce fuel importation in the USA following the 1973 oil crisis by the Energy Policy and Conservation Act (EPCA) of 1975.[9] The resulting Corporate Average Fuel Economy (CAFE) standards required auto manufacturers to increase the fuel efficiency of their vehicles sold in the USA. Since 2009 CAFE was integrated with the newly designed GHG emissions standard and continued to influence auto manufacturers to redesign and innovate fuel-efficient vehicles.[10] FES has now been expanded to the rest of the world including the EU, China, Japan, Australia, Canada, India and others including in DCs.[11]

FES takes different forms and is often enforced against auto manufacturers. It is usually expressed in numerical value either as distance travelled per litre (or gallon) of fuel while emissions standards are measured in a gram of CO2 emitted per kilometre (or mile).[12] However, the fact that standards are diverse and inconsistent across different countries has

[6] Julia Black, 'Enrolling actors in regulatory systems: examples from UK financial services regulation' (2003) Public Law 63, 67.

[7] Neil Gunningham, 'Environment Law, Regulation and Governance: Shifting Architectures' (2009) 21(2) Journal of Environmental Law 180; Xiang Yin and others, 'China's transportation energy consumption and CO2 emissions from a global perspective' (2015) 82 Energy Policy 233; IPCC, *Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, UK, 2014) [IPCC, AR5-WGIII] 1155.

[8] Felix Creutzig and others, 'Climate policies for road transporter visited (I): Evaluation of the current framework' (2011) 39 Energy Policy 2396.

[9] Thomas Klier and Joshua Linn, 'New-vehicle characteristics and the cost of the Corporate Average Fuel Economy Standard' (2012) 43(1) RAND Journal of Economics 186.

[10] EPA, DoT and NHTSA, 'Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule' Fed. Regist. 40 CFR, 25324- 25728, 2010.

[11] UN, 'Global verview on fuel efficiency and motor vehicle emission standards: policy options and perspectives for international cooperation', (Commission on Sustainable Development, 19th Session New York, CSD19/2011/BP3, 2-13 May 2011); Creutzig and others, 'Climate policies for road transporter I' (2011) (n 8).

[12] UN, 'Global overview on fuel efficiency and motor vehicle emission standards' (2011) (n 11).

challenged the highly globalised auto industry, and industries are calling for harmonisation.[13] Furthermore, if achieved, harmonisation will prevent diffusion of obsolete technologies and used vehicles to DCs. Nevertheless, the protectionist approach of some auto-producing countries that are opting for a local approach to a truly global sector remains the biggest challenge.

FES accelerates the rate of technology adoption and induces these innovations to be in fuel efficiency than other vehicle characteristics. A study on vehicle technology adoption as a result of tightening of FES in the US and Europe found an increased rate of technology adoption.[14] It was also noted that the measures taken to tighten up CAFE standards have changed firm behaviour, stimulated technology adoption and increased the alternative fuel vehicle (e.g. electric and hybrid vehicles) fleet in the USA which would not have increased in its absence.[15]

Cautiously, some argued that CAFE has little effect on changing consumers' behaviour by way of fostering eco-friendly consumer preference.[16] They assert that buyers still prioritise price factors over environmental performance during purchase. Arguably, as FES targets auto producers rather than consumers, other complementary instruments are needed to shape the demand side of the market.[17] Some also question the 'rebound effect' of FES that it will induce an increase in distance travelled and purchase of heavier and larger vehicles.[18] However, studies in Britain and the US found that the direct rebound effects of FES are either non-existent or minimal compared with its environmental benefits.[19] Hence, the

[13] Ibid.

[14] Thomas Klier and Joshua Linn, 'The effect of vehicle fuel economy standards on technology adoption' (2016) 133 Journal of Public Economics 41.

[15] Seung-Pyo Jun, Hyoung Sun and YooJi-Hui Kim, 'A study on the effects of the CAFE standard on consumers' (2016) 91 Energy Policy 148; Burak Sen, Mehdi Noori and Omer Tatari, 'Will Corporate Average Fuel Economy (CAFE) Standard help? Modeling CAFE's impact on market share of electric vehicles' (2017) 109 Energy Policy 279.

[16] Jun, Sun and Kim, 'Effects of the CAFE standard on consumers' (2016) (n 15) 157.

[17] Ibid.

[18] Steven Plotkin, 'Examining fuel economy and carbon standards for light vehicles' (OECD and International Transport Forum, DP 2007-1, 2007).

[19] Lee Stapleton, Steve Sorrell and Tim Schwanen, 'Estimating direct rebound effects for personal automotive travel in Great Britain' (2016) 54 Energy Economics 313; Jeremy West and others, 'Vehicle miles (not) traveled: Fuel economy requirements, vehicle characteristics, and household driving' (2017) 145 Journal of Public Economics 65.

argument that the benefits of fuel efficiency would be subsumed (off-set) by increased miles driven is not strongly supported by the evidence.

FES and GHG emission standards' effect on the total emissions are hard to evaluate due to other factors that induce an increase in mileage travelled and vehicle population. Perhaps in 1989 CAFE was responsible for the decrease in the average weight of new cars by 500 pounds (14%) relative to 1978.[20] Nevertheless, CAFE regulation has induced increase in the demand for light-trucks (defined to include van, minivan, SUV, pick-up truck) in the US and made it to double its passenger vehicle fleet share in the 1990s.[21] Godek noted that the safety concerns with small cars and high regulation of large cars have induced customers to opt for the less regulated light-trucks, which in effect has off-set the weight reduction gains achieved in cars domain.[22]

Similarly, some scholars and industrialists blamed CAFE regulation for its spillover effect of increasing traffic accident and fatalities claiming that small cars have less crash-resistant capacity.[23] However, to others, as much as bigger vehicles protect those inside, they pose a greater risk to those outside the vehicle (pedestrians and other commuters).[24] Furthermore, as lighter materials are not necessarily weaker than heavier ones, modern engineering can remedy the safety design concerns.[25]

After the introduction of binding emissions standards in the EU, the average emission from newly sold passenger cars dropped from 153.3g CO2/km in 2008 to 118.5g CO2/km by 2017.[26] However, the incremental change in fuel consumption has not stopped the overall

[20] Robert Crandall and John Graham, 'The effect of fuel economy standards on automobile safety' (1989) 32(1) The Journal of Law & Economics 97.

[21] Paul Godek, 'The Regulation of Fuel Economy and the Demand for "Light Trucks" (1997) 40(2) Journal of Law & Economics 495, 496.

[22] See ibid.

[23] Crandall and Graham, 'effects of FES on automobile safety' (1989) (n 20); ibid; Terry Hathaway, 'Corporate power beyond the political arena: The case of the 'Big Three' and CAFÉ standards' (2018) 20(1) Business and Politics 1, 18.

[24] Hathaway, 'Corporate power beyond the political arena' (2018) (n 23) 20.

[25] See ibid.

[26] Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO2 emissions from light-duty vehicles [EU Regulation 443/2009]; Elah Matt, 'The political economy of European Union environmental governance: the case of the voluntary agreement to reduce carbon dioxide emissions from new cars' (PhD dissertation, University of East Anglia June 2012) 183; EEA, Monitoring of CO2 emissions from passenger cars - Data 2017 - Provisional data <https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-14> accessed on 23 October 2018.

carbon emissions of cars and transport sector from increasing over the years.[27] Furthermore, in the EU, carbon emissions from new cars increased consecutively for 2017 and 2018 by 0.3% (0.4 g/km) and 1.8% (2.3 g/km) respectively due to the rise in the share of petrol cars, shift to heavier and powerful cars and rise in SUV registration.[28] This recent figure accentuates the argument that a significant improvement in vehicle technology induced by stringent regulation would be needed and sheer weight or other vehicle's characteristics change will not allow manufacturers to meet future targets.[29] However, as discussed in the later sections, setting FES is the subject of intense lobbying by industries and car-producing member states, and the final outcome is often a political compromise.

Indeed, although they have not stopped total transport emissions from increasing, FES and emission standards, especially in the major car-producing countries of Japan, the EU and the US, have been successful in reducing vehicle's emissions in many jurisdictions and inducing innovation.[30] However, the incremental changes achieved are far less than what is needed to decarbonise cars and the potential available in the sector. Perhaps, overreliance on the standards more than what it could do might have challenged the political acceptability and effectiveness of other instruments and strategies such as EVs and NMT.

#### *4.1.2 Vehicle ownership and use restrictions*

Restrictions on vehicle ownership, driving, or parking spaces have complemented other transport policies to change travel behaviour and foster urban land use plans. Unlike standards, these measures address commuter's behaviour to discourage vehicle ownership or use.

Vehicle ownership restrictions are attempted in South-east Asian metropolises of Singapore, Beijing, Shanghai, Guangzhou, Guiyang etc primarily to manage the growth of

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[27] IPCC, *AR5 WGIII* (2014) (n 7) 611; EEA, 'Monitoring CO2 emissions from passenger cars and vans in 2018' (European Environmental Agency, Brussels, 2020) 12ff.

[28] EEA, 'Monitoring CO2 emissions from passenger cars and vans in 2018' (2020) (n 27) 12ff.

[29] Georgios Fontaras and Zissis Samaras, 'On the way to 130g CO2/km—Estimating the future characteristics of the average European passenger car' (2010) 38 Energy Policy 1826; Darin Ullman, 'A difficult road ahead: Fleet fuel economy, footprint-based CAFE compliance, and manufacturer incentives' (2016) 57 Energy Economics 94, 100.

[30] Govinda Timilsina and Hari Dulal, 'A Review of Regulatory Instruments to Control Environmental Externalities from the Transport Sector' (World Bank, Policy Research WP 4867, March 2009); IPCC, *AR5 WGIII* (2014) (n 7) 613.

vehicle population and contain traffic congestion.[31] Such restrictions were coupled with investments on convenient and affordable public transport schemes across the cities.[32] Singapore started the vehicle quota system in 1990, where the government regularly avails permits that enable people to register a vehicle through an open bid auction scheme.[33] Similarly, Shanghai does an open bidding auction to give out quotas of vehicle licenses while Beijing opted for a ballot or lottery system than an auction.[34] Revenues generated from the auction are reinvested in the road and public transport improvements.[35] Although the formats are diverse, many researchers reported that the schemes have effectively limited the proliferation of vehicle population and eased congestion.[36] However, the decrease in fuel consumption and carbon emissions as a result of the restrictions on vehicle registration has been insignificant.[37]

Many other cities, especially in Latin American countries have also introduced vehicle usage restrictions (also called road space rationing) on certain days of the week based on its license plate numbers. The practice was expanded to many cities in the world like Mexico City, Athens, Manila, Beijing, Lagos, Sao Paulo and Bogota.[38] The responses are heterogeneous. Some praised it for being more equitable than road pricing, able to reduce congestion, especially during rush (peak) hours and increase public transportation use.[39] Many others, however, criticised it for its short-lived success until commuters adjust to exploit the loopholes like by purchasing older and more polluting extra vehicles, adjusting their trip to off-peak hours and failing to comply with the rule.[40] It is also criticised for being

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[31] Singfat Chu, ‘Allocation flexibility and price efficiency within Singapore’s Vehicle Quota System’ (2012) 46 Transportation Research Part A 1541.

[32] Singfat Chu, ‘Car restraint policies and mileage in Singapore’ (2015) 77 Transportation Research Part A 404.

[33] Chu, ‘Allocation flexibility and price efficiency within Singapore’s VQS’ (2012) (n 31).

[34] Ibid.

[35] Jun Yang and others, ‘A review of Beijing's vehicle registration lottery: Short-term effects on vehicle growth and fuel consumption’ (2014) 75 Energy Policy 157.

[36] Ibid; Xiaojie Chen and Jinhua Zhao, ‘Bidding to drive: Car license auction policy in Shanghai and its public acceptance’ (2013) 27 Transport Policy 39.

[37] Chen and Zhao, ‘Bidding to drive’ (2013) (n 36).

[38] Shanjiang Zhua, Longyuan Dub and Lei Zhang, ‘Rationing and pricing strategies for congestion mitigation: behavioral theory, econometric model, and application in Beijing’ (2013) 80 Procedia - Social and Behavioural Sciences 455.

[39] Louisde Grange and Rodrigo Troncoso, ‘Impacts of vehicle restrictions on urban transport flows: The case of Santiago, Chile’ (2011) 18(6) Transport Policy 862.

[40] Ibid; Zhua, Dub and Zhang, ‘Rationing and pricing strategies for congestion’ (2013) (n 38); Lanlan Wang, Jintao Xu and Ping Qin, ‘Will a driving restriction policy reduce car trips?—The case study of Beijing, China’ (2014) 67 Transportation Research Part A: Policy and Practice 279.

inefficient, disproportionately affecting low-income families who cannot afford to buy a second vehicle and decreasing productivity by limiting mobility.[41]

Car or road rationing is possibly designed to control air quality and congestion more so than carbon emissions. Findings are not conclusive to demonstrate a significant decrease in daily trips, travelled mileage, fuel consumption and carbon emissions attributable to it. However, when coupled with other policy measures, it could promote NMT and public transportation, increase fuel-efficient vehicle fleets and thereby decrease carbon emissions.

Another direct regulation widely used to address many transport externalities, including carbon emissions is parking restriction at workplace, residence and market areas. City councils have adopted parking restriction or high parking charges to deter vehicle use, reduce congestion in central areas and generate revenue. Its impacts are examined from different perspectives over the years and confirmed that restrictions on parking at a destination or residence areas determine commuters' travel behaviour, modal choice and car ownership.[42] Hence, urban planners and policymakers have also proposed conversion of old parking lots to public parks, bike lanes and walking corridors to encourage the use of public and non-motorised transportation.

These are not the only but the primary command and control instruments used to mitigate the externalities of car use. These instruments are replicated in different parts of the world, including in developing countries either alone or in combination with other instruments. How these instruments could be adopted into Ethiopian situation will be discussed in the later chapters.

## 4.2 Economic Instruments (EI)

There are other groups of instruments known by different names like 'incentive-based instruments', 'economic instruments' or 'market instruments'. The common denominator for all is the use of market forces of quantity or price to influence firms' and consumers' behaviour to the achievement of environmental goals. Proponents of economic

[41] Grange and Troncoso 'Impacts of vehicle restrictions on urban transport flows' (2011) (n 39).

[42] Amruta Pandhe and Alan March, 'Parking availability influences on travel mode: Melbourne CBD offices' (2012) 49(2) Australian Planner 161; Zhan Guo, 'Does residential parking supply affect household car ownership? The case of New York City' (2013) 26 Journal of Transport Geography 18; Steve Melia and Ben Clark, 'What happens to travel behaviour when the right to park is removed?' (2018) 72 Transport Policy 242.

instruments argue that it redresses the main weaknesses of CAC regulations, i.e. rigidity, inefficiency, ineffectiveness and regulatory monopoly.[43]

EI in the transport sector could take the forms of vehicle tax and charges (ownership or usage), tradable emission permits, fuel tax and other fiscal incentives (e.g. subsidies, rebates, scrappage schemes).[44] Except for tradable permits, where appropriate design and integration issues are still under deliberation,[45] others are used in different parts of the world.

### *4.2.1 Vehicle tax*

Vehicle taxes are originally levied to generate revenue.[46] It could take the form of registration (purchase) tax (RT), annual circulation tax (ACT), and road use charges (e.g. parking, congestion charges).[47] The bases for tax determination varies in different jurisdictions: the price of the vehicle, engine power, fuel efficiency or distance travelled.[48] However, the base is now shifting to carbon intensity or fuel consumption indicators and has become a significant emissions regulation instrument.[49] The expectation with such tax (also called Piguovian or corrective tax) is that either demand for the vehicle will decrease as a result of the rise in price, or revenues generated by the tax would be used to compensate or rectify the environmental damage caused by vehicle use.[50]

Emissions reduction as a result of car taxes (RT or ACT) is challenging to quantify partly due to its use in combination with other instruments like FES, carbon emission standards, fuel

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[43] Georgina Santos and others, 'Part I: Externalities and economic policies in road transport' (2010) 28 Research in Transportation Economics 2, 39; IPCC, *Mitigation of Climate Change. Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Geneve, Switzerland, 2014) [IPCC, *AR5- Synthesis Report*] 29-30.

[44] IPCC, *AR5 WGIII* (2014) (n 7) 1155; Dorina Pojani and Dominic Stead 'Sustainable Urban Transport in the Developing World: Beyond Megacities' (2015) 7(6) Sustainability 7784, 7797.

[45] DEFRA, 'Synthesis report on the findings from Defra's pre-feasibility study into personal carbon trading' (Department for Environment, Food and Rural Affairs, London April 2008) 4; Zia Wadud, 'Personal tradable carbon permits for road transport: Why, why not and who wins?' (2011) 45 Transportation Research Part A 1052; Charles Raux, Yves Croissant and Damien Pons, 'Would personal carbon trading reduce travel emissions more effectively than a carbon tax?' (2015) 35 Transportation Research Part D 72.

[46] Lisa Ryan, Susana Ferreira and Frank Convery, 'The impact of fiscal and other measures on new passenger car sales and CO2 emissions intensity: Evidence from Europe' (2009) 31 Energy Economics 365.

[47] Ibid.

[48] Ibid 366.

[49] Thomas Sterner, 'Fuel taxes: An important instrument for climate policy' (2007) 35 Energy Policy 3194.

[50] Jeremy de Souza and John Snape, 'Environmental tax proposals: analysis and evaluation' (2000) 2 Environmental Law Review 74, 74.

taxes, feebates and scrappage schemes.[51] However, after assessing performance in the EU countries, Dineen and others noted that member states without CO2-based car taxes had performed less in decreasing carbon intensity of newly registered cars.[52] Similarly, Gerlagh and others found that increase in carbon-sensitivity of RT over 2001 - 2010 has reduced the carbon emissions intensity of the average new car in the EU.[53]

Some researchers, however, argue that emission standards and CO2 emission based RT have direct rebound effects of increasing distance driven.[54] In addition, in the short run, RT might delay the purchase of a newer vehicle in fear of the escalating price.[55] Nevertheless, others noted that rebound effects are exaggerated and are also evident in other instruments.[56] Instead, the presence of rebound effects should trigger supplementary instruments to contain or minimise its effects.[57]

A harmonised CO2 based ACT in the EU was proposed by the European Commission (EC) since 1995 but has failed to materialise partly due to the 'subsidiarity' principle of the EU treaty.[58] Besides, scholars and policymakers are divided on whether RT or ACT is effective. By mentioning 'consumer myopia' or 'near-sightedness', some presented empirical evidence and argued that RT influences the behaviour of customers who often see cost-benefits over a short period (3 years) better.[59] In effect, buyers demand short pay-back periods for their investment on the vehicle contrary to the vehicle's lifetime (often 15 years)

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[51] Denis Dineen, Lisa Ryan and Brian Ó Gallachóir, 'Vehicle tax policies and new passenger car CO2 performance in EU member states' (2018) 18(4) Climate Policy 396.

[52] ibid 406.

[53] Reyer Gerlagh and others, 'Fiscal policy and CO2 emissions of new passenger cars in the EU' (2018) 69 Environ Resource Econ 103.

[54] Amela Ajanovic, Reinhard Haas and Franz Wirl, 'Reducing CO2 emissions of cars in the EU: analysing the underlying mechanisms of standards, registration taxes and fuel taxes' (2016) 9 Energy Efficiency 925; Gerlagh and others, 'Fiscal policy' (2016) (n 53) 29.

[55] Ajanovic, Haas and Wirl, 'Reducing CO2 emissions of cars in the EU' (2016) (n 54).

[56] Kenneth Gillingham and others, 'Energy policy: the rebound effect is overplayed' (2013) 493 (7433) Nature 475; Oliver Lah, 'The barriers to low-carbon land-transport and policies to overcome them' (2015) 7(5) Eur. Transp. Res. Rev. 1.

[57] Lah, 'barriers to low-carbon land-transport' (2015) (n 56); Ajanovic, Haas and Wirl, 'Reducing CO2 emissions of cars in the EU' (2016) (n 54).

[58] Ryan, Ferreira and Convery, 'The impact of fiscal and other measures' (2009) (n 46); Gerlagh and others, 'Fiscal policy' (2016) (n 53). See also EC, 'Proposal for a Council Directive on passenger car related taxes' COM (2005) 261 final.

[59] Stefano Della Vigna, 'Psychology and Economics. Evidence from the Field' (2009) 47(2) Journal of Economic Literature 315; Ryan, Ferreira and Convery, 'The impact of fiscal and other measures' (2009) (n 46); David Greene, David Evans and John Hiestand, 'Survey evidence on the willingness of U.S. consumers to pay for automotive fuel economy' (2013) 61 Energy Policy 1539; ibid.

used in ACT or technology cost analysis.[60] The argument is essentially about the types of information sought by users in making a rational decision about purchasing and driving behaviour. Contrary, the 2005 EC tax proposal favoured ACT asserting that RT 'negatively affects the competitiveness of the European car' and movement of cars across the single market.[61]

Hence, heterogeneous practices are observed on how and when to use taxes, its design and goals. For instance, some EU countries use fuel tax to discourage diesel alleging its air pollution impact, while others use it to encourage diesel for its low CO2 emission impact.[62] Vehicle taxes are also the primary sources of revenue, and often governments do not want to lose control of these revenue sources.[63] However, recent trends including in DCs exhibit that the carbon intensity and fuel efficiency of the vehicle are becoming the basis for determining the tax.

### *4.2.2 Fuel tax*

Economists believe that fuel tax, another form of corrective or Pigouvian tax, is an appropriate instrument to internalise carbon emissions and other externalities of road transport.[64] Like vehicle tax, fuel tax was initially levied on non-environmental grounds and notably for revenue generation but has proved to be an essential climate change mitigation instrument.[65] Fuel tax as an environmental instrument is used to internalise the social and environmental cost of using fuel and possibly make vehicle use costly.[66]

By comparing the USA and western European countries, Sterner argues that higher fuel tax in the latter helped it reduce overall consumption of fuel.[67] He claimed that had all OECD countries implemented higher fuel tax rates similar to the UK and Netherlands, CO2

[60] William Buzbee, 'Transportation as a climate change wedge and challenge under United States law' in Daniel A. Farber and Marjan Peeters (eds), *Climate Change Law*: Elgar Encyclopedia of Environmental Law series (Vol I, 2016) 426.

[61] EC, 'Proposal for a Council Directive on passenger car related taxes' COM (2005) 261 final', 7.

[62] Ryan, Ferreira and Convery, 'The impact of fiscal and other measures' (2009) (n 46) 366.

[63] Christian Brand, Jillian Anable and Martino Tran, 'Accelerating the transformation to a low carbon passenger transport system: The role of car purchase taxes, feebates, road taxes and scrappage incentives in the UK' (2013) 49 Transportation Research Part A: Policy and Practice 132, 133.

[64] Sterner, 'Fuel taxes' (2007) (n 49); Georgina Santos, 'Road fuel taxes in Europe: Do they internalize road transport externalities?' (2017) 53 Transport Policy 120.

[65] Thomas Sterner, 'Distributional effects of taxing transport fuel' (2012) 41 Energy Policy 75.

[66] Amy Lawton, 'Green taxation theory in practice: The 2012 reform of the carbon reduction commitment' (2016) 18(2) Environmental Law Review 126.

[67] Sterner, 'Fuel taxes' (2007) (n 49) 3201; Sterner, 'Distributional effects' (2012) (n 65) 76.

emissions from the transport sector would have lowered by 46% in OECD countries.[68] Contrary, had all OECD countries adopted lower taxes similar to the US, fuel consumption would have increased by 30%.[69]

However, not everybody is optimistic about the fuel tax, and it has faced political resistance in many jurisdictions.[70] Sterner asserts that the prevalence of political lobbying and the long-term effect of fuel tax compared with short term electoral targets are reasons for the political fallout.[71] Fuel tax's impact on different income groups, i.e. the distributional effect, is also the subject of much discussion. Conflicting results are observed in the literature regarding the distributional effects of fuel taxes: some finding it being regressive while others as neutral or progressive.[72] The choice of methodology, especially annual versus lifetime income, and wealth status of the study region, were mentioned as primary reasons for such inconsistency.[73] Studies that use annual income as variables found such policy to be regressive but those with lifetime income found it progressive or proportional.[74]

In the US context, West argues that gasoline tax is more progressive than taxing heavy engine vehicles or directly subsidising acquisition of new vehicles.[75] The research further notes that taxes on gasoline were only regressive for upper-income households.[76] Similarly, after studying seven EU countries and comparing them with Japan and USA systems, Sterner concluded that fuel taxation was an effective and potentially important instrument in dealing with climate change.[77] Sterner further explained that fuel tax is not regressive across all scenarios but has a tendency of progressivity in low-income countries and regressivity in high-income countries (and notably in high-income groups).[78]

Scholars also noted that incidences of fuel tax might show different results when the indirect effects of fuel price increase are considered in DCs.[79] In DCs where a car is

[68] Sterner, 'Fuel taxes' (2007) (n 49) 3198.
[69] ibid 3198.
[70] See ibid.
[71] ibid 3201.
[72] Sarah West, 'Distributional effects of alternative vehicle pollution control policies' (2004) 88 Journal of Public Economics 735.
[73] Sterner, 'Distributional effects' (2012) (n 65).
[74] Ibid.
[75] West, 'Distributional effects of alternative vehicle pollution control policies' (2004) (n 72).
[76] Ibid.
[77] Sterner, 'Fuel taxes' (2007) (n 49); Sterner, 'Distributional effects' (2012) (n 65).
[78] Ibid.
[79] Sterner, 'Distributional effects' (2012) (n 65).

considered as luxury products and owned by few, its impacts will be felt by the lower-income household due to its indirect impact on the price of other essential goods (like consumables). Hence, fuel tax might turn out to be slightly regressive when the indirect impact is considered. Sterner proposed that given its utility in climate mitigation efforts, small distributional effects of fuel tax could be reversed by other policy measures like recirculating the tax proceeds to the transportation sector.[80]

Another study in Costa Rica found that increasing gasoline tax would not be regressive since most automobiles are owned by wealthier classes.[81] Accordingly, a 10% price increase through direct spending on gasoline was found to be progressive, but the same 10% increase through direct spending on diesel was regressive (as poorer communities often rely on bus transport).[82] However, when only the indirect spending (on goods other than fuel and bus transportation) was considered, it was relatively regressive, and neutral when all the direct and indirect spending were considered. The study revealed that effects are different for diesel and gasoline, and also when direct and indirect spendings are considered. Historically, in most countries, diesel fuel is taxed less than gasoline partly because diesel is considered as ‘poor man’s fuel’ due to its use for buses, trucks, off-road vehicles and power generators.[83] Scholars also caution on different tax rates applied to gasoline and diesel that forces commuters to swap to diesel cars which has series local health impacts than gasoline cars.[84]

Generally, the literature suggests that fuel taxation, notably on gasoline, could be useful in DCs. Perhaps, it will not only reduce overall carbon emission from the transport sector but also offer co-benefits like income redistribution.[85] The IPCC report also claims that carbon taxation with recycling revenue can make the poorest households better off.[86] By referring to its long-term effect, economists and environmentalists urge DCs to adopt fuel tax soon

[80] ibid 82.

[81] Allen Blackman, Rebecca Osakwe and Francisco Alpizar, ‘Fuel tax incidence in developing countries: The case of Costa Rica’ (2010) 38 Energy Policy 2208.

[82] Ibid.

[83] Randy Chugh and Maureen Cropper, ‘The welfare effects of fuel conservation policies in a dual-fuel car market: Evidence from India’ (2017) 86 Journal of Environmental Economics and Management 244.

[84] Blackman, Osakwe and Alpizar, ‘Fuel tax incidence in DCs’ (2010) (n 81).

[85] Claudio Agostini and Johanna Jiménez, ‘The distributional incidence of the gasoline tax in Chile’ (2015) 85 Energy Policy 243.

[86] IPCC, *AR5 WGIII* (2014) (n 7) 1161-62.

before it becomes too costly to change societal structures.[87] However, as discussed in Chapter 6 below, empirical evidence from DCs such as Ethiopia is mixed and does not support a universal application of fuel tax. Hence, further inquiry is needed to understand the incidental and indirect effects of fuel taxes in DCs.

#### *4.2.3 Fiscal incentives*

Fiscal incentives like feebates, buy-back and scrappage schemes, and other forms of subsidy and incentive schemes have contributed to the transition to a low carbon transport.[88] Feebate works by levying surcharge (fee) on fuel-inefficient vehicles and providing rebates to cleaner vehicles (e.g. electric and hybrid cars).[89] Even if additional financial sources are required to support rebates, the surcharge levied on high emitters will contribute part of that funding. Scholars noted that the primary objective of a feebate scheme is not environmental but economic – stimulate the purchase of new vehicles to support automakers and job uptake.[90] Its wide use during the global economic recession of 2007-2010 when the sale of vehicles significantly decreased, substantiates the argument. Nonetheless, feebates have induced market penetration of fuel-efficient vehicles in different countries like 'Eco Auto' and 'Green Levy' programs in Canada, the 'Bonus-Malus' program in France, and others in Australia, the US, China etc.[91] Hence, all these feebate programs that have different forms and features have a spin-off effect of improving the fuel-efficiency of the fleet by replacing high emitting cars with low-carbon intensive vehicles like EVs.[92]

A related program designed to speed up the retirement of fuel-inefficient clunker vehicles is also designed in the form of 'buy-back' or 'scrappage incentive' schemes. In such

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[87] Sterner, 'Fuel taxes' (2007) (n 49) 3201; Stephen Spratt, 'Environmental Taxation and Development: A Scoping Study' (Institute of Development Studies WP 433, UK 2013).

[88] Brand, Anable and Tran, 'Accelerating the transformation' (2013) (n 63).

[89] David Greene and others, 'Feebates, rebates and gas-guzzler taxes: a study of incentives for increased fuel economy' (2005) 33 Energy Policy 757.

[90] Brand, Anable and Tran, 'Accelerating the transformation' (2013) (n 63); Dineen, Ryan and Ó Gallachóir, 'Vehicle tax policies' (2018) (n 51).

[91] Brand, Anable and Tran, 'Accelerating the transformation' (2013) (n 63) 140; Nicholas Rivers and Brandon Schaufele, 'New vehicle feebates' (2017) 50 Canadian Journal of Economics 201; Isis Durrmeyer and Mario Samano, 'To Rebate or Not to Rebate: Fuel Economy Standards Versus Feebates' (2017) Economic Journal 1.

[92] Xingping Zhang and others, 'Policy Incentives for the adoption of electric vehicles across countries' (2014) 6 Sustainability 8056; Dineen, Ryan and Ó Gallachóir, 'Vehicle tax policies' (2018) (n 51) 31.

schemes, beneficiaries would be owners of high polluting cars as determined by agencies.[93] Such schemes might take a tax break or buy back coupon provided by the company or government to cover a part of the new car's price. It was again primarily intended to stimulate the economy and create jobs but with enormous environmental co-benefits.[94] In the UK, the government allotted £300 million in its 2009 budget to benefit around 300,000 customers with old cars registered on or before 31 July 1999. A cash reward of £2000, at least half covered by manufactures, were prepared for such buyers to accelerate scrappage time.[95] In the US, tax credits of up to $5000 and 'Cash for Clunkers' of up to $4500 were provided depending on the vehicle's emissions intensity.[96] The scheme has become common in much of the EU, China, Japan, Canada, Australia, and Russia etc. Feebates and scrappage schemes often complement newly enacted stringent standards that would have otherwise allowed old vehicles and fuel guzzlers to operate irrespective of its environmental impact.[97]

Feebates and scrappage schemes' financial requirement and equity concerns will challenge its acceptability in DCs such as Ethiopia where only a few better-off families own private vehicles. Instead of cash rebates, tax reductions for environmentally effective but relatively expensive vehicles (e.g. electric cars) could at least pass the equity parameter. Equally, a one-off rebate in the form of tax reduction to accelerate scrappage (including for commercial passenger cars) might work with relative revenue neutrality. This is returned to in chapters 6 and 7.

Perhaps some authors have raised the rebound effects of scrappage scheme or rebates suggesting that newly purchased vehicles are driven more than the older ones, which ultimately off-set any emissions gain.[98] Hence, the evidence is not conclusive on its overall contribution to GHG emission reduction.[99] However, proponents argue that rebound

[93] Dineen, Ryan and Ó Gallachóir, 'Vehicle tax policies' (2018) (n 51).
[94] Ibid.
[95] Ibid.
[96] American Recovery and Reinvestment Act (ARRA) 2009, Pub.L. 111–5 US Congress; Zhang and others, 'Policy Incentives for the adoption of EV' (2014) (n 92).
[97] Kevin Roth, 'The unintended consequences of uncoordinated regulation: evidence from the transportation sector' (WP, Cornell University 2015).
[98] Brand, Anable and Tran, 'Accelerating the transformation' (2013) (n 63).
[99] Xavier D'Haultfoeuille, Pauline Givord and Xavier Boutin, 'The Environmental Effect of Green Taxation: the Case of the French Bonus/Malus' (2014) 124 The Economic Journal F444–F480.

effects are not unique for subsidy or incentive instruments but inherent in any fuel efficiency schemes which should be complemented with other instruments to control its rebound effects than avoiding the scheme at all.[100] Furthermore, determination of pivotal points for feebates and vehicle lifetime for scrappage schemes, the number of older cars on the road and their fleet share and other externalities associated with older cars are key designing factors.[101] For instance, in a country like Ethiopia, where about 75% of the vehicles are more than 15 years of age, revenue neutrality and emission reduction effects of such schemes are very much complicated. Hence as much as the policy choice is essential, so are the design and timing.[102]

## 4.3 Mixes of Instruments

### *4.3.1 Growing consensus on policy integration*

The traditional exclusivity argument raised by proponents of CAC and EI seems to be fading now. Those who advocate for the CAC raise the certainty, environmental effectiveness and legality of direct regulation. Nevertheless, they are charged for its perverse effects, doubtful cost-effectiveness and excessive rigidity.[103] Equally, EI proponents raise economic efficiency, environmental effectiveness, cooperative enforcement and flexibility of fiscal and quantity-based instruments.[104] They also seem to accept the limitations like political acceptability, the possibility of regulatory capture and administrative complexities.[105] Perhaps, not all the three layers of transport actors – automakers, fuel makers and

[100] David Hensher, 'Climate change, enhanced greenhouse gas emissions and passenger transport – What can we do to make a difference?' (2008) 13 Transportation Research Part D 95–111

[101] D'Haultfoeuille, Givord and Boutin, 'Environmental Effect of Green Taxation' (2014) (n 99)

[102] Brand, Anable and Tran, 'Accelerating the transformation' (2013) (n 63)

[103] Ian Bartle and Peter Vass, 'Climate change policy and the regulatory state: A better regulation perspective' (Research Report 19, UK, CRI, University of Bath, 2007). See also Janathan Golub (ed), *New Instruments for Environmental Policy in EU (*Routledge, 1998) 3; Richard B Stewart, 'A New Generation of Environmental Regulation' (2001) 29 Capital University Law Review 21; Gunningham, 'Environment Law, Regulation and Governance' (2009) (n 7).

[104] Santos and others, 'Part I' (2010) (n 43) 39; Stephen Holland, 'Emissions taxes versus intensity standards: Second-best environmental policies with incomplete regulation' (2012) 63 Journal of Environmental Economics & Management 375; IPCC, *AR5- Synthesis Report* (2014) (n 43) 29-30.

[105] Allen Blackman and Winston Harrington, 'The Use of Economic Incentives in Developing Countries: Lessons From International Experience With Industrial Air Pollution' (2000) 9 Journal of Environment & Development 5; Karen Sullivan, 'Environmental regulation: lessons from the 'credit crunch' (2009) 21(4) Environmental Law and Management 200; Dieter Helm, 'Government failure, rent-seeking, and capture: the design of climate change policy' (2010) 26(2) Oxford Review of Economic Policy 182.

consumers – respond similarly to all forms of regulation and instruments.[106] For instance, it is claimed that end-users tend to react very weakly to market-based policies, such as fuel carbon taxes or tradable permit system, especially for passenger travel.[107]

Consequently, scholars suggest that combining (integrating, mixing) CAC and EI as long as they do not target the same behaviour and base enhance environmental effectiveness, redress perverse impacts and enhance public acceptability of instruments.[108] Santos noted that in addition to its greater efficiency and effectiveness, '[b]y policy integration, financially unviable instruments that did not enjoy public support might become viable or more acceptable'.[109] Some fiscal measures face political unacceptability and equity concerns but could be complemented with direct regulatory instruments, like recirculating revenues and supporting public transport that enhances its effectiveness and acceptability.[110] Similarly, the rebound effects of FES can be redressed by integrating it with EI.[111]

After a quantitative analysis of the three most widely used policies in G20 countries – FES, vehicle ownership tax and fuel tax - Yang and others argued that emission reduction effects of integrated policies are superior to any of these measures being aggressively implemented separately.[112] Dineen and others also noted that EU member states that mix policies like FES, vehicle tax, CO2 labelling, company car tax, fuel taxes and scrappage schemes have achieved better emission reductions.[113] Practically, no single country had implemented a single instrument to address transport carbon emission.

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[106] Sonia Yeh and David McCollum, 'Optimizing the transportation climate mitigation wedge' in Joan Ogden and Lorraine Anderson (eds), *Sustainable Transport Energy Pathways: Institution of Transportation Studies* (University of Davis, California, 2011); Creutzig and others, 'Climate policies for road transporter I' (2011) (n 8).

[107] Ibid.

[108] Santos and others, 'Part I' (2010) (n 43) 40; Georgina Santos, Hannah Behrendt and Alexander Teytelboym, 'Part II: Policy instruments for sustainable road transport' (2010) 28 Research in Transportation Economics 46, 83.

[109] Santos, Behrendt and Teytelboym, 'Part II' (2010) (n 108) 83.

[110] Santos and others, 'Part I' (2010) (n 43) 39; ibid; Floridea Di Ciommo and Karen Lucas, 'Evaluating the equity effects of road-pricing in the European urban context – The Madrid Metropolitan Area' (2014) 54 Applied Geography 74; David Levinson, 'Equity Effects of Road Pricing: A Review' (2010) 30(1) Transport Reviews 33.

[111] Creutzig and others, 'Climate policies for road transporter I' (2011) (n 8); Yeh and McCollum, 'Optimizing the transportation' (2011) (n 106); Christian Flachsland and others, 'Climate policies for road transport revisited (II): Closing the policy gap with cap-and-trade' (2011) 39 Energy Policy 2100.

[112] Yang and others, 'On a pathway to de-carbonization' (2017) (n 2).

[113] Dineen, Ryan and Ó Gallachóir, 'Vehicle tax policies' (2018) (n 51).

#### *4.3.2 Additional complementary instruments*

Besides the traditional CAC and EI schemes, other sets of instruments like self-/co-regulation (self-auditing, information disclosure), soft instruments (e-commerce, car sharing, eco-driving and educational schemes, labelling) and planning schemes (public and non-motorised transportation) have proven record of complementary role in the transport sector.[114] These instruments have limited emissions reduction potential when implemented alone but are becoming vital components of successful policy integration.

Decarbonising the transport sector demands environmental instruments to be complemented with target government spendings like infrastructure investments and incentives to encourage modal shift to public transport and non-motorised transport (NMT).[115] These measures are believed to improve the performance of other instruments used in the sector.[116] Cities like Bogota (Colombia) and Curitiba (Brazil) have proved that a combination of instruments could help DCs in balancing the utilities and externalities of road transportation.[117] Although bus-rapid transit (BRT) has been replicated in major cities of the world, none has emulated the success of integrating it with other measures as Bogota and Curitiba did.[118]

There is no universally ready-made policy mix, and jurisdictions struggle to design appropriate mixes that best work for their individual situation. Besides the instruments technical efficiency, many local contexts such as legal culture, political economy and the presence of strong auto industry determine the choice of instruments and political support to it. Car regulation operates within the existing system and should be viewed within the bigger picture of other government and industry operatives. Regulatory design is also the subject of intense lobbying from the industry and environmental NGOs. Policymakers are often provided with the evidence regarding the technical efficiency of the instruments, but choices are not made solely based on such evidence. The regulatory rulemaking in the EU

[114] Black, `Decentring Regulation' (2001) (n 4) 116; Sanford Gaines and Cliona Kimber, 'Redirecting Self-Regulation' (2001) 13(2) Journal of Environmental Law 157, 162; Abbot, 'Bridging the Gap' (2012) (n 4); IPCC, *AR5 WGIII* (2014) (n 7) 604-605; Yuhan Huang and others, 'Eco-driving technology for sustainable road transport: A review' (2018) 93 Renewable and Sustainable Energy Reviews 596.

[115] Lloyd Wright and Lewis Fulton, 'Climate change mitigation and transport in developing nations' (2005) 25(6) Transport Reviews 691-717; IPCC, *AR5 WGIII* (2014) (n 7) 649).

[116] Yin and others, 'China's transportation' (2015) (n 7) 234.

[117] Wright and Fulton, 'Climate change mitigation' (2005) (n 115).

[118] Ibid 699.

and the US discussed below showcase the external influences (economic, political and social systems) to instruments design and choice.

## 4.4 EU Regulation: Political Rift

Besides the instruments 'own' technical efficiency, autoregulation is politically delicate and the subject of intense lobbying from the industry. Hall rightly stated that 'regulation is politically sensitive, rendering rulemaking too subject to change between different administrations.'[119] In a similar account, Paterson and Newman argued that the state promotes the car use over its competitors through its myriad of activities including financing road infrastructure, systematic neglect of other modes (e.g. train) and hidden subsidies (e.g. company cars).[120] Such protection and incentives offered to the auto sector, and its globalised production chain would further strengthen its lobbying power. The story of 'road lobbying' in the UK as told by Mick Hamer also revealed the systematic, structured and coordinated campaign of British Road Federation, where the motor associations were key players, that led to the construction of thousands of kilometres of road in the UK after world war two.[121] Similar lobbying was made by the auto and fuel industry actors notably in the EU and US.

### *4.4.1 Community strategy and voluntary agreement*

The EU started looking for community strategies and appropriate regulatory instruments to limit CO2 emission from cars soon after the publication of the IPCC's report in 1990.[122] The deliberation for policy instrument choices and emissions targets conducted between 1991 and 1995, however, were characterised by sharp divisions amongst competing political, economic and environmental interests represented by different EU institutions, member

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[119] Laura Hall, 'The evolution of CAFE standards: fuel economy regulation enters its second act' (2011) 39 Transp. L. J. 1.

[120] Matthew Paterson, 'Car culture and global environmental politics' (2000) 26 Review of International Studies 253; Daniel Newman, 'Cars and consumption' (2013) 37(3) Capital & Class 457, 469; Daniel Newman, 'Alienation and Mobility' (2016) 9(1) New Proposals: Journal of Marxism and Interdisciplinary Inquiry 28.

[121] Mick Hamer, *Wheels within Wheels: A Study of the Road Lobby* (London: Routledge & Kegan Paul, 1987).

[122] Matt, 'The political economy of European Union' (2012) (n 26) 128.

states and the auto industry.[123] Hence, the 1995 strategy, notably the target of achieving 120g CO2/km by 2005 the latest by 2010, was a compromise.[124]

The 1995 strategy identified three 'pillar strategies' through which the EU envisaged to achieve the target – fuel intensity reduction through voluntary agreements (VA), carbon and fuel-economy labelling, and financial incentives for low fuel passenger cars.[125] Commentators argue that not only the auto industry but some member states notably Germany, which want to protect the competitiveness of its national industries, influenced the EU to adopt VA instead of binding regulation.[126] Others asserted that given the diverse policy opinions and positions within the Commission, amongst the EU departments (DG Industry and DG Environment), member states and interest groups, VA agreement was the uncomfortable but preferred compromise of the time.[127] The Commission, however, made it clear that '[i]n the event of negotiations with the ACEA [European Auto-mobile Manufacturers' Association] not coming to a successful conclusion, the Commission undertakes to consider the introduction of binding legislation.'[128]

The negotiation to seal the VA started with ACEA that represented about 80% of the EU's sales by the time. ACEA supported the VA since 1991 hoping that it could play more with a non-binding, softer and flexible schemes.[129] Consequently, during the VA negotiation, ACEA kept pushing the Commission to a further softer target. Keay-Bright noted that there was information asymmetry during the negotiation where ACEA produced technical studies to support its positions and assigned technical staffs for the negotiation while the Commission lacked any independent feasibility study on emissions reduction scenarios and was represented by two mid-level staffs.[130] In June 1997, the ACEA offered a target of

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[123] Ibid 129.

[124] EC, 'A Community Strategy to reduce CO2 emissions from passenger cars and improve fuel economy. Communication from the Commission to the Council and the European Parliament (COM 95/689)' Brussels, 1995.

[125] Ibid.

[126] David Levy and Daniel Egan, 'A neo-Gramscian approach to corporate political strategy: conflict and accommodation in the climate change negotiations' (2003) 40 Journal of Management Studies 803, 820.

[127] Sarah Keay-Bright, 'A critical analysis of the voluntary fuel economy agreements, established between the automobile industry and the European Commission, with regard for their capacity to protect the environment' (Draft paper for ECPR, Joint session, Grenoble 6-11 April 2001).

[128] EC, 'A Community Strategy to reduce CO2 emissions from passenger cars' COM (1998) 495, 2.

[129] Jan Bongaerts, 'Carbon dioxide emissions and the ACEA agreement' (1999) 8 Eur Envtl L Rev 101, 102.

[130] Keay-Bright, 'A critical analysis of the voluntary fuel economy agreements' (2001) (n 127) 7.

167gCO2/km for 2005 (10% reduction) which was outrageously rejected by the EU claiming that it was inadequate and not different from the business-as-usual scenario.[131]

On the first two years of the negotiation, progress was plodding, and the ACEA was accused of being reluctant for a breakthrough. Nevertheless, the signing of the Kyoto protocol, which the ACEA had lobbied for a no or softer international deal, influenced the industry to accelerate the VA negotiation.[132] Moreover, the Commission later appointed high-level negotiators and threatened to adopt binding legislation in the absence of breakthrough by March 1998.[133]

After more than three years of negotiation, the initial target of achieving the target by 2005 was pushed to 2008. More so, in the VA agreement signed with the ACEA, the emission target was pushed to 140g CO2/km by 2008 with possible extension to 120g CO2/km target by 2012.[134] In addition, the terms of the VA that made its achievement contingent on important assumptions like improved fuel quality and 'unhampered diffusion of fuel-efficient technologies into the market' (e.g. the absence of fiscal measures applied against diesel-fuel cars) were significant concessions for the industry.[135] Scholars, environmental groups and the EU Parliament were not pleased with the outcome of the negotiation.[136] They argued that the 140gCO2/km target by 2008 from 186 g CO2/km in 1995 was inadequate and unambitious.[137] However, the Commission claimed that the gap between the EU's initial target of 120g CO2/km and VA's 140g CO2/km would be achieved by the

[131] ibid 9.

[132] Ibid, 10; Levy and Egan, 'A neo-Gramscian approach to corporate political strategy' (2003) (n 126) 821.

[133] Patrick ten Brink, 'Mitigating CO2 Emissions from cars in the EU (Regulation (EC) No 443/2009)' in Sebastian Oberthur and Sebastian Oberthür (eds) *The New Climate Policies of the European Union: Internal Legislation and Climate Diplomacy* (2010) 182; Keay-Bright, 'A critical analysis of the voluntary fuel economy agreements' (2001) (n 127) 6.

[134] EC, Implementing the Community Strategy to Reduce C02 Emissions from Cars: An Environmental Agreement with the European Automobile Industry, Communication from the Commission to the Council and the European Parliament COM(1998) 495 final Brussels, 1998, 3-5; Francois Cuenot, 'CO2 emissions from new cars and vehicle weight in Europe: How the EU Regulation could have been avoided and how to reach it?' (2009) 37 Energy Policy 3832.

[135] EC, An Environmental Agreement with the European Automobile Industry' (1998) (n 134) 4 and Annex p. 2; Keay-Bright, 'A critical analysis of the voluntary fuel economy agreements' (2001) (n 127) 10 .

[136] Keay-Bright, 'A critical analysis of the voluntary fuel economy agreements' (2001) (n 127) 26-27; Matt 'The political economy of European Union' (2012) (n 26) 150-54.

[137] Keay-Bright, 'A critical analysis of the voluntary fuel economy agreements' (2001) (n 127) 14.

combination of the other two pillar strategies, i.e. market changes induced by 'fiscal measures and fuel-economy labelling'.[138]

Multiple reasons could be raised for the adoption of the less ambitious target and softer and non-binding instrument. On the Commission's side, the EU institutions and members lacked unity on primary policy goals and instrument choices that had weakened the Commission's position even before the start of the negotiation. Some also accused the Commission of not having any readily available technical analysis for the proposed target nor alternative instruments in case if VA would fail.[139] Contrary, the very competitive nature of the sector and a large number of jobs at risk were effectively used by the ACEA to threaten policymakers.

### *4.4.2 Implementation progress*

Independent and EU assessments proved that although there was initial progress until 2003, industries were falling behind the 2008 and 2012 targets.[140] The average fuel efficiency of passenger cars improved by 10% between 1996 and 2008 but total emissions fell only by 4%.[141] Evidence demonstrated that most of the gains in CO2 emission reduction in the early years of the VA (1998 to 2003) were attributed to the shift to diesel passenger car, comparably fuel-efficient than gasoline cars, rather than technological innovation resulting in a decrease of individual car's fuel consumption.[142] Consequently, the diesel engine share of new cars had grown from 24% of the fleet in 1995 to over 47% in 2003.[143] Even that was off-set by an increase in the fleet composition of heavier, large size, and more luxurious fuel consuming cars.[144] To the admission of EC, the EU's car production size increased on the average by 100kg every five years from 1995 to 2003.[145] Cuenot asserted

[138] EC, COM(1998) 495, 4.

[139] Keay-Bright, 'A critical analysis of the voluntary fuel economy agreements' (2001) (n 127); Matt 'The political economy of European Union' (2012) (n 26).

[140] Brink, 'Mitigating CO2 Emissions (2010) (n 133) 187.

[141] Lah, 'barriers to low-carbon land-transport' (2015) (n 56) 4.

[142] Georgios Fontaras and Zissis Samaras, 'A quantitative analysis of the European Automakers' voluntary commitment to reduce CO2 emissions from new passenger cars based on independent experimental data' (2007) 35 Energy Policy 2239; Cuenot, 'CO2 emissions from new cars' (2009) (n 134) 3836.

[143] Fontaras and Samaras, 'A quantitative analysis' (2007) (n 142) 2240.

[144] Ibid.

[145] EC, COM(2007) 19], 6; Cuenot, 'CO2 emissions from new cars' (2009) (n 134) 3833.

that had the weight composition been kept constant at its 1998 average, the agreed target of 140g CO2/km by 2008 would have been achieved.[146]

Similarly, the EC's 2007 review reiterated the lack of adequate progress and its readiness to take additional measures.[147] The review further noted that the other two pillars of the 1995 strategy were also unsuccessful as the fuel-economy and CO2 consumption labelling and fiscal measures were implemented at varying degree and intensity among member states.[148] Environmental NGOs, which had assumed more power than they had in the 1990s like World Resource Institute, European Environment Bureau (EEB), Transport and Environment (T&E) and Greenpeace, intensified their lobbying for more ambitious and binding targets.[149]

Therefore, it became clear that binding limits and additional measures were required to force emission reduction. Finally, after a protracted process of consultation and lobbying, the EU enacted the emissions Regulation (EC) 433/2009 officially ending the VA.[150] The regulation set target of 130g CO2/km for 2015 and 95g CO2/km for 2021 for passenger cars. The final texts of the regulation revealed that the EU was forced to compromise many of its original proposals – final and intermediate targets, target date, amount of fine for non-compliance and utility criteria.[151] Hence, the target of achieving 120g CO2/km for newly registered cars had been pushed from 2005 to 2012 by the VA, and finally to 2015 in the final text of the regulation.[152] Furthermore, the 'integrated approach' scheme reduced the original target of 120g CO2/km to 130g CO2/km, whereby 10g CO2/km would be attributed to other technological improvements.[153]

Brink noted that EU's original proposal 'was the target of intense lobbying both from the automotive industry and member states in which the manufacturers concerned are based'.[154] The ACEA had consistently argued that the original proposal would hurt the

[146] Cuenot, 'CO2 emissions from new cars' (2009) (n 134).

[147] EC, Communication from the Commission to the Council and the European Parliament - Results of the review of the Community Strategy to reduce CO2 emissions from passenger cars and light-commercial vehicles, COM(2007) 19 final, Brussels, 2007, 5.

[148] Ibid.

[149] Matt 'The political economy of European Union' (2012) (n 26) 181 and 190.

[150] EU Regulation 433/2009.

[151] Brink, 'Mitigating CO2 Emissions (2010) (n 133) 197.

[152] EU Regulation 443/2009, Art 4.

[153] Brink, 'Mitigating CO2 Emissions (2010) (n 133) 194.

[154] ibid 197.

competitiveness of European cars and manufacturers, and 'have a knock-on effect on the European economy and society'.[155] The outcome was welcomed by the ACEA and Germany that fought to protect its auto industries and 'premium' markets (dominated with larger cars).[156]

The flexibility schemes provided, notably the exemption, preferences and pooling schemes offered to companies selling below 10,000 cars a year, were also the subjects of critique.[157] Most of these small number selling manufactures sell luxurious, expensive and highly polluting cars (up to 596 gCO2/km) to the wealthy families.[158] Critics argue that the regulation provides no meaningful incentive for such manufacturers to commit to an emission reduction, and instead facilitated market distortion, and above all granted the license for the wealthy classes to act irresponsibly.[159] Even in the absence of an exemption, manufacturers could continue selling these luxurious cars by adding the penalties to it, which will make up a very low part of the total price.[160]

Recently, the European Commission has initiated the post-2021 strategy whereby both vans and passenger cars will be required to decrease emission by 30% from its 2021 base by the year 2030.[161] The target was pushed further to 40% by the European Parliament on 8 October 2018 to the disappointment of car manufacturers, but later to be slashed to 35% by the EU Ministers.[162] The compromise was achieved as the coalition of Germany, Bulgaria, Slovakia, Hungary, and Poland blocked any ambitious target.[163] Throughout the process, the ACEA vehemently opposed to any target higher than 20% reduction from the 2021 level

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[155] Matt 'The political economy of European Union' (2012) (n 26) 203.

[156] Christian Hey, 'The German paradox: climate leader and green car laggard' in Sebastian Oberthur and Sebastian Oberthür (eds*), The new climate policies of the European Union: internal legislation and climate diplomacy*) (Brussels University Press, Brussels 2010) 215-18; Brink, 'Mitigating CO2 Emissions (2010) (n 133) 197; Ibid, 209.

[157] EU Regulation 443/2009, Arts 7 (on Pooling), 11 (Derogations for certain manufacturers); Christina Bampatsou and Efthimios Zervas, 'Critique of the regulatory limitations of exhaustCO2 emissions from passenger cars in European union' (2011) 39 Energy Policy 7794.

[158] Bampatsou and Zervas, 'Critique of the regulatory limitations' (2011) (n 157) 7797.

[159] Ibid.

[160] ibid 7798.

[161] EU, Proposal for a Regulation of the EP and of the Council setting emission performance standards for new passenger cars and for new light commercial vehicles as part of the Union's integrated approach to reduce CO2 emissions from light-duty vehicles and amending Regulation (EC) No 715/2007 (recast) COM/2017/676.

[162] Rochelle Toplensky, 'EU ministers agree 35% car emissions reduction by 2030' Financial Times, 10 Oct 2018 <www.ft.com/content/2075038a-cc58-11e8-b276-b9069bde0956> accessed 25 Oct 2018.

[163] Ibid.

by 2030. However, analysts assert that the 2015 Volkswagen (VW) emission scandal, Dieselgate, has diminished auto manufacturers' trust and lobbying power, and the ACEA could not force a target closer to what it wanted.[164] The rift between some member states and the auto industry became visible with their respective statements. The ACEA reiterated that the new target would have 'negative impact on industry competitiveness, auto workers and consumers alike'.[165] Whereas, countries like Sweden, Spain, France and Denmark see the target unambitious and regrettable and some members initiated a unilateral ban on internal combustion engines (ICE) sales.[166]

On the other hand, despite years of improvements in the emissions efficiency of new cars (the average emission from newly sold passenger cars dropped to 118.5g CO2/km by 2017 from its 153.3g CO2/km in 2008) and the rise in the sale of alternative fuel cars, total emissions and emissions from newly registered cars have increased in recent years.[167] In the EU, CO2 emissions from new cars increased by 0.3% (0.4 g/km) and 1.8% (2.3 g/km) in 2017 and 2018 respectively. [168] Similarly, in the UK, the average emission rose for the second year in a row in 2018 to 124.5g/km from 121g/km in 2017, a rise of 2.9%.[169] The major reasons were claimed to be the rise in the share of petrol cars, shift into higher emitting larger and heavier vehicle segments (Supermini to Dual Purpose), rise in SUV registration, the change in the testing system and the rise in car use and distance travelled.[170] Certainly, it shows the loopholes in the current regulation. The flexibility schemes within the standards are creating significant loopholes, and the standards were not stringent enough to achieve the objectives set. Instead, scholars suggest that

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[164] Ibid; Edin Mujkic and Donald Klingner, '"Dieselgate:" How Different Approaches to Decentralization, the Role of NGOs, Tort Law and the Regulatory Process Affected Comparative U.S. and European Union Outcomes in the Biggest Scandal in Automotive History' (2020) 43(7) International Journal of Public Administration 611.

[165] ACEA Press release, 10 October 2018, Brussels <www.acea.be/press-releases/article/car-and-van-co2-targets-environment-ministers-adopt-common-position-auto-in> accessed 30 October 2018.

[166] Ibid.

[167] SMMT, 'New Car CO2 Report 2018' (17th Report: 2017 data, The Society of Motor Manufacturers and Traders 2018) 20 <www.smmt.co.uk/reports/co2-report/> accessed 17 March 2019; Matt 'The political economy of European Union' (2012) (n 26) 183; EEA, Monitoring of CO2 emissions from passenger cars - Data 2017 - Provisional data <www.eea.europa.eu/data-and-maps/data/co2-cars-emission-14> accessed on 23 October 2018.

[168] EEA, 'Monitoring CO2 emissions from passenger cars and vans in 2018' (2020) (n 27) 12ff.

[169] SMMT, 'New Car CO2 Report 2018' (2018) (n 167); SMMT, '2019 UK Automotive Sustainability Report' (20th edn: 2018 data, The Society of Motor Manufacturers and Traders 2019) 22ff <www.smmt.co.uk/reports/sustainability/> accessed 10 July 2020.

[170] Ibid.

complementary instruments such as carbon tax or charge per distance-travelled are better suited to induce emissions compliance.[171]

### *4.4.3 Dieselgate and its impact*

Volkswagen (VW) was lauded as a model in corporate social responsibility and environmental management in the years preceding the emissions scandal.[172] However, such claims have been shattered when short term economic gains through circumventing legislation override long acclaimed ethical practices and environmental or social responsibilities.[173] That leaves the ethical behaviour of firms in limbo and is a blow to self-regulation advocates. Those who studied corporate governance and regulation also pinpointed that it is not realistic to rely on private companies that they will voluntarily comply with environmental standards.[174]

Moreover, the extent of legal measures taken against VW after the scandal brought another wave of scepticism on the EU's legal framework. The VW admitted that about 11 million cars across the world, 8 million in the EU and over 0.5 million in the USA, were affected by the 'defeat device' and about 9 million were recalled.[175] VW has paid more than $25 billion in customers' compensation and settlement to criminal and civil actions in the US, where $4.3bn was fine.[176] Although the criminal prosecutions by the US authorities were initially against very few mid-level employees, it recently went up the corporate ladder indicting former CEO Martin Winterkorn.[177]

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[171] Theodoros Zachariadis, 'After 'dieselgate': Regulations or economic incentives for a successful environmental policy?' (2016) 138 Atmospheric Environment 1.

[172] Carl Rhodes, 'Democratic Business Ethics: Volkswagen's emissions scandal and the disruption of corporate sovereignty' (2016) 37(10) Organization Studies 1501, 1505; Chiara Valentini and Dean Kruckeberg, '"Walking the environmental responsibility talk" in the automobile industry: An ethics case study of the Volkswagen environmental scandal' (2018) 23(4) Corporate Communications 528.

[173] Valentini and Kruckeberg (2018) (n 172) 537; Larry Li, Adela McMurray and others, 'Industry-wide corporate fraud: The truth behind the Volkswagen scandal' (2018) 172 Journal of Cleaner Production 3167; Michael Merenda and Manlye Irwin, 'Volkswagen's Diesel Emission Control Scandal' (2018) 13(1) Journal of Strategic Innovation and Sustainability 53, 56.

[174] Marie-Eve Arbour, 'Volkswagen: Bugs and Outlooks in Car Industry Regulation, Governance and Liability' (2016) 7(1) European Journal of Risk Regulation 4.

[175] Rhodes, 'Democratic Business Ethics' (2016) (n 172).

[176] David Lynch, 'VW admits guilt and pays $4.3bn emissions scandal penalty' *Financial Times* (London, 11 Jan 2017) <www.ft.com/content/d998b804-d81a-11e6-944b-e7eb37a6aa8e> accessed 25 October 2018.

[177] Bertel Schmitt, 'Dieselgate: 13 VW managers indicted around the world, big guys unbothered' *Forbes* (12 Jan 2017) <www.forbes.com/sites/bertelschmitt/2017/01/12/dieselgate-15-vw-managers-indicted-around-the-world-big-guys-unbothered/#43838a6b4e41> accessed 25 October 2018; Natalie Sherman,

However, measures have been very slow in the EU with a few criminal investigations, customer's lawsuit and compensation scheme, and overly delayed investigation. VW is also accused of being reluctant to disclose information to customers and investigators. For instance, in response to the preparation of group litigation in London's High Court against it, the VW argued that 'proceeding in England is premature' and they do not believe that 'UK customers will have suffered loss as a result of the NOx issue'.[178] Hence, the only substantial settlement in the EU thus far has been its June 2018 agreement with German authorities to end criminal prosecution for £880 million (€1 billion) fine.[179] Although the matter is not closed yet, it is unlikely that VW will face any more vigorous prosecution or fines in the EU for the scandal.

The legislative loopholes in the EU, such as the absence of corporate criminal responsibility and lenient consumers protection relieved VW from stricter measures against its misconduct. Perhaps the difference in how the standards are set, enforced and monitored in the US and EU are apparent where states are proactive in the US while member states rely on self-reporting in the EU.[180] The EU system was prone to lobbying by automakers (top-down) while the decentralised system in the US imposes robust and multiple regulatory oversights that companies cannot easily circumvent.[181] Besides a profounded tort and product liability claims intrinsic in the US legal system allowed car owners to trigger class action and forced VW to negotiate out of court damages settlement.

However, the scandal has triggered significant changes in the regulatory system in the EU and members states. The emission testing system has been changed into a relatively accurate Worldwide Harmonised Light Vehicle Test Procedure (WLTP), and new laws have given enforcement and monitoring powers both to the EU and member states.[182] The EC

'Diesel emissions scandal: Ex-VW boss Winterkorn charged in US' *BBC* (New York, 3 May 2018) <www.bbc.co.uk/news/business-43995167> accessed 25 October 2018.

[178] Jane Croft and Patrick McGee, 'VW faces UK group legal action over emissions scandal' *Financial Times* (London, 28 Jan 2018) <www.ft.com/content/1e50e9aa-02a7-11e8-9650-9c0ad2d7c5b5> accessed 25 October 2018.

[179] Andreas Cremer and Jan Schwartz, 'Volkswagen fined one billlion euros by German prosecutors over emissions cheating' *Reuters* (Berlin, 13 June 2018) <www.reuters.com/article/us-volkswagen-emissions-dieselgate/vw-fined-one-billion-euros-by-german-prosecutors-over-emissions-cheating-idUSKBN1J92AI> accessed 25 October 2018.

[180] Edin and Klingner, 'Dieselgate' (2020) (n 164) 614.

[181] Ibid.

[182] James Palmer and Tim Schwanen, 'Clearing the air after "dieselgate": Time for European regulators to experiment with participatory governance' (2019) 185 Geographical Journal 237.

has got more regulatory oversight (similar with the US EPA) by a 2018 regulation that empowers it to approve car models, fine up to €30,000 per faulty car, and order recalls.[183] Similarly, the UK vowed to bring in new measures that would allow it to charge imported car makers in the future.[184] The VW scandal marked, at least partly, the waning of auto industries' power and tightening up of regulatory frameworks across different jurisdictions. The long acclaimed 'job losses' used by auto industries to leverage regulatory measures seems to be anecdotal at this stage.

The scandal also revealed the importance of participatory environmental governance and greater transparency, where different stakeholders could contribute to the monitoring system and share vehicle data openly.[185] It was a small NGO operating in collaboration with the research institute and environmental agency of California that uncovered one of the biggest scandals of the sector. Such incidences leave a vital lesson for DCs who are easily outmuscled by the financial mighty and technical knowhow of auto companies. However, the integration of civic societies and communities in the regulatory system could help to detect a corporate trick.

## 4.5 USA Regulation: Shifting Power Balance

### *4.5.1 Corporate Average Fuel Economy (CAFE) standards*

The 1973 Arab war and oil embargo in the Middle East created oil shortage and price hikes and was considered as a serious security issue by the then US authorities.[186] Consequently, the Energy Policy and Conservation Act (EPCA) was enacted in 1975 with its fuel economy measures, Corporate Average Fuel Economy (CAFE) standards, to reduce fuel importation.[187] The standard set average fuel economy of a passenger car to be 18 mpg

[183] Regulation (EU) 2018/858 of the European Parliament and of the Council of 30 May 2018 on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, amending Regulations (EC) No 715/2007 and (EC) No 595/2009 and repealing Directive 2007/46/EC.

[184] Jessica Elgot, 'VW scandal: emissions cheats could face criminal charges' *The Guardian* (London, 2 February 2018) <www.theguardian.com/business/2018/feb/02/vw-scandal-emissions-cheats-could-face-criminal-charges> accessed 25 October 2018.

[185] Palmer and Schwanen, 'Clearing the air after dieselgate' (2019) (n 182) 240; Mujkic and Klingner, 'Dieselgate' (2020) (n 164).

[186] Hall, 'The evolution of CAFE standards' (2011) (n 119) 2.

[187] Klier and Linn, 'New-vehicle characteristics and CAFE' (2012) (n 9).

(miles per gallon) and 27.5 mpg for 1978 and 1985 respectively from its initial 13.9 mpg in 1975.[188]

American automakers met the initial standard through downsizing vehicles and operational designing changes and even exceeded the target until 1982.[189] Nevertheless, due to the production of more fuel-efficient cars elsewhere, the US auto industry had lost some of its market share to foreign cars. Moreover, the fall in fuel price in the 1980s triggered more demand for heavier and powerful than smaller and fuel-efficient cars among buyers. In 1985 it was apparent that the US automakers (especially the big three of GM, Ford and Chrysler) were struggling to meet the standard. This has forced auto companies to demand government interventions: financial support, reduction of the CAFE target and also revocation of the standard at all.[190] They successfully lobbied the National Highway Traffic Safety Administration (NHTSA) to decrease the standard to 26 mpg in 1986.[191] This decision, however, was challenged by environmental NGOs, cities and states on reasons of being 'arbitrary, capricious and contrary' to the spirit of the Act that has 'technology forcing' ambition for energy efficiency.[192] It was later raised back to 27.5 mpg in 1990. However, although automakers struggled to meet the CAFE standard in the 1990s, they met the target with ease and even exceeded it in the early 2000s.[193]

In the 1990s and 2000s, US industrial lobbying groups staged a campaign to discredit the science of climate change, exaggerate the economic cost of actions and launched a multimillion lobbying campaign against actions at home and beyond.[194] They effectively repelled attempts to raise the CAFE targets during Bush and Clinton administrations.[195] The flagship of the group was the Global Climate Coalition (GCC) that represent multiples of fossil fuel-related companies and associations where the auto and fuel industries were the major actors.[196] The GCC lobbied to contest the science of climate change, cost of mitigation

[188] The Energy Policy and Conservation Act (EPCA) [CAFE Standards] of 1975.
[189] Crandall and Graham, 'effects of FES on automobile safety' (1989) (n 20).
[190] ibid 98 and 100.
[191] Ibid.
[192] Hall, 'The evolution of CAFE standards' (2011) (n 119) 12.
[193] Jun, Sun and Kim, 'Effects of the CAFE standard on consumers' (2016) (n 15) 152.
[194] Levy and Egan, 'A neo-Gramscian approach to corporate political strategy' (2003) (n 126) 815.
[195] Hathaway, 'Corporate power beyond the political arena' (2018) (n 23) 13-14.
[196] Ibid.

and safety concerns of smaller cars.[197] Automakers were also members of the Coalition for Vehicle Choice (CVC) that brought industrial, labour and civic groups to oppose the Kyoto Protocol.[198]

In the meantime, due to increase in vehicle numbers and average distance travelled and demand for less regulated vehicles (light-trucks defined to include SUV, vans and pick-ups trucks), the CAFE standard was too little to stop the drastic increase in fuel consumption.[199] For instance, light-trucks' share of fleets increased from 10% during the introduction of the CAFE to 50% three decades later.[200] Once again, the USA's dependency on imported fuel increased from 36% in 1975 to 57% in 2008.[201] Besides, as the transport sector accounted for 28% of US's GHG emission by 2007, the environmental impact of carbon emissions from cars have become evident.[202] The IPCC's scientific reports about the science, causes and degree of climate change were also mounting at the time.[203] However, the political and social landscape was not conducive for any change on the CAFE standard nor the introduction of emission standard until after 2005, where a combination of actions forced the government to concede.

EPA was under pressure after the Supreme Court ruled out in 2007 that GHG emission satisfies the definition of 'pollutant' and within the EPA's statutory jurisdiction to regulate it under the Clean Air Act (CAA).[204] The suit was brought up by several states and NGOs against the EPA when it had denied the petition for the regulation of carbon emissions from vehicles.[205]

Moreover, California had announced its own standard and requested EPA for the pre-emption waiver as required by CAA, and if allowed, other states can simply adopt

[197] Ibid 22; Mark Richards, 'Regulating automakers for climate change: US reforms in global context' (2016) 26 Env. Pol. Gov. 498, 502.

[198] Hathaway, 'Corporate power beyond the political arena' (2018) (n 23).

[199] Hall, 'The evolution of CAFE standards' (2011) (n 119) 5.

[200] Andreas Schafer and others, *Transportation in a climate-constrained world* (MIT press, 2009) 75; Richards, 'Regulating automakers' (2016) (n 197) 502.

[201] W Ross Morrow and others, 'Analysis of policies to reduce oil consumption and greenhouse-gas emissions from the US transportation sector' (2010) 38 Energy Policy 1305, 1305.

[202] Hall, 'The evolution of CAFE standards' (2011) (n 119) 16.

[203] Jody Freeman, 'The Obama administration's national auto policy: lessons from the "Car Deal"' (2011) 35 Harv. Envtl. L. Rev. 348.

[204] Massachusetts v. EPA, 549 US 497 (2007); ibid 351.

[205] Margaret Grossman, 'Climate Change and the Law' (2010) 58 American Journal of Comparative Law 223, 233; Buzbee, 'Transportation as a climate change wedge' (2016) (n 60) 443.

California's scheme without many hurdles.[206] In the process, the auto industry lodged suits against California and other states to stop its independent GHG emission regulation claiming that the CAFE standard prohibits states from setting other standards 'related to fuel economy'.[207] Although California won some of the cases brought against it by the auto industry, the legal battle was far from over. Similarly, California's request for the waiver was initially rejected by the EPA, which had never rejected waiver requests before.[208]

The auto industry was also anxious about the prospect of being subjected to three different regulations (GHG by EPA, CAFE by NHTSA and state-level emission regulation). Nevertheless, throughout these processes, the automakers remained vehemently resistant to any change in the CAFE standard nor the GHG emissions regulation, and lodged multiples of suits but to no avail.

### *4.5.2 Amending CAFE*

In the late 2000s, the political, industrial and economic landscape started to change. The economic crisis that forced vehicle demand to surge to the lowest level over three decades, a relative increase in the oil price and mounting pressure on the USA to contain its CO2 emission forced the industry to soften its positions. As the CAFE remained unchanged for about two decades, the auto industry in the US was by far lagging behind its competitors in the EU and Japan on standard induced fuel-efficient products.[209] Hence, it was also in the interest of the US auto industries to move forward in technology innovation to improve its internal efficiency, competitiveness at the market and shield it from public pressure on climate change discourses.[210]

In contrast, the two biggest US auto industries (General Motors and Chrysler) were eyeing for government support due to financial crisis. This allowed the administration to gain a much better advantage over the auto industry. The administration has used the auto industries' concession and willingness to produce greener and fuel-efficient vehicles to

[206] 42 U.S.C.§§ 7401 (1970); Clean Air Act (CAA) § 177, 42 U.S.C. § 7507.

[207] Cases include the famous Central Valley Chrysler-Jeep v. Witherspoon, 456 F. Supp. 2d 1160 (E.D. Cal. 2006); Douglass Rohrman, 'States Are Feeling the Heat' (2006) 4(8) Frontiers in Ecology and the Environment 444.

[208] Freeman, 'The Obama administration's national auto policy' (2011) (n 203) 351.

[209] Schafer and others, *Transportation in a climate-constrained world* (2009) (n 200) 68; Hathaway, 'Corporate power beyond the political arena' (2018) (n 23) 16.

[210] Richards, 'Regulating automakers' (2016) (n 197) 499-500.

sympathise the public in support of the bailout scheme. For some, it was also an indication that the government will not let the auto industry go down, but for others, it was just a win-win scenario.[211]

The combined pressures brought the Energy Independence and Security Act (EISA) of 2007 that raised CAFE standard for all passenger vehicles (including light-trucks) to 35 mpg by 2020.[212] The automakers reluctantly acquiesced to the bill while environmentalists considered it unambitious.[213] Automakers were incredibly satisfied with the firm-specific 'attribute-based standard' of EISA that would not force them to downsize vehicles to meet the regulation and hence favour bigger vehicle sellers.[214] The achievement was down to auto lobbyists who had invested over $37 million for 2007 alone while their opponents (environmentalists) cashed only $917,108 for the first half of 2007.[215] Nevertheless, the 35 mpg target by 2020 was reported to be much lower than the level of fuel economy already achieved in other countries by 2007: EU (43.3 mpg), Japan (42.6 mpg) and China (35.8 mpg).[216] However, one crucial change brought up by EISA and defined the subsequent years was empowering the executive to change CAFE standards without consulting the Congress.[217]

Soon after being elected to office, the Obama administration requested the EPA and NHTSA to work for new and stringent regulation. They brought the joint final rule – a target of 35.5 mpg for 2012-2016 - that allows industries to achieve both CAFE standard and GHG emission standard at a time was a breakthrough.[218] Thus, California dropped its independent regulation and agreed to a uniform federal standard.[219] Besides, auto industries signed the 'letter of commitment' to the new joint proposed rules, agreed not to block California's pre-emption request through 2016, dropped pending court cases and

[211] Alex Taylor Ill, *Sixty to zero: an inside look at the collapse of General Motors-and the Detroit auto industry* (Yale University Press 2010); ibid; US Department of the Treasury, Auto Industry-Program preview, <www.treasury.gov/initiatives/financial-stability/TARP-Programs/automotive-programs/Pages/default.aspx> accessed 10 July 2020.

[212] Richards, 'Regulating automakers' (2016) (n 197) 503.

[213] ibid 504.

[214] Hathaway, 'Corporate power beyond the political arena' (2018) (n 23) 26-27.

[215] ibid 30.

[216] ibid 28.

[217] Energy Independence and Security Act of 2007, 42 U.S.C. ch. 152 § 17001 et seq.

[218] EPA, DoT and NHTSA, 'Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule' Fed. Regist. 40 CFR, 25324- 25728, 2010.

[219] Freeman, 'The Obama administration's national auto policy' (2011) (n 203) 363.

consented to work together for beyond 2016 target.[220] Encouraged by the achievement of the joint rulemaking, the same process was followed to seal the 2025 target of 54.5 mpg without many hurdles.[221]

Although many praised the consultative, inclusive and joint rulemaking process, the ambitiousness of the current standard given the state of technology and the standard in other countries is still debatable.[222] Nevertheless, it has satisfied and relieved the environmental groups, Congress members, agencies and auto industries alike.[223] Freeman noted that the joint rule pleased the auto industries' quest for 'regulatory clarity, certainty, and uniformity'.[224] However, it came through intense lobbying by environmentalists and states, and the 2008 economic crisis that deprived the auto industry of their influences played a role.

Accordingly, decisions in the US and EU on regulatory instruments and designs in the passenger vehicle sector are results of much-complicated processes, the subject of heavy lobbying by the auto sector and environmentalists, and a compromise between seemingly competing interests. However, the auto industries' influence has weakened due to the recent economic crisis and dieselgate scandal, giving way for more stringent regulations to come as witnessed in the EU.[225] However, in countries which do not appear in the global automakers' map, industrial lobbying has limited influence in the design of instruments.

It is also important to note that there are additional factors that influence regulatory instruments and their design in the EU and US, such as their topography and the respective legal and governance systems. The US has larger landmass and cities extend beyond a single county compared with compact and tight character of most EU cities.[226] As a result, compact cars are popular in the EU, while larger size vehicles such as pick-ups and dual-purpose cars are favoured in the US.

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[220] Ibid.

[221] EPA and NHTSA, '2017 and later model year light-duty vehicle greenhouse gas emissions and corporate average fuel economy standards' Fed. Regist 77, 62623–63200, 2012; Freeman, 'The Obama administration's national auto policy' (2011) (n 203).

[222] Hathaway, 'Corporate power beyond the political arena' (2018) (n 23) 31.

[223] Freeman, 'The Obama administration's national auto policy' (2011) (n 203) 365-366.

[224] ibid 364.

[225] Hathaway, 'Corporate power beyond the political arena' (2018) (n 23) 32.

[226] Buzbee, 'Transportation as a climate change wedge' (2016) (n 60) 441.

Apart from industrial lobbying, diverse interests among member states and the rulemaking process have blocked a stringent and comprehensive regulation from coming at the EU level. Likewise, some EU member states have manipulated the rulemaking system to lobby for a lenient regulation to protect their domestic car industry. This has forced member states to resort to the national system such as tax and incentives to promote greener cars. In the US, proactive states and judicial practices forced the reluctant federal government to improve the regulation. Individual states such as California have used state powers to deviate from the lenient federal regulation and create a stringent car regulation. Even then, neither of them have won the fight yet.

At the time of writing, governments throughout the world are pondering the implications of the Covid pandemic. The core tensions between economy and health and environmental concerns resurface here. Green activists advocate using the pandemic to transform the debate, including greater reliance on NMT and shifting public expenditure to stimulating low-carbon modes. However, some countries have continued to adopt policies that favour automobile over greener modes such as public transport.

## 4.6 Conclusion

When, how and whom to regulate is very complicated in the transport sector. This emanates from the nature of the sector (economic and social importance), actors' interaction, lobbying power of industrial actors, the presence of numerous externalities and cultural elements of cars. The attempt to handcuff regulation by auto industries were eroded by the growing interest of civic societies and progressive states. When the US federal government were reluctant to strengthen emission and fuel regulation, California and other states moved unilaterally. Similarly, Denmark felt the same towards the EU's incremental emission reduction and threatened to ban internal combustion engines (ICE) unilaterally.[227] Hence, transport policies and instruments are the results of an intense political rift and lobbying as much they are the product of scholarship.

Even then, none of the countries have succeeded in designing a perfect regulatory system and stabilising emissions from cars. For instance, both overall transport emissions and

[227] 'Denmark embraces electric car revolution with petrol and diesel ban plan' *Reuters* (Copenhagen, 2 October 2018) <https://uk.reuters.com/article/uk-denmark-autos/denmark-embraces-electric-car-revolution-with-petrol-and-diesel-ban-plan-idUKKCN1MC151> accessed 15 November 18.

emissions from newly registered cars have increased in the EU and UK in 2017 and 2018.[228] Thus, also lessons could be taken from such advanced economies; they should be looked at very carefully and adapted to local needs and contexts. Perhaps numerous additional factors appear in DCs such as the socio-economic importance of accessibility that influences instrumental design.

Complexities of transport instruments are also down to layers of policy objectives instruments are required to meet. Policies that address GHG emissions are either instruments very specific to road emissions or generally applied to the sector with other objectives but with spin-off effect on mitigating carbon emissions. Consequently, besides its impact on carbon emissions, such instruments are evaluated on its impact on the overall transport system (e.g. access and quality transportation) and revenue generated.[229] These latter objectives are influential in DCs like Ethiopia, where a significant amount of revenue is generated from car tax.

These lessons are foundations for discussing how these factors influence instruments design and choice in Ethiopia. The following chapters will discuss these factors and context in Ethiopia and the instruments that will decarbonise cars.

[228] EEA, 'Monitoring CO2 emissions from passenger cars and vans in 2018' (2020) (n 27) 12ff; SMMT, '2019 UK Automotive Sustainability Report' (2019) (n 169) 22ff.

[229] Lah, 'barriers to low-carbon land-transport' (2015) (n 56).

# Chapter 5
# Used Car Regulation

## Introduction

Similar to other sectors, the choice of instruments for regulating road transport emissions is influenced by numerous factors occurring both at the international and nation-state levels. Significantly, factors external to the nation and beyond its regulatory jurisdiction adds complexity to the framework required to evaluate a given instrument's mitigation potential and its interaction with other systems. For instance, developing countries (DCs) who are net importers of cars struggle to influence technology innovation through their regulatory systems. In the preceding chapter, it is argued that international regulation was the most preferred regulatory jurisdiction for a truly global auto sector and its environmental impact but became a distant aspiration due to the diverse economic and political interests of major actors. That forced countries to design unilateral instruments that fit into their context and environmental objectives.

In the fight against carbon emissions from the transport sector, Ethiopia faces a significant challenge in regulating imported used cars that dominate the car market and the ageing fleet. Although the regulatory landscape is slowly changing, many aspects of used cars remain unregulated, sporadic and ineffective.

Hence, this chapter investigates the strategies and instruments that could be used to regulate used cars in the Ethiopian context. It has become apparent that instruments designed for new cars may not effectively mitigate emissions from used cars. With the view of providing foundations for the discussion, the chapter begins with the characterisation of motorisation and fleet composition in Ethiopia followed by the nature and potential of the domestic auto industry to stimulate low carbon fleets. The regulation of used car both at the national and international level are discussed with greater detail. This enables us to explore the push and pull factors for the proliferation of used cars and their popularity in the local market as well as identify how regulatory instruments could respond to it. To make the regulation of used cars end-to-end, the final section analyses the role of a tailored end-life-vehicle (ELV) and scrappage system could play in removing the clunker cars from the road.

## 5.1 Motorisation in Ethiopia

### *5.1.1 Car demand characterisation*

The rate of motorisation of three vehicles per 1000 people in Ethiopia is lower than the sub-Saharan Africa (SSA) average of 42 vehicles and Kenyan rate of 30 vehicles in 2014.[1] However, vehicle stock is increasing at a fast rate and estimated to reach 2.3 million by 2030, from only 320,000 units in 2010.[2] The Ministry of Transport (MoT) reported that the total vehicle stock had increased three-fold in just eight years (977,349 vehicles) by 2018.[3]

Empirical evidence is, however, scarce to explain the causes of the increasing demand for cars, save as a general reference to the country's recent economic development and population increase.[4] Understandably, multiple factors contribute to the cause, including urban planning, poor public transport service and the rise of the middle classes in urban areas. Hence, poor housing conditions in the city centre and urban planning has resulted in urban sprawl, government housing and real estate development being conducted in the outskirts of the city (e.g. Hayat and Abado), and expansion of informal but affordable land dealing in the surrounding urban and semi-urban areas.[5] Furthermore, city renovation and slums clearance activities have continued to expel urban dwellers from the city centre (e.g. Lideta, Kassanchis, Sheraton and Arat Kilo) to the outskirts while the land is being developed for commercial purposes.[6] As a result, the labour market, social and public services (e.g. school, commercial services and health posts) remain in the city centre while affordable housing has moved far away from them.[7] This is aggravated by the deteriorating public

[1] Martyn Davies and Thomas Schiller, 'Deloitte Africa Automotive Insights - Navigating the African Automotive Sector: Ethiopia, Kenya and Nigeria' (Deloitte 2018) 7.

[2] Ethiopia, 'Carbon Resilient Green Economy (CRGE) Strategy' (MoFEC, EPA Addis Ababa, 2011) [CRGE Strategy] 171.

[3] Ethiopia Ministry of Transport (MoT), Vehicle database, July 8, 2019 (Sene 30, 2011). Such figures however include all types of vehicles – motor cycle, three-wheel vehicles, none road agriculture and construction machines.

[4] 'CRGE strategy' (2011) (n 2); Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1) 7.

[5] Interview with an expert at Federal Transport Authority (FTA) (FTA-03) (Addis Ababa, Ethiopia 8 August 2019); Interview with managers and owners of used car import and sales companies (CI-01 and CI-02) (Addis Ababa, Ethiopia 27 August 2019); WB, 'Ethiopia: Addis Ababa Urban and Metropolitan Transport and Land Use Linkages Strategy Review', (World Bank, Report No: ACS12347 18 September 2014) para 16.

[6] Gebre Yntiso, 'Urban Development and Displacement in Addis Ababa: The Impact of Resettlement Projects on Low-Income Households' (2008) 24(2) EASSRR 53-77; Yves Pedrazzini, Stéphanie Vincent-Geslin and Alexandra Thorer, 'Violence of Urbanization, Poor Neighbourhoods and Large-Scale Projects: Lessons from Addis Ababa, Ethiopia' (2014) 40(3) Built Environment 394.

[7] Ibid.

transport services of Addis Ababa - long queues, low quality and longer time spent on the road.[8] Studies reveal that these factors force commuters who can afford one to switch to private cars.[9]

Some commentators also claimed that 'a new middle class is slowly emerging to push up demand [for cars]'.[10] The identification and characterisation of middle classes are contentious, fluid and too broad.[11] The African Development Bank (AfDB) categorised people with $2-20 a day purchasing power parity (ppp) as middle classes.[12] In contrast, the UNDP and the Brookings Institute consider those with an income of $10-100 per day as middle class.[13] However, despite the differences in the parameters, they agree that African middle classes are increasing and catalysing consumptive behaviour.[14]

The middle-class category is rarely used in Ethiopian policies and literature. However, AfDB predicted that South Africa, Nigeria and Ethiopia will provide the largest number of new middle classes in the continent.[15] Similarly, the World Bank and Ethiopian Central Statistics Agency (CSA) studies indicated that the proportion of households living below the poverty

[8] Eshetie Berhan, Birhanu Beshah and Daniel Kita, 'Performance Analysis on Public Bus Transport of the City of Addis Ababa' (2013) 5 International Journal of Computer Information Systems and Industrial Management Applications 722; Kelbesa Kenea, Susan Kinnear and Delwar Akbar, 'Accessibility of Anbessa City Bus Service in Addis Ababa, Ethiopia: An Analysis of Stakeholder's Opinions' (2017) 23(1) Australasian Journal of Regional Studies 48.

[9] Mark Kutzbach, 'Motorization in developing countries: Causes, consequences, and effectiveness of policy options' (2009) 65(2) Journal of Urban Economics 154, 155; Hari Bansha Dulal, Gernot Brodnig and Charity G Onoriose, 'Climate change mitigation in the transport sector through urban planning: A review' Habitat International 35 (2011) 494.

[10] Aaron Maasho, 'Africa Business: Ethiopia to expand tiny car assembly business in industrial drive' *Reuters*, Addis Ababa June 1, 2016 <www.reuters.com/article/ethiopia-autos-idUSL5N18I090> accessed 08 May 2019.

[11] Jean-Nicolas Bach and Clélie Nallet, 'Conceptualizing the Middle Class in a Developmental State: Narratives and Expectations in Ethiopia' (2018) 117/468 African Affairs 439.

[12] AfDB, 'The middle of the pyramid: dynamics of the middle class in Africa' (African Development Bank, Market Brief 20 April 2011) 5 <www.afdb.org/sites/default/files/documents/publications/the_middle_of_the_pyramid_the_middle_of_the_pyramid.pdf> accessed 8 May 2020.

[13] UNDP, 'The rise of the south: human progress in a diverse world, human development report 2013' (New York: UNEP 2013); Homi Kharas, 'The unprecedented expansion of the global middle class: an update' (Brookings Global Economy and Development WP 100, Feb 2017).

[14] AfDB, 'The Middle of the pyramid' (2011) (n 12) 6; Danielle Resnick, 'The political economy of Africa's emergent middle class: retrospect and prospects' (2015) 27 Journal of International Development 573, 578; Henning Melber, 'Somewhere above poor but below rich': explorations into the species of the African middle class(es)' in Henning Melber (ed) *The Rise of Africa's Middle Class: Myths, Realities and Critical Engagements* (Zed Books 2016) 2; Lena Giesbert and Simone Schotte, 'Africa's new middle class: fact and fiction of its transformative power' (GIGA Focus-Africa, No 1, May 2016).

[15] AfDB, 'The Middle of the pyramid' (2011) (n 12) 15.

line had decreased significantly over the years in Ethiopia.[16] Consequently, although the role and potential of these 'middle classes' are contested, many agree that Ethiopia's middle classes are rising too.[17] Recognising the difficulty of conceptualising and identifying middle classes in Ethiopia, Bach and Nallet noted that the developmental state political economy adopted in Ethiopia had shifted its target category from vulnerable and poor rural farmers to what it calls 'urban micro and small enterprises and middle-income people' after the 2005 election.[18] This could as well be an indication of rising middle classes who are destined to influence the country's political and economic structure.

Scholars stated that the expansion of the middle classes would increase the per capita carbon footprint due to change in lifestyle and consumption patterns, noticeable in transport, housing and food consumption.[19] A study in Kenya discovered that middle classes spend a great deal of money on transport (either private or public), education and health services.[20] Similarly, in Nigeria, South Africa and Tanzania, possessing a private car is one, although not a necessary, characteristics of being in a middle class.[21] In some instances, automobile ownership and consumption of petroleum products are considered as proxy indicators for identifying middle classes, or upper middle classes.[22] Studies in China, India and Vietnam have used car ownership, also called 'car index', instead of income or consumption to identify and then characterise middle classes.[23] For instance, Hansen

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[16] Ethiopia, 'Ethiopia's Progress towards Eradicating Poverty: An Interim Report on 2015/16 Poverty Analysis Study' (National Planning Commission, Addis Ababa September 2017); WB, '5th Ethiopia Economic Update: Why So Idle? Wages and Employment in a Crowded Labor Market' (Washington, D.C. WBG, 19 December 2016) 24 <http://documents.worldbank.org/curated/en/463121480932724605/5th-Ethiopia-economic-update-why-so-idle-wages-and-employment-in-a-crowded-labor-market-draft-for-public-launch> accessed 08 May 2019.

[17] AfDB, 'The Middle of the pyramid' (2011) (n 12); UNDP, 'The rise of the South'(2013) (n 13); Mthuli Ncube and Abebe Shimeles, 'The making of the middle class in Africa' (Presented at the April 2013 African Economic Development Conference, Vancouver 2013) 8, <http://mortenjerven.com/wp-content/uploads/2013/04/vancouver-MthuliAbebe-April-18th-2013.pdf/> accessed 24 May 2019; David Tschirley and others, 'The Rise of A Middle Class in East and Southern Africa: Implications for Food System Transformation' (2015) 27 Journal of International Development 628, 633.

[18] Bach and Nallet, 'Conceptualizing the Middle Class in a Developmental State' (2018) (n 11).

[19] Tim Stoffel, 'Human development and the construction of middle classes in the Global South' in Melber (ed) *The Rise of Africa's Middle Class: myths, realities and critical engagements in the rise of Africa's middle class* (2016) 32; Kharas, 'The unprecedented expansion of the global middle class' (2017) (n 13) 18.

[20] Dieter Neubert, 'Kenya – an unconscious middle class? Between regional-ethnic political mobilization and middle-class lifestyles' in Henning Melber (ed) *The Rise of Africa's Middle Class* (Zed Books 2016) 118.

[21] Henning Melber (ed), The rise of Africa's middle class: myths, realities and critical engagements in the rise of Africa's middle class (Zed Books 2016) 102, 151, 170, 177, 178, 191 & 193.

[22] AfDB, 'The Middle of the pyramid' (2011) (n 12) 8.

[23] Arve Hansen, 'Consuming doi moi: Development and middle-class consumption in Vietnam' (2017) 3(2) Journal of Social Sciences and Humanities 171, 177.

characterised motorcycle owner Vietnamese as lower middle classes and those with cars as upper middle classes.[24]

A motorcycle is not very common in Ethiopia. Nevertheless, a saloon car that costs about $15,000 is affordable only for those who are professionals, business owners and employed at managerial or by international institutions, i.e. characteristics of (upper) middle classes.[25] Hence, the increase in demand for cars could be related to this rise of middle classes.

Car dealers and importers in Ethiopia asserted that buyers come from all walks of life – business owners, government institutions, employees of international institutions and even students.[26] A car dealer has claimed that:

> People want comfort as their income increases. They do not want to be exposed to direct sunlight and rain or suffer from public transportation mayhem. A shop owner who makes money aspires of driving to and off work with her own car. That is what people want…Some sell their house or other valuables or get a loan or 'ekub'[27] to buy a car. Car was considered to be a luxury a while ago, but now, as to me, it has become a necessity. Car is still expensive to buy, and I believe that people use them to expedite their business or work. The better offs buy new brands while others resort to affordable used cars.[28]

The respondent associated the demand for a car with an increase in income and the absence of decent public transport. It is also worth noting that such an increase in demand is observed in the absence of any car financing from third parties. Consumer loans for a car purchase are available in many commercial banks but under very stringent conditions – deposit (up to 40% of the price), reliable income, collateral, high interest etc.[29] Car dealers have also done little to finance car purchase either by themselves or in partnership with

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[24] Ibid.

[25] AfDB, 'The Middle of the pyramid' (2011) (n 12) 6. See also Homi Kharas, 'The emerging middle class in developing countries' (OECD Development Center WP 285, January 2010); Kharas, 'The unprecedented expansion of the global middle class' (2017) (n 13).

[26] Interview with an expert in environmental consulting firm (EC-01) (Addis Ababa, Ethiopia 8 August 2019); Interview with managers and owners of used car import and sales companies (CI-01 and CI-02) (2019); Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (Addis Ababa, Ethiopia 26 August 2019).

[27] 'Ekub' or 'Equb' is a tradition cash saving system where members contribute equal amount of cash periodically to be given to each one of them by turn over a definite period, a year or months. See Agegnehu Bisrat, Karantininis Kostas and Li Feng, 'Are there Financial Benefits to Join RoSCAs? Empirical Evidence from Equb in Ethiopia' (2012)1 Procedia Economics and Finance 229.

[28] Interview with manager and owner of used car import and sales company (CI-01) (2019).

[29] Ibid; Interview with manager and owner of used car import and sales company (CI-02) (2019); Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (2019). For instance banks like Dashen, Berhan, Enat, Wegagen, Zemen, Hibret and Anbessa have all advertised consumer loan for purchase of private cars.

financial institutions.[30] A respondent claimed that on a few occasions, the government facilitated bank loans for public transport operators, e.g. taxi associations and bus service providers to purchase new cars and buses.[31] However, arrangements like personal contract purchase (PCP) and personal contract hire (PCH) designed by auto manufacturers and financial institution in different parts of the world are not familiar in Ethiopia.[32] In high- and middle-income countries, PCP and PCH are accused of plunging middle classes into a debt trap. For instance, PCP allows purchasers to take cars with or without deposit for reduced monthly payments that run up to four years with the option of buying it at the end for a pre-agreed amount or return the key. However, the recent entry of multinational auto manufacturers in Ethiopia like Volkswagen (VW) and Hyundai might mark the start of new marketing strategies to further push purchasing capacity, including car financing.

### *5.1.2 Fleet composition*

The problems created by cars are multi-faceted. According to a report, 85% of vehicle sales in 2015 were used vehicles, and about 84% of all the sales were passenger vehicles.[33] The same report stated that 80-90% of imported vehicles in Ethiopia are used vehicles.[34] Likewise, the National Bank of Ethiopia (NBE) confirmed that petroleum (excluding jet fuel) and road motor vehicles have gulped up 20.9% of the import values for the 2017/18 FY.[35] This makes petroleum products and motor vehicle export the second and the fifth-largest import value items respectively in 2017/18, a trend that has continued for over a decade.[36] Hence, road transport is putting enormous pressure on the country's economy and hard currency balance.

To understand the environmental impact of all these imports and vehicle fleet, let us see the composition of fleets by major vehicle features. A pilot assessment in 2012 in about

[30] Ibid.

[31] Interview with an official at Federal Transport Authority (FTA-01) (Addis Ababa, Ethiopia 8 August 2019); Interview with an expert at Federal Transport Authority official (FTA-02) (Addis Ababa, Ethiopia 25 July 2019).

[32] Richard Partington, 'Car finance: the fast lane to debt?' *Guardian*, (London 19 September 2017) <www.theguardian.com/money/2017/sep/19/car-finance-debt-dealers-consumer-credit> accessed 08 May 2019.

[33] Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1) 15.

[34] Ibid 11.

[35] NBE, '2017/18 Annual Report' (National Bank of Ethiopia Addis Ababa, Ethiopia January 2019) <www.nbe.gov.et/publications/annualreport.html> accessed 7 March 2019. Ethiopian Fiscal Year (FY) runs from July 9 to July 8.

[36] Ibid Annex 11.

three-quarters of the country's administrative states found that although most light-duty vehicles (LDV) are still run by gasoline, the proportion of diesel cars are growing – 60% in 2010 – and are likely to dominate the fleet shortly. [37] Likewise, the average size and engine power of cars are increasing over the years. In Addis Ababa where more comprehensive data is available, around 86% of gasoline LDV are saloons followed by Minibus (10%), SUVs and Pickups. However, for diesel LDV, saloon cars take up only 1.3% while SUV, Pickup and Minibus take 37%, 32% and 31% respectively. Similarly, in 2012 the average engine power of gasoline LDV was found to be 1001 - 1300 cc whereas it was 2501 - 4000 cc for diesel LDV. Hence, diesel LDV consumes enormous amounts of fuel compared to gasoline due to its size and engine power.

Diesel fuel contains more energy than gasoline and allows vehicles to travel more distance per litre than gasoline. However, the prevalence of heavy engine power in diesel fleets that require more fuel per kilometre than smaller engines will off-set the efficiency of diesel fleets. In Ethiopia, used-diesel cars have induced an increase in emissions. Hence, in the absence of meaningful regulation that makes larger used and diesel cars more expensive and unaffordable, the smaller but environmentally efficient saloon and compact cars are not preferred.[38]

Ethiopian geography is characterised by high to low altitudes, hills and valleys and rough terrain and urban centres are spread across the country.[39] Thus, smaller cars used for urban trips may have difficulty in performing across these torrid areas in rural settings. As a result, multi-purpose (urban-rural) vehicles such as pickups, station wagons or SUVs are preferred for such terrain, which might have contributed to the increasing average size of LDV. This might show that different models and brands might be needed to suit Ethiopia's geophysical and climate conditions. As much as North Americans love to have large and heavy cars (e.g. light-truck), Japanese regulation and overall conditions allowed microcars ('Kei') to flourish.[40] Perhaps it requires accurate data about the purpose of car trips and

[37] AAIT, 'Final report on pilot global fuel economy initiative study in Ethiopia' (Addis Ababa Institute of Technology, Federal Transport Authority 2012) 53.

[38] Interview with manager and owner of used car import and sales company (CI-01) (2019).

[39] Getu Segni Tulu and others, 'Why are pedestrian crashes so different in developing countries? A review of relevant factors in relation to their impact in Ethiopia' (36th Australasian Transport Research Forum (ATRF): Transport and the New World City, Brisbane Australia 2-4 October 2013).

[40] Peter Wells, 'The Market for New Cars' in Paul Nieuwenhuis and Peter Wells (eds) *The Global Automotive Industry* (Wiley publisher 2015) 21.

then local innovation to cement the real Ethiopian test in car models as light-truck and Kei become ubiquitous in their local markets although unfamiliar elsewhere. However, no evidence was found to relate the increase in size and engine power of cars to utility demands but to the prevalence of cheap used cars and rebound effects of the recent improvement in the fuel efficiency of diesel cars.[41] The middle-class narrative might have contributed to such trends of increasing size and engine power of LDVs. Some also noted the growing car culture in certain sections of the society where the size and brand of the cars are used to show social and economic status, and safety and quality concerns.[42]

The Ethiopian fleet is also characterised by ageing stock.[43] In Addis Ababa, the 2012 AAIT assessment revealed that around 18% of gasoline LDVs are more than 30 years old, 35% of them 23-30 years old, and only 11% of them between 2 to 8 years old.[44] Diesel cars are relatively younger, where only 16% of them are older than 23 years, and 30% of them between 2 to 8 years old. This puts the average age of diesel and gasoline LDVs at 11 and 22 years, respectively. Taking this 2012 assessment and adopting the most conservative estimate, the average fleet age of LDVs in Ethiopia stands at 16-17 years. Although about two-thirds of the fleets were added in the last eight years, newly purchased cars itself have contributed to the ageing fleet. Thus, Ethiopia has not benefited from the car's fuel efficiency improvement achieved in the past decade. The situation is worsened by the rampant shortage of genuine spare parts, the poor practice of regular service and maintenance in the country.[45] Chapter 6 will discuss how tailored car inspection and roadworthiness test would tackle this problem and improve the car's efficiency.

The combined effects of age, size and engine power have made the average fuel efficiency of diesel LDV to be only 9 L/100KM with a corresponding emission of 245 gCO2/km, and petrol LDV to be 6.9 L/100km with a corresponding emission of 173 gCO2/km.[46] Hence, the

[41] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 37).

[42] Interview with an official at Ethiopian Petrol Supply Enterprise (EPSE-01) (Addis Ababa, Ethiopia 30 July 2019); Interview with manager and owner of used car import and sales company (CI-01) (2019); Mulugeta Getu Sisay, 'Economic commentary: What Ethiopians need is mobility, not automobility' Addis Standard, August 24, 2018 <http://addisstandard.com/economic-commentary-what-ethiopians-need-is-mobility-not-automobility-a-rejoinder-on-punitive-import-tax-for-cars> accessed 08 May 2019.

[43] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 37) 59-64.

[44] Ibid.

[45] Tulu and others, 'Why are pedestrian crashes so different in developing countries' (2013) (n 39).

[46] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 37).

average LDV fuel economy sits at 7.9 L/100km with 212 gCO2/km emission for 2010.[47] This is higher than the average carbon emissions of other countries - 150 in South Africa, 185 in Kenya, 135 for Europe and 135 for Japan (gCO2 per km travelled) in 2012.[48] Unless interventions are made against gas guzzlers and clunker vehicles, the market system is ineffective to improve the fuel efficiency of the fleet. Nevertheless, Ethiopia has a lot to do to benefit from the advantages of latecomers and not to be flooded with inefficient technologies pushed off the road in high-income countries. One possible intervention to change the fleet composition would be to have local production of cars that could induce the purchase of new cars over clunker used cars.

## 5.2 Domestic Auto Industry

### *5.2.1 Auto production value chain*

Before embracing Ethiopia into the auto industry discussion, it is worth highlighting the global and regional (Africa) context. As alluded to earlier in the thesis, global auto manufacturing was dominated by a few developed countries until very recently when emerging economies like China, India, Brazil and Mexico started to assume shares.[49] Although SSA is considered as the 'last frontier for automotive production' of its own,[50] it is still a net car importing region. Sub Saharan countries (excluding South Africa) alone imported about 1.5 million LDVs in 2013 but predicted to reach 10 million units (including South Africa) by 2030.[51]

Morocco and South Africa are the major auto manufacturing hubs in the continent while the rest (Egypt, Algeria, Nigeria, Kenya, Ethiopia, Angola, etc) host only smaller semi-

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[47] Ibid.

[48] University of Nairobi, 'Report on Global Fuel Economy Initiative Study in Kenya (GFEI)' (University of Nairobi Enterprises and Service Ltd (UNES) July 2014) <www.globalfueleconomy.org/media/461029/africa_erc-gfei-kenya-final-narative-report-23-07-2014-_2_.pdf> accessed 27 March 2019.

[49] OICA, '2016 production statistics' (International Organization of Motor Vehicle Manufacturers) <www.oica.net/category/production-statistics/2016-statistics> accessed 08 October 2018; Zifei Yang and others, 'On a pathway to de-carbonization – A comparison of new passenger car CO2 emission standards and taxation measures in the G20 countries' (2018) 64 Transportation Research Part D: Transport and Environment 53.

[50] Anthony Black and Thomas McLennan, 'The last frontier: prospects and policies for the automotive industry in Africa' (TIPS Annual Forum, Johannesburg July 2015) 4.

[51] Anthony Black, Brian Makundi and Thomas McLennan, 'Africa's automotive industry: potential and challenges', (African Development Bank WP Series No 282, Abidjan, Côte d'Ivoire 2017) 6 & 7.

knocked down (SKD) assembling lines producing a few thousand cars a year.[52] Major global car producers and component manufacturers have subsidiaries in Morocco and South Africa producing more than 400,000 cars a year.[53] Each of their plants produces more than 100,000 cars a year destined to regional and global markets, including the Middle East and the EU. For instance, Morocco was the leading supplier of components for Ford and the 5th largest car exporter to Europe in 2018.[54]

Global car production currently depends on two conditions: economies of scale and the component supply chain.[55] Multinational car manufacturers sustain profit and market share by producing few brands in large numbers – economies of scale, especially in the new and emerging markets.[56] Furthermore, rising labour costs, market competition and the interdisciplinary nature of production (e.g. increased use of IT and electronics) have forced auto manufacturers to depend on a growing number of component supply networks.[57] Nieuwenhuis argues that modern auto manufacturers 'outsource between 60 and 80% of the ex-works value of a car' to chains of component suppliers.[58] These allow them to exert time and money on designing, technology innovation and assembling rather than producing each and every component.[59] However, geographical proximity and reliable business relationships with supply chains are equally crucial.[60] For instance, the strong presence of auto manufacturers in South Africa and Morocco was catalysed by the existence of components and parts producers within a reasonable distance, and international

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[52] ibid 8 & 10; Davies and Schiller, 'Deloitte Africa automotive insights' (2018) (n 1) 5.

[53] 'Manufacturing industry central to Morocco's exports' *Oxford Business Group,* <https://oxfordbusinessgroup.com/overview/new-ecosystem-manufacturing-becoming-central-kingdom%E2%80%99s-exports> accessed May 19 2019; Automotive Industry Export Council, Automotive Export Manual-South Africa, 2018, 6 <www.aiec.co.za/Reports/AutomotiveExportManual.pdf> accessed 19 May 2019.

[54] William Boston, 'Car Makers Turning North Africa Into Auto Hub: Seeing high potential for growth, auto makers are transforming North Africa into a regional manufacturing centre' (30 Sept 2018) <www.wsj.com/articles/car-makers-turning-north-africa-into-auto-hub-1538323200> accessed 19 May 2019; *North Africa Post*, 'Morocco among top five car exporters to Europe' (Morocco 6 March 2019) <http://northafricapost.com/28667-morocco-among-top-five-car-exporters-to-europe.html> accessed 19 May 2019).

[55] Peter Wells, 'The Market for New Cars' (2015) (n 40).

[56] Paul Nieuwenhuis and Peter Wells (eds), *The Global Automotive Industry* (Wiley publisher 2015) 20 & 43.

[57] Patrick Galvin, Elena Goracinova and David Wolfe, 'Recent trends in manufacturing innovation policy for the automotive sector' in Nieuwenhuis and Wells (eds), *The Global Automotive Industry* (2015) 56.

[58] Paul Nieuwenhuis, 'Car manufacturing' in Nieuwenhuis and Wells (eds) *The Global Automotive Industry* (Wiley publisher 2015) 44.

[59] Ibid.

[60] Galvin, Goracinova and Wolfe, 'Recent trends in manufacturing innovation' (2015) (n 57) 56.

marketing. The industrial areas of Rabat and Tangier in Morocco and Port Elizabeth in South Africa are home to many component producers that are well connected to vehicle factories located in their vicinity.

The situation, however, is different in the rest of Africa. The regional value chain and integration are too weak to enable the emergence of entrepreneurs that could supply different parts of the vehicle to auto manufacturers.[61] The fragmentation has made the cost of manufacturing vehicles very high compared with giant companies that leverage economies of scale with established value chains. Besides, the absence of a uniform tariff across the region and customs clearance procedures exacerbate the hurdle of importing different kits to manufacture the vehicle in the continent.[62] The East African Community (EAC) is currently negotiating to nurture a single 'integrated automotive market' called the Regional Automotive Industry Platform of East Africa (Raipea) to benefit from the economies of scale and ease integration in the region.[63] Hence, supportive industrial policy is vital to augment a viable automotive industry in the region.[64]

### *5.2.2 Car production in Ethiopia*

The automotive industry in Ethiopia is in its infant stage. Ethiopia has no meaningful car manufacturing industry and depends on imported vehicles from the Middle East (UAE), Asia (Japan, China and Korea) and European countries.[65] A respondent from the Ministry of Trade and Industry revealed that a small number of auto assembling plants have been taking root in recent times but have a limited capacity of producing less than 10,000 vehicles a year.[66] Respondents claimed that these locally assembled cars do not have a marketing problem and are often bought by the government and companies.[67]

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[61] Black, Makundi and McLennan, 'Africa's automotive industry' (2017) (n 51) 17.

[62] Ibid 18.

[63] Allan Olingo, 'VW prepares for planned regional vehicle market' *The East African*, (4 February 2019) <www.theeastafrican.co.ke/business/VW-prepares-for-planned-regional-vehicle-market/2560-4966370-4he7r0z/index.html> 7 March 2019. EAC members are Burundi, Kenya, Rwanda, South Sudan, Tanzania, and Uganda.

[64] Black and McLennan, 'The last frontier' (2015) (n 50) 5.

[65] Ethiopian Customs Commission, 'Import database: vehicles' (ECC, Unpublished Addis Ababa, Ethiopia July 2019).

[66] Interview with an official in Ministry of Trade and Industry (MoTI) (MoTI-02) (Addis Ababa, Ethiopia 24 July 2019); MoTI, 'Automobile and Trailer Manufacturers List' (MoTI Metal Engineering Support Directorate Unpublished Addis Ababa, July 2019); Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1) 14

[67] Interview with an official in MoTI (MoTI-02) (2019); Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (2019).

Hence, to increase the market share of locally assembled cars, a mix of strategies that would increase the uptake of new cars and limit the purchase of used cars should be designed. Expectedly, local assembly plants hire only in the hundreds and are yet to make a significant impact on the national economy. The industry's ability to establish producers association, and influence government policy, negotiate on essential policy tools, and strategies, as witnessed in the EU and US, are rare. In fact, it was only in July 2018 that automotive producers established their first auto industry association which is rarely involved in policy designs.[68]

However, the recent establishment of subsidiaries of multinational auto companies will change this operational landscape. In January 2019, Volkswagen Group (VW) signed a memorandum of understanding (MoU) with the Ethiopian government to establish its subsidiaries in Ethiopia.[69] VW chose Ethiopia due to its population and fast-growing economy.[70] According to the MoU, besides the car assembly facility, VW committed to working on the localisation of automotive components, the introduction of mobility concepts and opening skill development centres. Similarly, in February 2019, the Korean auto giant Hyundai partnered with the domestic Marathon Motor to inaugurate its assembly facilities in Ethiopia.[71] The new facility is believed to have an operational capacity of producing 10,000 cars a year including electric vehicle. Indeed, the coming of VW and Hyundai into the Ethiopian market marks the beginning of a new phase and could trigger a change in industrial policy.

The automotive sector is currently guided by the generic industrial policy which has lots of loopholes and is far from addressing the unique circumstance of auto manufacturing. Ethiopian investment laws enshrine ranges of generous investment incentives to many

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[68] Interview with an expert in MIDI (Ethiopian Metal Industry Development Institute) (MIDI-01) (Addis Ababa, Ethiopia 27 August 2019).

[69] MoU between Volkswagen Group and Ethiopian Investment Commission (EIC), (Unpublished, EIC Ethiopia January 2019); Olingo, 'VW prepares for planned regional vehicle market' (2019) (n 63).

[70] VW, 'Volkswagen develops automotive industry in Ethiopia' *Volkswagen*, (Addis Ababa/Wolfsburg, 28 Jan 2019) <www.volkswagenag.com/en/news/2019/01/Volkswagen_develops_automotive_industry_in_Ethiopia.html> accessed 7 March 2019. VW is expanding its presence in Africa with its facilities already operating in South Africa, Algeria, Kenya and Rwanda, and adding Nigeria, Ghana and Ethiopia to its list.

[71] Abdur Rahman Alfa Shaban, 'Korean auto giant, Hyundai, opens assembly plant in Ethiopia' *African News*, (21 February 2019 <www.africanews.com/2019/02/21/korean-auto-giant-hyundai-opens-assembly-plant-in-ethiopia> accessed 7 March 2019.

sectors. Nevertheless, most of the incentives are designed either to apply in general to all investments or in particular to the manufacturing sector to encourage the transfer of technology, expand job opportunities, encourage export earning, and use local resources in the production.[72] Assembly firms import knock-down kits from abroad, assemble them with minimum value addition and sell them in the domestic market.[73] This production system still demands an enormous amount of foreign currency to procure the kits, employs limited labour, does not export any product, and is hardly considered as a substitute for an imported vehicle to enjoy the full range of investment benefits.

Nevertheless, they can still enjoy part of the investment incentives. For instance, they can import their investment capital good free of taxes and duties and spare parts up to 15% of the value of capital goods, enjoy an exemption from paying profit tax for two to three years and carry forward any losses.[74] Even then, producers of vehicle bodies, components, parts and accessories producers enjoy more income tax exemptions (three to four years) than auto manufacturers (two to three years). Besides, other priority sectors like textile and pharmaceuticals enjoy a considerable incentive, including up to six years of income tax exemption.[75]

Reports claimed that auto companies were promised to enjoy a 30% additional tax incentive if they could make 30% of their input locally.[76] Although several firms source some components such as tyres locally, the definition of 'local content' and how it will be determined in the auto sector is not defined yet. Global production of auto parts and components are made in a specialised value chain where economies of scale make it globally competitive.[77] Hence, although parts and components could be produced locally, albeit in small numbers, their price will be higher than the global market. Currently, few parts like the tyre, battery, hooks, brake pad, shock absorber, radiator, leaf spring,

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[72] Ethiopian Investment Proclamation No 769/2012, Preamble and Art 5.

[73] Maasho, 'Ethiopia to expand tiny car assembly business' (2016) (n 10).

[74] Investment incentives and investment areas reserved for domestic investors council of Ministers Regulation 270/2012, Arts 5(1), 7, 13 and Sch 1.17.

[75] Investment incentives and investment areas reserved for domestic investors council of Ministers Regulation 270/2012.

[76] Davies and Schiller, 'Deloitte Africa automotive insights' (2018) (n 1) 14.

[77] Nieuwenhuis and Wells (eds), *The Global Automotive Industry* (2015) (n 56).

mudguard and footrest are locally produced albeit in small quantities.[78] Even then, most of these products are rarely used by local companies due to differences in specifications. For instance, a local company, Horizon Tyres, produces cross-ply (bias-ply) tyres but car producers often use radial tyres.[79]

Ethiopia's industrial strategy has not considered the auto-industry as a priority sector. However, recent interests shown by global automakers, an increase in market demand and economic growth has signalled the sector's potential for future growth. If so, the sector deserves to be regulated through a tailored strategy that creates enabling environment for technology innovation and leapfrogging to occur in the areas of EVs, hydrogen cells and car design that suits the country's needs. The strategy, among other things, should extend investment incentives for the auto-sector, facilitate access to finance, design fiscal instruments to support technology adoption and diffusion, stimulate local component and parts production.

In climate terms, the presence of local manufacturers will support the decarbonisation of cars. It could make enforcing environmental objectives more straightforward and holds auto manufacturers to account. As can be seen below, local production could also be linked with scrappage schemes to accelerate replacing the ageing fleets.

## 5.3 Used Cars

### *5.3.1 Why used cars?*

Data about the used vehicle market is underreported and inaccurate.[80] However, some reports claimed that the global market of used cars has over USD 17.6 billion value in 2014 and will increase by 7% from 2018-2022.[81] The used car market is a lucrative and protected business that takes a significant market share in exporting countries: 14% of all vehicles

[78] Interview with expert in MIDI (MIDI-01) (2019); Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (2019).

[79] Ibid; Interview with an official in MoTI (MoTI-02) (2019) .

[80] David Coffin and others, 'Examining barriers to trade in used vehicles' (UNITC WP ID-044, August 2016), 8 <www.usitc.gov/publications/332/used_vehicle_wp_id-44_final_web_0.pdf> accessed 23 March 2019; UNEP, 'Used vehicle: A global overview' (Background Paper 2017) <www.unece.org/fileadmin/DAM/trans/doc/2017/itc/UNEP-ITC_Background_Paper-Used_Vehicle_Global_Overview.pdf> accessed 23 March 2019.

[81] Coffin and others, 'Examining barriers to trade in used vehicles' (2016) (n 80); Technavio, 'Global Used Car Market 2018-2022' (2018) <www.technavio.com/report/global-used-car-market-analysis-share-2018> accessed 22 March 2019.

exported for the USA and 7% for Japan in 2014.[82] Furthermore, some non-car producing countries are involved in the value chain as an intermediate market. For instance, UAE is one of the largest importers of used vehicles (1.4 million units in 2014) and serves as a transitional market hub for its neighbours and Eastern and Southern African countries.[83]

However, not all used cars are necessarily polluting, and its remaining economic value could be utilised by importing countries. Some argue that imported younger used cars are fuel-efficient and less-carbon intensive than the ageing fleet already on the road in low-income countries.[84] Furthermore, a study for the EU argued that second owners of young used cars of 4-9 years old still benefit from the efficiency of the car.[85] The argument essentially is that not all used cars in high-income countries have finished their economic value, and utilising these cars in the middle- and low-income countries has benefits for both.

Although there is some truth in the above argument, it does not rule out the necessity of regulating used vehicle imports. In the absence of rigorous scrappage schemes, younger used vehicles do not necessarily replace existing clunker vehicles but will be added to the existing fleet with an impact of increasing emissions at a rate higher than a new vehicle would typically do. As discussed in the preceding sections, the used vehicle market stimulates the behaviour of choosing large-size vehicles over smaller ones.[86] This will slow down the transition to cleaner and innovative new vehicle technologies in low-income countries. Furthermore, used cars accelerate the rate of motorisation as the low-middle

[82] Coffin and others, 'Examining barriers to trade in used vehicles' (2016) (n 80); Anumita Roychowdhury, 'Clunkered: combating dumping of used vehicles—A roadmap for Africa and South Asia' (Centre for Science and Environment, New Delhi 2018) 30. The major exporters are the USA, Japan, Germany and Canada whereas the UAE, Mexico, Poland and Nigeria are major importers.

[83] Jorge Macias and others, 'Policy Handbook for the Regulation of Imported Second-Hand Vehicles' (Global Fuel Economy Initiative Mexico 2013) 14 <www.globalfueleconomy.org/media/45362/wp7_regulation_for_2nd-hand_vehicles-lr.pdf> accessed 18 February 2019; Black and McLennan, 'The last frontier' (2015) (n 50) 7; Coffin and others, 'Examining barriers to trade in used vehicles' (2016) (n 80) 9; UNEP, 'Used vehicle: A global overview' (2017) (n 80) 10.

[84] Ibid.

[85] Kris Vanherle and Robert Vergeer, 'Data gathering and analysis to improve the understanding of 2nd hand car and LDV markets and implications for the cost effectiveness and social equity of LDV CO2 regulations' 7 (for DG Climate Action Transport & Mobility Leuven, Belgium 2 May 2016) <https://ec.europa.eu/clima/sites/clima/files/transport/vehicles/docs/2nd_hand_cars_en.pdf> accessed 8 May 2019; UNEP, 'Used vehicle: A global overview' (2017) (n 80) 4.

[86] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 37); Coffin and others, 'Examining barriers to trade in used vehicles' (2016) (n 80) 6.

classes, who otherwise use public or non-motorised transport, can now afford to buy cheap used cars.[87]

It is pertinent, at this juncture, to discuss why used cars have dominated car markets in low-income countries. There are both push (from exporting) and pull (importing) factors in the process. Used car sales are an alternative to incurring a higher scrappage cost and hassle to companies and individuals in high-income countries.[88] Stricter legislative frameworks on emissions, progressive regulatory standards, stringent testing schemes, high rate of technology innovation, the soaring price of scrapping and increase in purchasing power motivated owners in exporting countries to replace cars quickly before their economic use is exhausted.[89] For instance, new cars in Japan are subject to mandatory inspections after three years and then every two years that costs owners 1000 to 2500 USD each time.[90] Likewise, an owner who wants to discard his vehicle pays a scrapping charge of about 90-180 USD.[91] Therefore, the presence of used car market offers owners attractive incentive that they could raise cash for purchasing a new and improved car. Besides, the availability of an international market for used cars also triggers discarding vehicles early before exhausting their economic life. These cars make their way into low- and middle-income countries of Asia, Africa and South America.[92]

Used cars also have very high demand, particularly in low-income countries, due to their lower initial price. An informant described that used cars are available with a third of the price of a new car of a similar model.[93] Moreover, a greater variety of vehicles which otherwise are unaffordable or unavailable are brought offering purchasers with a vast choice.[94] Some also mention that due to low labour cost, the lifetime costs of maintaining a used vehicle is not too high in these low-income countries.[95] Nevertheless, a counter-

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[87] Gordon Pirie, 'Sustainable Urban Mobility in 'Anglophone' Sub-Saharan Africa' (Global Report on Human Settlements 2013, Nairobi 2011) 18 <www.unhabitat.org/grhs/2013> accessed 21 April 2019; Vanherle and Vergeer, '2nd hand car and LDV markets' (2016) (n 85) 32.

[88] UNEP, 'Used vehicle: A global overview' (2017) (n 80) 5.

[89] Ibid 6.

[90] Ibid 20. See also Qinghua Zhao and Ming Chen, 'A comparison of ELV recycling system in China and Japan and China's strategies' (2011) 57 Resources, Conservation and Recycling 15.

[91] UNEP, 'Used vehicle: A global overview' (2017) (n 80) 6.

[92] Ibid 4.

[93] Interview with manager of used car import and sales company (CI-01) (2019).

[94] Ibid; Coffin and others, 'Examining barriers to trade in used vehicles' (2016) (n 80) 4.

[95] Coffin and others, 'Examining barriers to trade in used vehicles' (2016) (n 80) 4.

argument to this is that only a few owners perform standard and regular maintenance that lead to deteriorating technical efficiency of used vehicles and compromising public health and environmental conditions.[96] Some in Ethiopia also claimed that durability, roadworthiness and availability of genuine spare parts made known imported used cars more attractive than the locally assembled cars.[97] For instance, the presence of designated dealers, maintenance facilities and historical performance makes Toyota more competitive than others.[98] Hence, the market failures observed in the car market that have made used and polluting cars cheap and preferable should be readjusted to demonstrate their lifetime environmental and social impact by public policy measures.

### *5.3.2 Regulatory instruments*

Ethiopia faces the daunting task of managing a large number of imported used vehicles and the ageing fleet. Policy options available for importing countries to regulate used cars include a complete ban, a ban on used-vehicles beyond a certain age, higher tariffs for used cars, restrictions on the number of imported used cars (licensing) and set specific technical requirements (conditions).[99] A complete ban on used cars may prejudice the economic and social benefit of younger used cars, especially to the low-income groups that cannot afford to buy new cars.[100] It is noted that not all used cars are polluting and it is both economically and environmentally feasible to use the remaining economic life of a younger used car in DCs.[101]

The problem of regulating used cars was shared by many African countries. In Kenya, only 15% of the newly registered vehicles were new, and only 48% of them were locally assembled in 2015.[102] Hence, it banned the importation of used vehicles older than eight years which was set to drop to five years in 2019 for vehicles above engine power of 1500 cc. The age limitation was complemented with an incremental tax rate on vehicles older than three years and a target of completely banning the import of used vehicles by 2021.[103]

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[96] Tulu and others, 'Why are pedestrian crashes so different in developing countries' (2013) (n 39) 9, 11.
[97] Interview with manager of used car import and sales company (CI-01) (2019).
[98] Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1) 11.
[99] Coffin and others, 'Examining barriers to trade in used vehicles' (2016) (n 80) 12.
[100] Vanherle and Vergeer, '2nd hand car and LDV markets' (2016) (n 85).
[101] UNEP, 'Used vehicle: A global overview' (2017) (n 80).
[102] Black, Makundi and McLennan, 'Africa's automotive industry' (2017) (n 51) 25; Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1).
[103] Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1).

A relatively more robust policy framework and success were reported from Mauritius. A regulation that combines a three year age limit on used vehicles import, feebates on high emitters and rebates on low emitters resulted in 50% of the imported cars to be brand new in 2015.[104] In the continent where only South Africa, Morocco, Sudan and Egypt completely ban the importation of used vehicles, and 25 others impose age restrictions ranging from 3 to 15 years, many found it hard to emulate the success of Mauritius.[105]

Unfortunately, Ethiopia was one of the few African countries with no restrictions on the importation of used vehicles until 2020.[106] Given the above experiences, this thesis proposes imposing a ratchet scheme of age limitation starting with 10-8-5 years and setting a long term target where a maximum limit or complete ban would come. This allows enough time for transition – the provision of decent public transport, access and security of NMT and local production of cars. Setting the age limit too low might adversely affect low-income social groups in the short run, and soar the price of cars already on the road. As long as effective environmental standards are in place to force scrappage or ELV recycling, the complete banning of used cars may have little environmental effect for now.

Used cars are imported by nearly 4,000 small and medium-sized companies where most of them operate as a family business and import less than hundreds per year.[107] Moreover, some formal and informal dealers and garages have specialised in producing modified parts and maintaining these used vehicles. A ratchet restriction on used cars will allow these firms to find other feasible business models, continue to retain the labour and support the ambition of greening transportation. With government support, these small and medium firms could form bigger companies and produce parts and component that could feed the car assembly industry.[108] The Metal Industry Development Institute (MIDI), which is

[104] UNEP, 'Used vehicle: A global overview' (2017) (n 80) 7.

[105] Anumita Roychowdhury, 'Consumer demand doesn't let countries ban import of cheap used cars' (Down To Earth, 15 November 2018) <www.downtoearth.org.in/news/africa/consumer-demand-doesn-t-let-countries-ban-import-of-cheap-used-cars-62135> accessed 23 March 2019.

[106] Interview with an official in the Ministry of Transport (MoT) (MoT-01) (Addis Ababa, Ethiopia 22 July 2019); Interview with an expert in the FTA (FTA-02) (2019); AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 37); Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1).

[107] Ministry of Trade and Industry, 'Automotive business license data base' (MoTI, Unpublished July 2019).

[108] Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (2019).

mandated to facilitate the development of the auto sector through capacity building, market linkage and businesses advice could facilitate the process.[109]

In addition, fiscal measures that will balance the environmental and social cost of used vehicles should be designed to complement age restriction. The demand for used vehicles due to their lower price compared with new vehicles could be readjusted by imposing differing taxes and duties based on a combination of factors like age, engine size, fuel efficiency, carbon emissions and utility. This is a revenue-neutral scheme which will encourage people to opt for new and better-performing vehicles. A supplementary scheme of fiscal incentives (e.g. tax rebates) on low emitting cars could soften public outrage.

Another complementary instrument to age restriction could be compulsory labelling and certification for used cars. Currently imported used cars display fuel economy and emission levels at production and not at the time of resale. That leaves substantial grey areas for manipulation, and confusion among purchasers and regulators. Hence, importing companies should ensure the existence of appropriate labelling, verify its authenticity and share it with the customs and transport authorities in Ethiopia.

### *5.3.3 Evolving fiscal instruments*

Until 2019, used vehicles were subject to up to 30% depreciation allowance while computing the tax base that gives them an advantage over new cars.[110] Many have complained that such car tax system punished new car buyers which led to its removal in 2019.[111] Furthermore, the government has announced reforms in the customs duty and excise tax laws that have the objective of increasing revenue by broadening the tax base. Regarding used cars, whether to use economic instruments (tax) or direct regulation in the form of restricting the importation of used cars has been debated for years among agencies. Transport departments have pushed for restricting or banning of the used vehicles of a certain age while the Ministry of Finance and Economic Cooperation (MoFEC) resisted on revenue sensitivity grounds. Finally, MoFEC won the argument, and the country adopted

[109] Metal Industry Development Institute Establishment Council of Ministers Regulation No 182/2010, Arts 5 & 6.

[110] Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1) 14; ERCA (Ethiopian Revenue and Customs Authority), Customs Duty and Taxes Calculation Directive No 111/2015, November 2015, Arts 17-19.

[111] Interview with an expert in environmental consulting firm (EC-01) (2019); Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (2019).

differentiated customs and taxes based on their age and types in July 2019 and January 2020.[112] It was argued that banning used cars beyond the age of 5 years, as requested by transport authorities, would cost the government about 12 billion ETB in revenue loss.[113] However, as MoFEC has kept the impact assessment study confidential, the consideration and weight given to the economic cost, public health impacts of pollution and long term environmental impacts of old used cars are unknown.

*Table 5.1 New Tariff classification and custom duty rate (2019)*

| **Cylinder Capacity** | **Propulsion type** | **Customs Duty based on New or used (%)** | | | |
|---|---|---|---|---|---|
| | | CKD | SKD | New (CBU) | Used (>1yrs) |
| Vehicles that transport ≤ 10 persons | ICE | 5 | 10 | 30 | 35 |
| | HEV/PHEV | 5 | 10 | 20 | 35 |
| | BEV | Free | 5 | 10 | 20 |
| Others | | 5 | 10 | 30 | 35 |
| Light trucks of ≤ 5 tonnes of weight | <1500 kg | 5 | 10 | 30 | 35 |
| | >1500 kg | Free | 5 | 10 | 10 |

Source: MoFEC, 'Customs Tariff Amendment No. 8' (2019)

*Table 5.2 Excise tax bill (2020)*

| **Cylinder Capacity** | **Propulsion type** | **Excise Tax on New Cars (%)** | | | **Excise Tax on Used Cars (%)** | | | | **Other Taxes (%)** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CKD | SKD | New (CBU) | 1-2 yrs | 2-4 yrs | 4-7 yrs | >7 yrs | VAT | Surtax | Withholding Tax |
| ≤ 1300 | ICE | 5 | 5 | 5 | 55 | 105 | 205 | 405 | 15 | 10 | 3 |
| | HEV/PHEV | 5 | 5 | 5 | 55 | 105 | 205 | 405 | 15 | | 3 |
| 1301-1500 | ICE | 60 | 60 | 60 | 110 | 160 | 260 | 460 | 15 | 10 | 3 |
| | HEV/PHEV | 60 | 60 | 60 | 110 | 160 | 260 | 460 | 15 | | 3 |
| 1501-1800 | Gasoline | 60 | 60 | 60 | 110 | 160 | 260 | 460 | 15 | 10 | 3 |
| | Diesel | 100 | 100 | 100 | 150 | 200 | 300 | 500 | 15 | 10 | 3 |
| | HEV/PHEV | 60 | 60 | 60 | 110 | 160 | 260 | 460 | 15 | | 3 |
| > 1800 | ICE | 100 | 100 | 100 | 150 | 200 | 300 | 500 | 15 | 10 | 3 |
| | HEV/PHEV | 100 | 100 | 100 | 150 | 200 | 300 | 500 | 15 | | 3 |
| Battery Electric Vehicle | | - | - | - | 50 | 100 | 200 | 400 | 15 | | 3 |
| Others | | 30 | 30 | 30 | 80 | 130 | 230 | 430 | 15 | 10 | 3 |
| Light trucks ( ≤ 5 tonnes) | | - | - | - | 100 | 100 | 200 | 400 | 15 | - | 3 |

Source: Excise Tax Proclamation No 1186/2020

The two laws are the first of its type to impose differentiated customs/tax rates to new and used cars, and partly respond to the long-standing request of environmentalists and auto assembly firms. The most significant change is observed in the excise tax that impose a de

[112] Excise Tax Proclamation No 1186/2020; MoFEC, 'Customs Tariff Amendment No. 8 Based on the 2017 Version of the Harmonised System' (Addis Ababa July 2019)

[113] Interviews with an official in the MoFEC (MOFEC-02) (Addis Ababa, Ethiopia 17 August 2019); Interview with an expert in FTA (FTA-02) (2019); Interview with an official in the MoT (MoT-01) (2019)

facto ban on used cars of older than four years. The argument behind the new reform was a mix of economic (revenue) and environmental concerns. The government argued that alleviating environmental pollution caused by used cars, generating additional revenue from inelastic goods and services, and discouraging the consumption of hazardous and luxury products and services necessitated the revision.[114] However, some of these goals are intertwined and inseparable. By improving the fuel efficiency of car fleets, the instrument could achieve economic and environmental goals concurrently - reducing dependency on imported fuels and reducing carbon emissions. Although restricting imported used vehicles alone would not achieve the intended environmental objectives, it is a significant step forward in the long and tedious process of greening the transport sector. The law induces carbon emissions reduction in two ways – reducing the number of cars on the road and improving the fuel efficiency of the fleet.

However, the revision was a revenue-induced change, and environmental parameters are added on as a secondary objective. The manner in which environmental values are reflected in the legislation exposes this deficiency. For instance, the carbon emissions and technical efficiency differences between a two and a three years old car are insignificant, but the taxes are doubled for the latter. The same goes for a four- and five-year-old cars, and a new and a one-year-old car. This knife-edge margin of years that came along with massive tax rate differences will open the door for manipulation, document forgery and preparation of dubious certification. As a result, it will become too much to bear for the already ill-functioning and bribe prone customs clearance system.[115]

Furthermore, the revision faces serious enforcement and acceptability challenges. The punitive tax rate on used vehicles (up to 500%) would make used cars unaffordable and nearly equal with the price of new cars. However, such aggressive and unprecedented increases in tax rates have surprised everyone in the auto sector, including some government offices. Stakeholders, including government agencies, were not consulted on the measure, have no preparation on how to enforce and monitor it. Hence, it might create an administrative gap and also force desperate businesses to look for loopholes to manipulate the system. Instead, a step by step approach that sets short to long term targets

[114] MoFEC, 'Draft Excise Bill explanation note' (MoFEC Unpublished, Addis Ababa 2019).
[115] Interview with a manager and owner of used car import and sales companies (CI-02) (2019).

could have balanced all the economy, environment, administrative and social equity concerns.

The new higher excise tax may contribute to the abatement of transport emission but is short-sighted, insufficient and with many loopholes that should be filled with complementary instruments. Instead, a comprehensive automotive strategy and vehicle regulation system that regulates the importation, operation and disposal of used-car could be established. In no way does this thesis envisage car-free transport soon and the feasible approach is to minimise its importance and stimulate innovation for a smooth transition. Perhaps, the banning of used-cars will face political resistance, runs the risk of crippling the value chain build around the used-car market, risk laying off a significant amount of labour force and erase the value-for-money argument of younger used cars.

## 5.4 International Regulation of Used Cars

### *5.4.1 Exporting waste vehicles: unknown whereabouts*

It was repeatedly argued in this thesis that the absence of international or regional regulation of used cars has forced states to adopt local measures.[116] However, the stringency of a given regulation and its effect on other nations depend on the country's status as either importing or exporting nation. Generally, regulations enforced in used-car exporting countries shape and influence the international market for used cars. For instance, end-life vehicle (ELV) disposal systems designed in the car exporting countries have allowed these waste cars to end up into low-income countries, including Ethiopia.[117] The EU system is chosen as an example to illustrate this.

The EU has adopted non-binding guidelines, Correspondents' Guidelines No. 9 on Shipments of Waste Vehicles, for monitoring the reuse and scrappage of cars.[118] The EU prohibits exporting waste vehicles outside of the EU unless in exceptional circumstances, such as the 'goods' being destined for recovery.[119] However, some reports found that

[116] UNEP, 'Used vehicle: A global overview' (2017) (n 80).

[117] ECC (Ethiopian Customs Commission), 'Import database: vehicles' Addis Ababa, Ethiopia July 2019; Yilak Akloweg, Yoshitsugu Hayshi & Hirokazu Kato, 'The effect of used cars on African road traffic accidents: a case study of Addis Ababa, Ethiopia' (2011) 15(1) International Journal of Urban Sciences 61-69; Davies and Schiller, 'Deloitte Africa Automotive Insights' (2018) (n 1) 4.

[118] EU, Correspondents' Guidelines No. 9 on Shipments of Waste Vehicles, 8 July 2011.

[119] EC Regulation No 1013/2006 on shipments of waste (Waste Shipment Regulation – WSR).

implementation loopholes let cars destined for scrappage being exported to Eastern European and African countries illegally.[120] European Commission report for the EU28 found 4.66 million vehicles of 'unknown whereabouts' for 2014, vehicles that are deregistered but neither legally exported nor issued with a 'Certificate of Destruction' (CoD).[121] The same report suggested that as the distinction between ELV and used vehicles is both ambiguous and unsettled under the EU law (the guidelines are non-binding), illegal exports to non-OECD countries might have contributed to it.[122] The UK's auto industrial association, SMMT, also claimed that there is a large percentage of unaccounted ELVs every year which are either illegally exported or unofficially scrapped.[123] The non-binding guidelines provide non-exhaustive descriptions of waste vehicles and left considerable grey areas – both in definition and monitoring - to obscure waste as used vehicles.[124] Moreover, the EU exported 1.15 million used vehicles in 2014 to non-member states and inspecting each to verify whether it is used vehicle, or ELV (waste) requires enormous resources.[125] Hence, the EU has not devised a robust scheme to verify the status of exported vehicles and relies on an assessment made according to the non-binding guideline by exporters.

Although high-income countries are tightening up their own domestic vehicle regulations to require higher performance on fuel efficiency and carbon emissions, its spillover effect has resulted in exporting emissions to low-income countries. Exporting countries that have better technological and regulatory capacity to regulate their international transaction have ignored environmental threats of exporting ELV vehicles, and even do not keep an accurate record of the transactions.[126]

### *5.4.2 WTO rules*

DCs have used trading measures to prevent clunkers from entering their roads, albeit with less success. For instance, countries like India, Brazil and Colombia cited WTO rules to ban

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[120] Roychowdhury, 'Clunkered' (2018) (n 82) 98.

[121] EC, 'Assessment of the implementation of Directive 2000/53/EU on end-of-life vehicles (the ELV Directive) with emphasis on the end of life vehicles of unknown whereabouts' EU DG Env, 2018, Brussels, 9.

[122] Ibid.

[123] SMMT, '2019 UK Automotive Sustainability Report' (20th edn: 2018 data, The Society of Motor Manufacturers and Traders) 29 <www.smmt.co.uk/reports/sustainability/> accessed 10 July 2020.

[124] EU, 'Correspondents' Guidelines No. 9 on Shipments of Waste Vehicles' (2011) Secs 7-12.

[125] EC, 'Assessment of the implementation of the ELV Directive' (2018) (n 121) 6.

[126] Vanherle and Vergeer, '2nd hand car and LDV markets' (2016) (n 85) 70; UNEP, 'Used vehicle: A global overview' (2017) (n 80).

or impose environmental requirements on imported used cars.[127] However, despite its co-benefits on environmental values, the real intention of such measures were the protection of their domestic auto industry. The issue was also raised in the preparation of Ethiopia's new tax law, and preference was given to fiscal instruments rather than banning the importation of used cars to make it WTO-consistent and facilitate Ethiopia's accession process.[128]

It is understood that member countries are allowed to make WTO inconsistent measures under Article XX(b) and (g) of GATT necessary to protect their environment and human health.[129] In the US-Gasoline case, the Appellate Body decided that 'WTO Members have a large measure of autonomy to determine their own policies on the environment (including its relationship with trade), their environmental objectives and the environmental legislation they enact and implement.'[130]

However, when it comes to specific cases, the languages of Article XX were strictly interpreted and measures screened through a two-tier (sometimes three-tier) test. That is, measures are first subject to the requirements under the exceptions, and then the opening statement (chapeau) of Article XX, i.e. such exceptional measures should not be applied to 'constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail or a disguised restriction on international trade'.[131] For instance, the word 'necessary' within the meaning of Article XX(b) is construed by comparing the measures adopted with other less trade-restrictive alternatives that could

[127] India, 'Guidelines for Environmentally sound management of end of life vehicles (ELVs)' (Ministry of Environment and Forest and Climate Change and Central Pollution Control Board-Government of India 2016); Macias and others, 'Policy Handbook Mexico' (2013) (n 83) 15.

[128] Interview with an official at ECC (Ethiopian Customs Commission) (ECC-01) (Addis Ababa, Ethiopia 13 August 2019).

[129] GATT (General Agreement on Tariffs and Trade) (1 Jan. 1948) 55 UNTS 194, Art XX. It reads that:

Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:

(a)…..

(b) necessary to protect human, animal or plant life or health;

(g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption.

[130] WTO Appellate Body Report, United States — Standards for Reformulated and Conventional Gasoline, WT/DS2/AB/R, adopted 20 May 1996, DSR 1996:I, 30-31.

[131] WTO Analytical Index: GATT 1994 – Article XX (Jurisprudence), December 2018, 6 <www.wto.org/english/res_e/publications_e/ai17_e/gatt1994_art20_jur.pdf> accessed 1 Nov 2019.

be used to achieve the same objectives.[132] In the process, scientific data on the cause and effect of the alleged environmental risk, the nature of the policy and measure in question and the way it was executed will be scrutinised under the exceptions.[133] It is widely argued that the interpretation and analytical framework (two-tier test) adopted by WTO tribunals were restrictive and precluded members from adopting environmental protection policies and laws.[134] Nevertheless, in 2017, the WTO Panel in Brazil-Taxation case found that 'increasing vehicle safety and the reduction of CO2 emissions are policy objectives that are covered by subparagraph (b) of Article XX of the GATT 1994'.[135] That allows WTO members to adopt WTO-inconsistent measures aimed at reducing CO2 emission or exhaust pollutants.

The Brazil-taxation case was submitted by the EU and Japan against Brazil's tax systems, among them was the INOVAR-AUTO programme. INOVAR-AUTO programme provides for a reduction of the IPI Tax (Tax on Industrial Products) on certain motor vehicles as defined by different laws.[136] The program uses a combination of variables to identify beneficiaries like vehicle characteristics (e.g. specific vehicle design and technology it uses), companies' domicile and companies' involvement in specific programmes (e.g. participation in vehicle labelling, investment in R&D and capacity building initiatives in Brazil).[137] The EU and Japan challenged the measures claiming that they amount to discrimination, incentive and subsidy in favour of domestic products and against imported products, and hence WTO-inconsistent.[138] Whereas Brazil argued that such measures were WTO-consistent, but if found to be WTO-inconsistence, they are justified under the exceptions provided under Article XX (b) and (g).[139] Although the panel rejected Brazil's claim and found that the

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[132] WTO Appellate Body Report, Brazil - Measures Affecting Imports of Retreaded Tyres, European Communities v Brazil, WT/DS332/AB/R, Adopted on 3rd December 2007 DSR 2007:IV (Brazil – Retreaded Tyres), para 156.

[133] WTO Analytical Index: GATT 1994 – Article XX (2018) (n 131).

[134] Sanford Gaines, 'The WTO's Reading of the Gatt Article XX Chapeau: A Disguised Restriction on Environmental Measures' (2001) 22(4) U. Pa. J. Int'l Econ. L.; Niall Moran, 'The First Twenty Cases Under GATT Article XX: Tuna or Shrimp Dear?' In Adinolfi G and others (eds) *International Economic Law* (Springer, Cham 2017). By 2014, only two out of the 20 cases appealed to the Appellate Body are accepted under GATT's Art XX.

[135] WTO Panel, Brazil – Certain Measures Concerning Taxation and Charges' (Brazil-Taxation) WT/DS472/R WT/DS497/R 30 August 2017, para 7.881.

[136] Brazil, Decree 7,819/2012, Articles 11-19.

[137] Ibid; See also WTO Panel, Brazil-Taxation' (2017) (n 135) paras 2.97 to 2.122.

[138] WTO Panel, Brazil-Taxation' (2017) (n 135) para 7.2.

[139] Ibid, para 7.849.

measures are unjustified under Article XX(b) and (g) of GATT due to the availability of alternative measures that are WTO-consistent or less-trade restrictive and likely to achieve Brazil's objectives,[140] it sets an important precedent for future use.

The panel affirmed that

> [p]rotection afforded to domestic producers by the discriminatory aspects of the measure could enable such domestic producers to develop their industry… Ultimately, by elevating the domestic industry from a position of technological and competitive inferiority to a position in which the domestic industry could compete with foreign motor vehicles, the INOVAR-AUTO programme could conceivably contribute in the long-run to overall vehicle safety as well as overall reductions in CO2 emissions.[141]

Hence, for Ethiopia to benefit from Article XX(b), the policies and measures adopted should be assessed against the analytical tests of that (1) the policies aim to protect human health or environment, (2) the proposed measures were necessary to fulfil the objectives, (3) such policy measures were applied in consistent with the chapeau of Article XX, and finally (4) absence of other WTO-consistent or less trade-restrictive measures to achieve the objectives.[142] Given the recent development in WTO jurisprudence and Ethiopia's context (e.g. emissions increase from road transport, the prevalence of used vehicles, scale of the traffic accident, net-zero carbon emission plans for 2030 etc), banning used vehicles, restricting vehicles on certain environmental grounds (e.g. emission level or fuel economy) or discriminatory taxes would not contravene WTO laws.[143] Ethiopia is free to define the level of environmental quality it wants, and take measures to achieve that objective in line with Article XX of GATT.[144] Many African WTO members (e.g. Mauritius, Egypt and South Africa) banned the importation of used cars or stipulated strict specifications on economic, safety and environmental reasons, and remained unchallenged before WTO tribunal.

On the other hand, as importing countries continue to impose restrictions on the import of used cars, market share for used cars will soon fall.[145] Hence, it is in the interests of exporting countries and companies as well to create a bilateral or multilateral system to address the problem. Apart from restricting the exportation of emissions, preserving

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[140] Ibid, para 7.961.
[141] WTO Panel, Brazil-Taxation' (2017) (n 135) para 7.904.
[142] ibid, paras 7.857, 7.930ff.
[143] ibid, paras 7.906-7.916.
[144] WTO Analytical Index GATT 1994 – Article XX (2018) (n 131) 27-28.
[145] UNEP, 'Used vehicle: A global overview' (2017) (n 80).

clunkers within the developed countries market could encourage innovation in the forms of modification, car design or material use. More importantly, it will stop developed country protagonists from 'dumping' second-hand cars into DCs, give 'existing' second-hand cars a value at home and discourage the continuous production of cars in large numbers. However, if such international regulation fails to materialise, robust regulation of used cars should be devised by importing countries.

## 5.5 Scrappage Schemes and End-Life-Vehicle (ELV) Recycling

Polluting and gas guzzler cars are still on Ethiopian roads with no meaningful restriction.[146] Although the de facto ban discussed above is likely to perpetuate this, the problem is complicated, and there will not be one single solution to it. Some of the proposed solutions are discussed below, while others will come in the next chapter.

### *5.5.1 Scrappage system*

Scrappage schemes are designed to remove gas guzzlers, high emitting older cars and ELVs from the road. Studies found that fuel economy might remain relatively similar for the first nine years of the vehicle's age, but significantly decrease as it gets old.[147] Perhaps, in the current speed at which advanced vehicle technology emerges, vehicles would become obsolete very quickly than it would have been a decade ago. More importantly, most used cars in Ethiopia are reported to be very old (average 16-17 years), larger in size and with higher engine power which makes them fuel-inefficient and high carbon emitter than smaller new vehicles.[148] This makes a tailored scrappage and ELVs scheme vital for Ethiopia.

Global experience, however, warns that public-funded scrappage schemes brought a little contribution to decrease overall CO2 emissions due to increased distance-travel with the new car.[149] Critics have also presented evidence that scrappage schemes are implemented to achieve economic and social goals, i.e. to stimulate the car market and save jobs, rather

[146] For instance, Lada (Russia), Opel (UK), Beetles Volkswagen (Germany), and Peugeot (France) of the 1970s and 1980s are abundant on Ethiopian roads. Toyota Corolla Dx (called Woyane) of the 1980s and 90s are still on the market for resales and used for taxi services in most urban centres including Addis Ababa.

[147] Vanherle and Vergeer, '2nd hand car and LDV markets' (2016) (n 85).

[148] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 37).

[149] Bert Van Wee, Gerard De Jong & Hans Nijland, 'Accelerating Car Scrappage: A Review of Research into the Environmental Impacts' (2011) 31(5) Transport Reviews 549; Shigemi Kagawa and others, 'Better cars or older cars? Assessing CO2 emission reduction potential of passenger vehicle replacement programs Author links open overlay panel' (2013) 23(6) Global Environmental Change 1807.

than on environmental grounds.[150] Above all, Ethiopia cannot afford to provide financial incentives for these old and classic cars to be pulled off the road. Besides, as only a few middle and higher classes own private cars, public spending on other modes of transport rather than on replacing private cars in the form of scrappage schemes might perform better on social justice and environmental grounds. Equally, imposing stringent emissions or age restriction on existing fleet may be difficult to enforce and get political acceptance. As a result, instead of cash out, tax relief or carrying the tax forward for purchasing a new car on condition of presenting the certificate of destruction (CoD) may balance these competing interests.

Access to finance is another stumbling block that prevents car owners from replacing existing old cars with environmentally effective new cars. Buyers are required to pay the full price of a car together with all taxes and duties in a lump sum – difficult for owners who depend on their old cars for a living. Financial institutions and car dealers could design car financing schemes to replace these clunker cars. Recently, the government granted the Addis Ababa taxi association a one-off duty-free import of about 1200 cars to replace city's clunker taxis.[151] Although some question the quality of these Chinese made cars to withstand the neighbourhood's rough roads, it has significantly changed the fleet composition of the city's transport.[152] However, those clunker cars were not removed from the road but are transferred to other users with a reduced price who use them in remote suburbs, in small cities or just as a private car.[153] This forces us to enquire about the ELV recycling infrastructure and system, a noticeable absence in Ethiopia.

Some of the cars on the road could be considered classic cars (vintage cars) of cultural or historical importance. Nevertheless, Ethiopia does not have a system that defines and protects such classic cars. It was revealed that a foreign investor requested a license for

[150] Rachel Aldred and Daniela Tepe, 'Framing scrappage in Germany and the UK: from climate discourse to recession talk? (2011) 19(6) Journal of Transport Geography 1563; Christian Brand, Jillian Anable and Martino Tran, 'Accelerating the transformation to a low carbon passenger transport system: The role of car purchase taxes, feebates, road taxes and scrappage incentives in the UK' (2013) 49 Transportation Research Part A: Policy and Practice 132, 133; Denis Dineen, Lisa Ryan and Brian Ó Gallachóir, 'Vehicle tax policies and new passenger car CO2 performance in EU member states' (2018) 18(4) Climate Policy 396.

[151] Bezawit Admasu and Samuel Getachew, 'Old and New Taxis Battle for the Pockets of Addis Passengers', *Addis Fortune* (Addis Ababa 25 Oct 2016) <https://addisfortune.net/articles/old-and-new-taxis-battle-for-the-pockets-of-addis-passengers> accessed 11 May 2019.

[152] Ibid.

[153] Interview with an expert in the FTA (FTA-02) (2019).

maintaining and exporting used cars from Ethiopia a few years ago.[154] The investor claimed to have buyers abroad but was not trusted by the authorities. After a lengthy consultation amongst the transport, environmental, metal industry, culture and tourism and police authorities, the government rejected the request. Although the reason given for the rejection was that scrapped vehicles would be recycled in the metal industry, the authorities were suspicious of the motives of the investor. This is an indication of the absence of a clear strategy and system to deal with ELVs.

Ethiopia does not have a system to regulate scrapping or disposal of ELV. The vehicle registration proclamation obliges the owner or possessor of a vehicle to surrender the title certificate within 30 days if the vehicle is exported, scrapped or permanently removed from use.[155] By doing so, the law confers a positive obligation on the owner to clear the vehicle from the registry. The transport proclamation also states that the transport authority is responsible for issuing a directive regarding the 'refurbishing, scraping or destroying of motor vehicles' and monitoring its execution.[156] However, informants mentioned that Ethiopian vehicle deregistration system is half-baked and works only for vehicles which were registered along with trade or business license and paid annual profit tax.[157] In this case, the owner should complete the deregistration process with transport authorities for getting the tax clearance from tax authorities. However, for private cars, authorities have not designed a monitoring mechanism to hold owners accountable to the deregistration process. This is partly because the registration is linked with the car rather than with the owner, who is free to register other cars in his/her name although the license for the previous car was not renewed nor returned.

Unfortunately, a sequential approach is envisaged by transport authorities where regulating imported used vehicles are prioritised over the existing clunkers.[158] Instead, a synergy of strategies that address both newly registered and existing clunker cars should

[154] Ibid.

[155] Vehicles Identification, Inspection and Registration Proclamation No. 681/2010, 11 August 2010, Art 9.

[156] Transport Proclamation No. 468/2005, 6 August 2005, Art 7(2)(q).

[157] Interview with an expert in the FTA (FTA-02) (2019).

[158] Interview with an official in the MoT (MoT-01) (2019); Interview with an official in the FTA (FTA-01) (2019).

be designed. The latter could be accomplished through creating a formal ELV recycling system that stimulates formal withdraw of clunker cars from the roads.

### *5.5.2 ELV recycling system*

As is the case in many African countries, ELV disposal in Ethiopia is conducted by the informal sector where they are manually dismantled for their spare parts, and the rest is taken to melting facilities or scrap dealers. In Addis Ababa, there are suburbs called '*Somale tera'* and '*Minalush tera'* where scrapped spare parts are marketed. Nevertheless, technical and infrastructure capabilities are low for efficient recovery and utilisation of ELV resources that could have fed into the auto industry.[159] As the parts will not end up in a landfill and create jobs for low and middle-level experts, the practice contributes to the recycling and recovery of the wastes. For instance, there is a practice called '*mebelalat'*, literally means 'exterminate each other', commonly used in the vehicle repair and maintenance subsector.[160] *Mebelalat* refers to the situation where an old vehicle will be dismantled, and its essential parts recovered to run other old vehicles. The dismantling and parts recovery cycle will continue with the other vehicles as genuine spare parts are not available for those old vehicles.

Such reuse and scrapping business remained informal and underdeveloped and hardly contributed to the removal of ELVs from the roads.[161] However, it might have promoted the continued use of clunker vehicles through the supply of spare parts and exposed the environment, especially land and water, to dangerous waste substances leaked from the ELV.[162] The recirculation of such overly used and uninspected spare parts poses an imminent danger to traffic safety. China prohibited reuse of some parts of a car such as engines, steering, transmissions, axles and frames to prevent traffic accidents caused by the improper reuse of these parts of ELV.[163]

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[159] Masaaki Fuse, Kenichi Nakajima and Hiroshi Yagita, 'Global flow of metal resources in the used automobile Trade' (2009) 50(4) Materials Transactions 703.

[160] Interview with an expert in the FTA (FTA-02) (2019).

[161] ibid. FTA assert that it has not issued any separate license for scrapping or parts recovery business, and operates either as garage or spare part dealers.

[162] Zhao and Chen, 'A comparison of ELV recycling' (2011) (n 90) 17.

[163] Shin-ichi Sakai and others, 'An international comparative study of end-of-life vehicle (ELV) recycling systems' (2014) 16(1) J Mater Cycles Waste Manag 1, 5.

Moreover, the separation and safe disposal of hazardous materials deserve technical inputs and advanced technologies. However, the mechanical and manual dismantling practice and the absence of tailored laws and enforcement systems resulted in the unsafe disposal of these hazardous materials. The increase in clunker car ownership and the loopholes in the existing environmental legislation necessitates the need for ELV recycling framework laws. Furthermore, the increased use of plastics, rare metals and high-value metals in electric vehicles (EVs) and lightweight vehicles accentuates the urgency of designing the framework.

The objectives of ELV recycling system is to avoid wastes from going to landfill and prevent depletion of materials. In doing so, it aspires to reduce waste from source, reuse and recover materials and possibly stimulate design changes that will enable easier waste separation and recovery.[164] Beyond the recovery of materials from ELV, the Ethiopian system should resolve two pressing issues – induce withdrawal of clunker cars from the road and create safe disposal of hazardous waste substances from ELVs.

Currently, clunker cars have greater market value on the road than when designated as ELV (waste). Hence, unless a regulation forces these cars out off the road and send them to ELV recycling, they will continue to be driven even with their environmental and traffic risks. Among the many forms of ELV system, extended producers responsibility (EPR) might help address most of the challenges surrounding ELV recycling in Ethiopia.

### *5.5.3 Extended Producer Responsibility (EPR)*

Extended Producer Responsibility (EPR) is an environmental tool that makes manufacturers or importers responsible for the whole life cycle of the vehicle and integrates them in the final disposal of the vehicle through take-back, cost-sharing or recycling schemes.[165] Jurisdictions like the EU, Japan, Korea, China, the USA, Canada and Australia have well-

[164] Jooyoung Park, Nohora Díaz-Posada and Santiago Mejía-Dugand, 'Challenges in implementing the extended producer responsibility in an emerging economy: The end-of-life tire management in Colombia' (2018) 189 Journal of Cleaner Production 754-762; David A P Paterson and others, 'Incorporating remanufacturing into the end-of-life vehicles directive: current presence and the waste problem' (2018) 8 Jnl Remanufactur 23–37. See also Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles (ELV) (OJ L 269, 21.10.2000, 34).

[165] Thomas Lindhqvist, 'Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems' (2000) IIIEE, Lund University, PhD thesis); Park, Díaz-Posada and Mejía-Dugand, 'Challenges in implementing EPR' (2018) (n 164).

established legislative and marketing schemes to manage ELV recycling.[166] Volkswagen and BMW in Germany and Nissan and Toyota in Japan have set up facilities for recycling and dismantling their own vehicles as part of the EPR scheme.[167] DCs like India have issued ELV management guidelines that call for coordination among different stakeholders in the value chain, manufacturers being the prominent one.[168] A chain of responsibilities that brings together manufacturers, exporters (if any), importers and dealers responsible for the supply of spare parts, provision of maintenance and final disposal could work. Such a scheme enables producers to track the destination of their products and performance, facilitate the flow of vehicle information to consumers, and possibly eliminate illicit trading schemes in transit markets (the Middle East for East African case). In the context of used vehicle importing countries, most of their waste could be fed into the automotive value chain and alleviate the environmental damage otherwise generated from its disposal.

In many countries, EPR is found to be economically and environmentally effective for many reasons - it endorses the 'polluter pays principle' and relieve local authorities from the burden, induce changes in design and material uses in the product making process, stimulate safe disposal of hazardous wastes and create a value chain for greater reuse of materials.[169] Compared with the conventional waste management methods that require municipalities to lead the collection, handling and disposal activities, EPR imposes responsibilities on automakers and importers that will induce changes in the product design and marketing early in the value chain, share the administrative burden and foster innovative waste management techniques.[170]

Indeed, the absence of well-developed local automakers, sound waste management system and the presence of informal sector would be the biggest challenge to achieve economies of scale and create a more robust value chain for the recovered materials.[171] However,

[166] EU ELV Directive 2000/53/EC; Japan Law for the Recycling of ELVs (2005); Korea Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles (2008).

[167] Roychowdhury, 'Clunkered' (2018) (n 82) 101.

[168] India, 'Guidelines for Environmentally sound management of ELV' (2016) (n 127).

[169] OECD, 'Analytical framework for evaluating the costs and benefits of extended producer responsibility programmes' (OECD, Working Group on Waste Prevention and Recycling, March 2005) 8ff.

[170] OECD, 'Extended Producer Responsibility: a Guidance Manual for Government' (OECD Publishing, Paris 2001) 50.

[171] OECD, 'Extended Producer Responsibility: Updated Guidance for Efficient Waste Management' (OECD Publishing, Paris 2016) 53ff.

some vehicle importing countries such as the Netherlands have successfully adopted EPR that forces vehicle importers and producers pay waste disposal fee and manage the disposal through their association.[172]

Inclusive approaches that integrate the informal sector such as the waste collectors, car dismantlers and garages through skill development and creation of value chains could avoid the trap. Such systems would be designed through the use of a mix of instruments that force producers to take-back part of the waste, support local businesses that collect, dismantle and recycle components, and set standards for percentage of recovery from the vehicle weight. Furthermore, information instruments such as labelling and reporting requirements would broaden the understanding by stakeholders.[173] Economic instruments such as requiring deposit-funds, advanced disposal fee and taxes to induce both car owners and producers/importers enforce strict disposal procedures are already in use in some countries.[174]

Giant car manufacturers may be reluctant to engage with governments of individual importing nations due to the smaller size of car markets in Ethiopia. Hence, ELVs schemes can impose responsibilities on local producers and importers, who might then negotiate terms with manufacturers.[175] That is, for instance, if creating an EPR system with Toyota, which has 85% of the used car imports and 65% of car sales shares in Ethiopia becomes unfruitful, local companies that import Toyota cars could be held responsible for the final disposal of its cars. Nevertheless, such a scheme could also open up opportunities for new forms of business ventures to flourish that will bring producers, importers and scrapping facilities together.

The ELV recycling fees are affected by different factors such as availability of landfill, the presence of auto manufacturers, car price and the general regulation of cars. The EU law relieves vehicle owners from paying for the ELV recycling while Japan owners pay for the

[172] Sue Cassells, John Holland and Anton Meister, ‘End-of-life vehicle disposal: Policy proposals to resolve an environmental issue in New Zealand’ (2005) 7(2) Journal of Environmental Policy & Planning 107; Jeongsoo Yu and Shuoyao Wang, ‘Comparative Analysis of ELV Recycling Policies in the European Union, Japan and China’ (2019) Investigationes Linguisticae, Vol. XLIII 34.

[173] OECD, ‘EPR Updated Guidelines’ (2016) (n 171) 21ff.

[174] Ibid 22.

[175] See Park, Díaz-Posada and Mejía-Dugand, ‘Challenges in implementing EPR’ (2018) (n 164).

service.[176] Whereas in the Netherlands and Korea, car importers and producers are required to cover the cost of ELV recycling.[177] However, as ELV has significant positive value in the Ethiopian market, importers and producers may not be required to incur immediate cost except for the disposal of hazardous wastes.

## 5.6 Conclusion

Used cars pose a unique challenge to DCs like Ethiopia. A fast-growing population and economy triggered a surge in demand for private cars, notably cheap used cars. As much as they aid mobility, used cars have accelerated the shift from using non-motorised transport (NMT) and public transport to a private car. As a result, the current passenger fleet is dominated by the ageing, heavy engine and large-size cars. In addition to its adverse environmental effects, such fleets are consuming an enormous amount of fuel and foreign currency, increasing traffic accident and retarding domestic auto sector.

Regulating used cars is a challenge not only for Ethiopia but also for those who are on the importing end of the international transaction. The car production-oriented regulatory system in car-exporting countries has inadvertently fuelled exporting of emissions to low-income countries. Hence, in the absence of control by exporting countries and international frameworks, individual importing countries are forced to design their own regulatory systems to tackle the growing threat of used cars.

Such regulation systems and import restrictions, however, need to be WTO-GATTs consistent so as not to hamper Ethiopia's accession to WTO or trigger a costly dispute with WTO member states. Hence, a mix of restriction and fiscal instruments of differentiated tax rate based on vehicle age, fuel consumption, carbon emission and technology could be adopted. The proposed system considers the businesses and transport services dependant on used cars and takes a step-by-step approach that starts with less stringent fiscal instruments followed by age restrictions. The strategy will have a long-term plan of banning the importation of used vehicles or vehicles beyond a certain age.

[176] EU ELV Directive 2000/53/EC.

[177] Cassells, Holland and Meister, 'End-of-life vehicle disposal' (2005) (n 172); Sakai and others, 'An international comparative study of ELV' (2014) (n 163) 5.

Economic impacts and co-benefits of any measures are an integral part of the instrumental choice analysis and are believed to be vital for efficiency, acceptability and sustainability of the regulation. For used-car regulation, economic and social parameters were considered to propose fiscal instruments over the banning of used cars in the immediate future. Furthermore, such a system will be linked with scrappage and ELV systems that remove clunker and unworthy cars from the road. Complementary measures of additional incentive to the local auto sector and clunker owners, and requiring car importers to oversee the final disposal of ELV are recommended. To this, a tailored version of extended-producers responsibility (EPR) is proposed to help regulate the supply side of used-car market and account importers and producers to the performance, recycling, reuse and disposal of ELV.

Apart from this, the following chapter explores additional instruments that regulate new cars in particular but still relevant for used-cars.

# Chapter 6
# Conventional Car Regulation

## Introduction

The instruments predominantly linked to used cars like age restrictions on the importation of used cars, scrappage scheme for clunker cars, extended producers responsibility (EPR) for end-life-vehicles (ELV) and labelling of used cars were discussed in the preceding chapter. Nevertheless, not all of these instruments are unique to used cars nor are the forthcoming instruments exclusive to new cars. It is instead to which types of cars they are used the most. Hence, as a continuation of the preceding chapter, this chapter scrutinises other regulatory instruments that could be used indiscriminately to all types of internal combustion engine (ICE) cars. Additional instruments specific to electric vehicles (EVs) are discussed separately in the forthcoming chapter.

The presentation on chapters 2 and 3 revealed that overreliance on public expenditure had exposed Ethiopia to its inherent limits like debt crisis and environmental sustainability concerns. Thus, this thesis looks into the potentials of other mitigation instruments that suit Ethiopian context and environmental objectives and decarbonise cars. It is worth noting that a car-free society is not envisaged anytime soon and the goal is to limit its numbers and distance travelled, and improve its efficiency. This will be achieved through a balanced regulation of both the supply (car producers and importers) and demand (buyers and commuters) of cars.

Regulatory instrument choices are influenced by various factors that are both internal and external to the instrument. Scholars agree that not only the instruments' environmental effectiveness and economic efficiency but also their suitability to existing political, legal, institutional and social systems should be assessed before their adoption.[1] Thus, the governance system, environmental objectives and nature of mobility and fleet composition that have been discussed in the preceding chapters are essential variables to be considered.

[1] IPCC, Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, 2014) [IPCC, AR5-WGIII] 207-282; Gjalt Huppes and others, 'Instrumentation Strategies and Instrument Mixes for Long Term Climate Policy' (PhD thesis Leiden University 2015).

Hence, primarily economic instruments of ownership tax and fuel tax, and direct regulation instruments of fuel efficiency and carbon emission standards, vehicle inspection and vehicle use restrictions are discussed. Throughout of the discussion, integration (mixing) of different instruments aimed at maximising the mitigation potentials of the instruments, and redressing perverse effects of otherwise effective instruments are emphasised; likewise, instruments that stimulate innovation, limit enforcement and monitoring costs, and reduce compliance cost-uncertainty are considered.[2] Hence, less attention is paid to the traditional instrumental categorisation and more on how it functions in the real world to stabilise emissions from cars. Other instruments like fiscal incentives (e.g. rebates) for low carbon cars and soft instruments (e.g. labelling and information campaigns) are discussed along with the principal instruments they complement.

## 6.1 Ownership (Acquisition) Taxes

Taxes and charges on cars are principally imposed on economic grounds and are the primary sources of government revenue. However, in recent times they have become the major instruments to achieve environmental goals, including carbon mitigation. However, in Ethiopia, the tax rate, base of computation and items exempted from it are the subjects of criticism by many including automotive sector actors and environmentalists.[3] As a result, the government has revised the customs duties (2019) and excise legislation (2020) where a car was the focus. Below, we will discuss the criticisms against the former tax system and then how far the new system has incorporated environmental values.

### *6.1.1 Obsolete tax laws*

The prominent taxes on cars are the excise tax and customs duties which were enforced for about 15 years without significant modifications.[4] The taxes and duties on cars presented in Table 6.1 reveal that the tax base, exemptions and lower tax rates were determined based on economic, social and political considerations (e.g. diplomatic community), and not on environmental grounds. However, there were instances where some features of them

[2] OECD, Instrument mixes for environmental policy, (OECD 2007) 25-27.
[3] Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (Addis Ababa, Ethiopia 26 August 2019).
[4] Interview with an expert in environmental consulting firm (EC-01) (Addis Ababa, Ethiopia 8 August 2019).

(e.g. excise, surtax and customs duties) served environmental objectives.[5] A close look at the tax rates reveals that passenger vehicles with less than ten seats were more heavily taxed than buses and mini-buses. Moreover, less fuel-efficient and higher emitting passenger cars like those with higher engine power were subject to a higher rate. Similarly, freight and public transport vehicles with more than ten seats were exempted from excise and the 10% surtax;[6] and customs duties were higher for low occupant vehicles (e.g. 35% for LDV) but less for public transport vehicles (e.g. 10% for buses with 15 or more seats). That was mainly meant to achieve the socio-economic objectives of encouraging the use of public transport and discourage private vehicles.

However, the full potential of taxes to mitigate carbon emissions were not reflected in the tax system. Regulations in major car-producing countries, especially in the EU and Asia, have forced cars' features to change continuously, such as downsizing engines and car sizes.[7] One such regulatory instrument that has contributed to the reduction of the carbon intensity of newly purchased cars was carbon-based ownership taxing.[8] However, by subjecting all cars below 1300 CC to similar tax rates, the Ethiopian tax system could not stimulate the purchase of smaller and microcars, especially those below 1000 CC. Furthermore, electric vehicles (EV) with higher emission abatement potential were subject to the same rate of tax as a conventional car of less than 1300 CC (Table 6.1).[9]

Like other taxes, the base of computation was the vehicle's final price (CIF) which inadvertently encouraged the purchase of cheaper, potentially polluting vehicles rather than environmentally effective but relatively expensive vehicles.[10] Besides until 2019, used cars were entitled up to 30% discount as depreciation value from the FOB (Free on Board – port of shipment) value that gave used cars additional price advantage in the market.[11]

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[5] Mebrahtom Fitiwi, 'The need for environmental tax in Ethiopia: economic analysis of law' (2014) 2 Mekelle University Law Journal 102.

[6] Import Surtax Council of Ministers Regulations No 133/2007, Art 4.

[7] See Chap 4 above.

[8] Denis Dineen, Lisa Ryan & Brian Ó Gallachóir, 'Vehicle tax policies and new passenger car CO2 performance in EU member states' (2018) 18(4) Climate Policy 396; Reyer Gerlagh and others, 'Fiscal policy and CO2 emissions of new passenger cars in the EU' (2018) 69 Environ Resource Econ 103.

[9] AAIT, 'Final report on pilot global fuel economy initiative study in Ethiopia' (Addis Ababa Institute of Technology, Federal Transport Authority 2012).

[10] Interview with an official at Ethiopian Customs Commission (ECC) (ECC-01) (Addis Ababa, Ethiopia 13 August 2019).

[11] Ibid; ECC, Customs Duty and Taxes Calculation Directive No 111/2015 (November 2015) Arts 17-19.

*Table 6.1 Older Custom Duties and Taxes on Vehicles*

| | Goods /Items | Customs Duty % | Excise Tax % | Import Surtax % | VAT % | Withold ing % | Tota l % |
|---|---|---|---|---|---|---|---|
| **I** | **Public Transport** | | | | | | |
| 1 | Capacity of 10 to less than 15 seats | 35 | - | - | 15 | 3 | 53 |
| 2 | 15 or more seats | 10 | - | - | 15 | 3 | 28 |
| **II** | **Passenger cars Less than 10 seats** | | | | | | |
| 3 | Cylinder capacity < 1300 cc | 35 | 30 | 10 | 15 | 3 | 93 |
| 4 | Cylinder capacity between 1300 and 1800 cc | 35 | 60 | 10 | 15 | 3 | 123 |
| 5 | Cylinder capacity between 1800 and 3000 cc | 35 | 100 | 10 | 15 | 3 | 163 |
| 6 | Electric/Battery Vehicles | 35 | 30 | 10 | 15 | 3 | 93 |
| **III** | **Trucks** | | | | | | |
| 7 | Cargo vehicles up to 1500 kg (weight) | 35 | - | - | 15 | 3 | 53 |
| 8 | Cargo vehicles >1500 kg | 10 | - | - | 15 | 3 | 28 |
| 9 | Heavy-Duty, 5 - 20 ton | 10 | - | - | 15 | 3 | 28 |

Another feature of Ethiopian taxes and which has continued today is its cumulative nature.[12] One commentator rightly noted that:

> Vehicle affordability is further locked up by prohibitively high vehicle taxes of sometimes more than 220% depending on engine size. As taxes in Ethiopia are cumulative, the excise tax is calculated on the customs duty, the surtax is charged on top of the excise tax, and customs duty and final VAT is calculated once the surtax, excise tax and customs duty have been added. Imported vehicles may cost as much as three times the retail price of the vehicle outside of the country.[13]

The conclusion is that it was only this higher and cumulative tax system that has effectively deterred many middle-income groups from acquiring private cars and maintain a high share of NMT and public transport. Public reaction to such tax system was generally adverse. Most felt that the tax system was punitive and denied middle classes from accessing decent private transportation.[14] They argued that in the absence of alternative modes of transport and the poor condition of public transport, the government was collecting unreasonably

[12] Customs Proclamation No 859/2014, Art 89(2); Income Tax Proclamation No 979/2016, Art 85(1); Excise Tax Proclamation No 307/2002, Art 5; VAT Proclamation No 285/2002, Art 15; Import Surtax Council of Ministers Regulations No 133/2007, Art 4.

[13] Martyn Davies and Thomas Schiller, 'Deloitte Africa automotive insights - Navigating the African automotive sector: Ethiopia, Kenya and Nigeria' (Deloitte 2018) 12.

[14] Emmanuel Igunza, 'Why are cars so expensive in Ethiopia?' *BBC* (Addis Ababa 16 January 2017) <www.bbc.co.uk/news/world-africa-38607986 > accessed 12 March 2019; Ayele Gelan, 'Economic commentary: Punitive import tax on cars deprive Ethiopians a driving seat, undeservedly, and hurt the country' *Addis Standard* (Addis Ababa, 9 August 2018) <http://addisstandard.com/economic-commentary-punitive-import-tax-on-cars-deprive-ethiopians-a-driving-seat-undeservedly-and-hurt-the-country/> accessed 12 March 2019. See also 'Normalising owning a car in Ethiopia' *Fortune* (Addis Ababa 6 Dec 2016); 'Even old cars are expensive in Ethiopia' (VOA 20 March 2015); 'Tax regulations hamper car acquisition in Ethiopia' *Channels Tv* (24 March 2015); 'Prices of second hand cars race ahead' *Fortune* (Addis Ababa 16 March 16 2019.

high revenue from cars and made them a luxury product affordable only for the wealthier classes. Some commentators were also obsessed with the lax car tax in neighbouring Kenya (averaging 47%) that has resulted in cars being half the price that they were in Ethiopia.[15] However, as the initial price has always been the single most determinant factor for car ownership in Ethiopia, any inadvertent decrease in the tax rate would, all things being equal, harm the environment.[16]

The classification of vehicles even for tax purposes was not free from controversy due to thin lines separating different categories and newly emerging features of cars. For instance, a half van (dual-purpose vehicle) with more than an 1800 cc engine was categorised as a light-truck and exempted from excise and surtaxes. However, in 2014, the revenue authority's decision to categorise it as a passenger car and subject it to 100% excise and 10% surtaxes created outrage among importers.[17] Furthermore, cars with less than ten seats but used for public transport (taxi) were subject to the same tax rate as private cars. These are examples that the tax system needed revision to suit to changing contexts such as new car designs and definitions of pollution that excise taxes were meant to rectify.

Another option available to incentivise low emission cars was the benefits provided in the environmental impact assessment (EIA) and environmental pollution control (EPC) laws for environmentally sound technologies but has never been invoked in the transport sector.[18] Article 10 of the EPC Proclamation specifically calls for customs duty exemption for the importation of pollution control equipment and enactment of detailed regulations to determine other incentive packages for fostering clean methods. Likewise, Article 16 of the EIA Proclamation required environmental agencies to provide 'financial and technical support to cover additional costs' of environmental rehabilitation, pollution prevention or clean-up efforts. However, neither the much expected economic incentive regulation nor the financial supports pledged have come to fruition in this sector.[19] Even then, it is

[15] Ayele Gelan, 'Punitive import tax on cars' (2018) (n 14).

[16] Ibid.

[17] Jemal Abdu, 'New code interpretation driving up tax on vans' *Fortune* (Addis Ababa 27 July 2014 <https://addisfortune.net/articles/new-code-interpretation-driving-up-tax-on-vans/> accessed 30 March 2019.

[18] Environmental Impact Assessment (EIA) Proclamation No 299/2002; Pollution Control Proclamation No 300/2002, Art 10.

[19] Interview with an official in the Ministry of Transport (MoT) (MoT-01) (Addis Ababa, Ethiopia 22 July 2019).

uncertain whether these stipulations could be extended to include incentives for the production or importation of greener goods based on their environmental impact (e.g. carbon emissions level). In the short-term, instead of enacting a separate environmental tax law, authorities could adopt a liberal interpretation of these provisions and issue the regulation/directive to encourage clean products (e.g. zero-emitting cars) that substitute high emitting ones. However, the definition of 'clean technology' requires careful benchmarking, continuous update and rigorous review of global and local trends.

### *6.1.2 Recent tax reform*

Authorities led by the finance and revenue ministers have revised the obsolete customs duty and excise tax laws that redefined vehicle taxes and duties in 2019.[20] Public pressure and other policy objectives such as the need to incentivise local producers and climate change have forced the government to reconsider the tax classification and rates applied to vehicles. Although the car tax system needed a complete overhaul and a comprehensive framework rather than a quick fix on excise tax alone, the changes made in the customs duty and excise tax have considered environmental conditions.

*Table 6.2 New Tariff classification and custom duty on new cars (2019)*

| **Cylinder Capacity** | **Propulsion type** | **Customs Duty based on New or used (%)** | | | |
|---|---|---|---|---|---|
| | | CKD | SKD | New (CBU) | Used (>1yrs) |
| Vehicles that transport ≤10 persons | ICE | 5 | 10 | 30 | 35 |
| | HEV/PHEV | 5 | 10 | 20 | 35 |
| | BEV | Free | 5 | 10 | 20 |
| Others | | 5 | 10 | 30 | 35 |
| Light trucks of ≤ 5 tonnes of weight & transport | <1500 kg | 5 | 10 | 30 | 35 |
| | >1500 kg | Free | 5 | 10 | 10 |

Source: Customised from 'Customs Tariff Amendment No. 8' (2019)

*Table 6.3 Excise tax on new cars (2020)*

| **Cylinder Capacity** | **Propulsion type** | **Excise Tax on New Cars (%)** | | | **Other Taxes (%)** | | | **Excise Tax on Used Cars (> 1 year)** |
|---|---|---|---|---|---|---|---|---|
| | | CKD | SKD | New (CBU) | VAT | Surtax | Withholding Tax | |
| ≤ 1300 | ICE | 5 | 5 | 5 | 15 | 10 | 3 | 55-405 |
| | HEV/PHEV | 5 | 5 | 5 | | | | 55-405 |
| 1301-1500 | ICE | 60 | 60 | 60 | 15 | 10 | 3 | 110-460 |

[20] Interview with an official in the Ministry of Finance and Economic Cooperation (MoFEC) (MOFEC-02) (Addis Ababa, Ethiopia 17 August 2019); Interview with an official at ECC (ECC-01) (2019).

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | HEV/PHEV | 60 | 60 | 60 | | | | 110-460 |
| 1501-1800 | Gasoline | 60 | 60 | 60 | 15 | 10 | 3 | 110-460 |
| | Diesel | 100 | 100 | 100 | 15 | 10 | 3 | 150-500 |
| | HEV/PHEV | 60 | 60 | 60 | | | | 110-460 |
| > 1800 | ICE | 100 | 100 | 100 | 15 | 10 | 3 | 150-500 |
| | HEV/PHEV | 100 | 100 | 100 | | | | 150-500 |
| Battery Electric Vehicle | | - | - | - | | | | 50-400 |
| Others | | 30 | 30 | 30 | 15 | 10 | 3 | 80-430 |
| Light trucks ( ≤ 5 tonnes) | | - | - | - | 15 | - | 3 | 100-400 |

Source: Taken from Excise Tax Proclamation No 1186/2020

Compared with the excise tax, the customs law has brought little change in the new ICE cars category. Likewise, in the excise tax law, many of the foundations of the previous tax system such as the cumulative nature of the tax, tax rate based on engine power and utility remained unchanged. However, important changes have come that contribute to the environmental pollution abatement efforts - carbon mitigation and local air pollution alike. The new system created different categories of cars for tax purpose - car kits (CKD/SKD), new cars (including used cars of less than a year old), used cars, hybrid-electric vehicles (HEV), plug-in hybrid -electric vehicles (PHEV) and battery electric vehicles (BEV).

The revision on both customs duties and excise tax were primarily motivated by revenue, and environmental concerns were only secondary to it. Hence, fuel efficiency and carbon emission levels of cars were not used as parameters to set the tax rate. Instead, the new law used the proxy indicators of engine size, propulsion/combustion type (ICE or EVs, diesel vs gasoline) and production year to determine the environmental impacts of cars. On this ground, the revision was a missed opportunity for greater use of fiscal instruments to achieve environmental objectives. In the determination of tax rate, in addition to engine power and utility, consideration should have been made on cars' carbon emissions and fuel efficiency. Carbon emission and fuel consumption-based tax could have allowed the integration of other mitigation instruments such as labelling, emission standards, inspection and roadworthiness test and scrappage scheme in the fight against climate change. Thus, it would have pushed transport and environmental authorities to enact fuel-efficiency and carbon emission standards and stimulate emission sensitivity in the car market.

Differentiated tax on diesel and gasoline cars is controversial. Although diesel cars emit less carbon per kilometre than gasoline cars of the same engine power, diesel cars are generally larger in size and heavier in engine power, which off-sets the gains. This was observed in Ethiopia as well where the average emission of diesel LDV was found to be 245 gCO2/km, while petrol LDV emitted 173 gCO2/km.[21] Furthermore, diesel cars emit higher particulates and other pollutants that deteriorate the local air condition and affect public health conditions.[22] Although it has not been reflected across all categories of cars, the new tax law rightly subjected diesel cars of 1500 to 1800 CC to higher tax rate (100%) than gasoline cars (60%) of its equivalent. This is a significant change in understanding and Ethiopia's commitment to avoid dieselification that has a long-term impact on climate mitigation and local air quality.

The new tax also subjected lower engine and smaller cars (less than 1300 CC) to only 5% of excise compared with 30% before, and 60% or more on other larger size cars. This will inevitably send a clear message to the market that smaller, fuel-efficient and less carbon-emitting cars are favoured over used and heavier cars. Although early to predict, Japanese and European small and micro cars which are already available in the market in a few numbers will get a higher market share in the future. Likewise, as the prices of these smaller size cars will still be higher than the previous price of used cars, the tax system will not by itself trigger higher demand for cars. Instead, it will shrink the previous market share of used cars in favour of new smaller size cars. Hence, the new excise tax has improved the loopholes of the previous law but has not fully embraced the features of environmental instruments.

Another important issue is whether a separate environmental (carbon) tax could have been possible to fully internalise environmental costs including carbon emissions in selected products like cars. Theoretically, the environmental tax would solve many of the loopholes but is complicated by the current governance system and speed of policy reforms. Under the Ethiopian federal setup, tax bases and power of taxation are divided between federal and regional governments by the constitution.[23] In the event of new or undesignated tax bases, the joint session of House of Peoples Representatives (HPR) and House of

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[21] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 9).

[22] Michal Krzyzanowski, Birgit Kuna-Dibbert and Jürgen Schneider (eds), *Health effects of transport-related air pollution*, (World Health Organization, Copenhagen Denmark 2005) <www.euro.who.int/__data/assets/pdf_file/0006/74715/E86650.pdf > accessed 23 July 2020.

[23] Ethiopian Constitution Proclamation No 1/1995, Art 96-100.

Federations (HoF) will by two-third majority determine which governments' power it should be.[24] Fitiwi argued that an environmental (green) tax falls in the undesignated tax categories which would prompt heated debate in the houses.[25] On the logic of this thesis, the country needs to enact an environmental tax system but this would be a long- to a mid-term solution given the complex and broad nature of environmental pollution. Hence, environmental costs of cars could be internalised by reforming the existing tax legislation without the need to wait for a separate green tax system.

Some scholars also suggested vehicle annual circulation tax (ACT) instead of ownership (registration) tax.[26] However, ACT will not fit into Ethiopia's current situation for many reasons. Primarily, 'consumer myopia' or 'near-sightedness' would increase acquisition of more cars in ACT rather than in an ownership tax compromising its climate mitigation potential.[27] Secondly, revenue collected from the tax will shrink and is certainty prejudicial in the short-term, and the government does not seem willing to compromise on that. Finally, enforcement certainty and administration costs of ACT will soar leading to tax evasion.

Finally, it is worth noting that ownership tax can only influence the purchasing decision of commuters and not car use decisions after purchase.[28] Hence, it should be implemented along with instruments that regulate vehicle use and circulation such as fuel quality and pricing, use restriction (sections below) and scrappage schemes (Chapter 5).

## 6.2 Fuel Tax

### *6.2.1 Determinants of fuel price*

It is generally understood that an increase in fuel price induced by tax deters the acquisition of cars and reduces distances travelled.[29] Before discussing the possibility of a carbon tax

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[24] Ibid Art 99.

[25] Fitiwi, 'The need for environmental tax in Ethiopia' (2014) (n 5).

[26] EC, 'Proposal for a Council Directive on passenger car related taxes' COM (2005) 261 final; Lisa Ryan, Susana Ferreira and Frank Convery, 'The impact of fiscal and other measures on new passenger car sales and CO2 emissions intensity: Evidence from Europe' (2009) 31 Energy Economics 365–374.

[27] See the discussion on Chap 4 above on vehicle tax.

[28] Dineen, Ryan and Ó Gallachóir, 'Vehicle tax policies in EU member states' (2018) (n 8) 399; Gerlagh and others, 'Fiscal policy and CO2 emissions in the EU' (2018) (n 8).

[29] Thomas Sterner, 'Fuel taxes: An important instrument for climate policy' (2007) 35 Energy Policy 3194; Amy Lawton, 'Green taxation theory in practice: The 2012 reform of the carbon reduction commitment' (2016) 18(2) Environmental Law Review 126.

on fuel, it is important to see how the quality and price of fuel is determined in the Ethiopian market. To that end, interviews have been conducted, with key actors, aimed at clarifying this. A minimum fuel quality standards are initially set by the Ethiopia Standard Authority (ESA). Then, Ethiopian Petroleum Supply Enterprise (EPSE), the sole importer of fuel to Ethiopia, sets its specification based on ESA's standards.[30]

Fuel specifications obtained from EPSE indicated that although they are unleaded, they have high sulphur content, i.e. 500 ppm for gasoline and diesel – an improvement from 1000 to 5000 ppm reported in 2012.[31] Experts stated the improvement from 1000 to 500 ppm was essentially influenced by the global market and suppliers inability to supply a lower quality of fuel rather than Ethiopia's own proactive specification.[32] For instance, they claim that one of Ethiopia's reliable suppliers (Kuwait Petroleum Corporation (KPC)) has given EPSE a notice to upgrade the specification to 50 ppm sulphur to align with company's corporate standards.[33] The government is yet to decide whether to switch the supplier or pay the increased price for the improved fuel to the Kuwaiti supplier. If it chooses the latter, it will be forced either to subsidise or increase the pumping price – the scenario it tried to avoid. Fuel specification has an impact on price and the authorities are reluctant to tighten up the specification.[34] Responents also indicated that environmental factors are the least weighted factors in determining fuel specification and price in Ethiopia.[35]

Fuel has been subsidised by the government for many years in Ethiopia. The pumping price is determined on a monthly or bimonthly basis by the Ministry of Trade and Industry (MoTI) in consultation with sectoral offices like finance ministry.[36] Although the details are kept confidential, respondents mention that both market and non-market factors are used to

[30] Interview with an official at Ethiopian Petroleum Supply Enterprise (EPSE) (EPSE-01) (Addis Ababa, Ethiopia 30 July 2019); Interview with an official at Federal Transport Authority (FTA-01) (Addis Ababa, Ethiopia 8 August 2019).

[31] Ibid; AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 9) 99. Officials in FTA allege that Ethiopian law, although did not specify to which law they are referring to, put the sulphur requirement to 5000 ppm for diesel and 2000 ppm for petrol, and only suppliers have pushed it down to 500 ppm. Yet experts in EPSE told me that Ethiopian specifications are set at 500 ppm since few years back.

[32] Interview with an official at EPSE (EPSE-01) (2019); Interview with an official at FTA (FTA-01) (2019).

[33] Ibid.

[34] Ibid; AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 9) 102.

[35] Interview with an official at EPSE (EPSE-01) (2019); Interview with an official at FTA (FTA-01) (2019).

[36] Ethiopian Petroleum Supply Enterprise Establishment Council of Ministers Regulation No 265/2012; Interview with an expert at Ministry of Trade and Industry (MoTI) (MoTI-01) (Addis Ababa, Ethiopia 12 July 2019).

determine the pumping prices. These include international market price, political and social situations of the country such as political stability and public opinion, costs of other basic commodities (sugar, wheat flour, cooking oil etc), burden on the community and government's capacity to subsidise.[37] Hence, fuel price is highly regulated by government decision and fluctuation is kept to the minimum.[38] The cost of such stabilisation is covered by the Fuel Price Stabilisation Fund that sources its budget from international donations, government support and profit generated from fuel sales.[39]

Out of the 160 Nationally Determined Contributions (NDCs) submitted to UNFCCC, Ethiopia is one of the seven countries that have proposed fuel subsidy reductions.[40] It indeed claimed to have removed fuel subsidy in October 2008 claiming other priorities of public expenditure, a deficit in the balance of payment and the need to design alternative public transport systems.[41] It has also joined the Friends of Fossil Fuel Subsidy Reform groups to advocate for the removal of fossil fuel subsidy.[42] Despite the government's claim that it has stopped fuel subsidy, respondents close to the system and how fuel price is regulated reveals otherwise.[43] Thus, as long as the pumping price is artificially set by the government, levying a carbon tax on fuel would not be feasible.

### *6.2.2 Incidence of fuel tax*

Fuel taxes were originally levied for generating revenue but were later used as an environmental instrument globally.[44] As note above, an increase in fuel price induced by

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[37] Interview with an expert at MoTI (MoTI-01) (2019).

[38] Ibid; Masami Kojima, 'Fossil Fuel Subsidy and Pricing Policies Recent Developing Country Experience' (World Bank Policy Research WP7531 January 2016).

[39] Fuel Price Stabilization Fund Establishment Proclamation No 247/2001. Yet there were also times when the authorities generated revenue from fuel sales by keeping the local pumping price well above the global average during the prolonged fuel price collapse of 2015-17. Fuel Price Stabilization Fund has contributed about 12.5 billion Birr ($0.6 billion) and 10.18 billion Birr ($0.5 billion) to 2015/16 and 2016/17 budget of the country, respectively. Yonas Abiye, 'Government to absorb fuel prices change due to devaluation' *Ethiopian Reporter* (Addis Ababa 28 October 2017) <www.thereporterethiopia.com/index.php/article/fuel-prices-track-international-indices> accessed 20 February 2019.

[40] Sudhir Gota and others, 'Nationally-Determined Contributions (NDCs) offer opportunities for ambitious action on transport and climate change' (Partnership on Sustainable Low Carbon Transport October 2016) 17 <www.ppmc-transport.org/wp-content/uploads/2015/06/NDCs-Offer-Opportunities-for-Ambitious-Action-Updated-October-2016.pdf> accessed 27 May 2020.

[41] Council of Ministry Regulation Decision on October 3, 2008; EPCC, *First Assessment Report - An assessment of Ethiopia's policy and institutional frameworks for addressing climate change* (Ethiopian Panel on Climate Change, Ethiopian Academy of Sciences, Addis Ababa 2015) 27.

[42] Friends of Fossil Fuel Subsidy Reform (FFFSR) <http://fffsr.org/about/> 02 June 2018.

[43] Interview with an official at EPSE (EPSE-01) (2019); Interview with an expert at MoTI (MoTI-01) (2019).

[44] Ryan, Ferreira and Convery, 'The impact of fiscal and other measures' (2009) (n 26).

tax deters the future acquisition of cars and reduces distances travelled by cars. Yet the debate over the regressive or progressive nature of fuel tax in low-income countries is contentious. Some economists argue that fuel tax is progressive and pro-poor in Ethiopia. Mekonnen and others asserted that the burden of fuel tax rests on high spending social groups.[45] However, it also found that fuel tax is 'less progressive for public transport than for private transport.'[46] Likewise, in their other work, they stated that high-income groups spend the largest share of their income on transport fuel and fuel tax has a greater burden on high-income groups and urban dwellers than others.[47] However, these studies do not consider indirect effects of fuel tax on other goods apart from transport, which is likely to be higher. Perhaps, any economic analysis of the incidence of fuel tax would be incomplete unless it considers its indirect impact on goods and services, and how the business would respond to it.

As a land-locked country, Ethiopia depends on road transport for many of its transportation needs – goods and passengers. The impact of fuel tax should be assessed together with its impact on basic goods and services that the poor are dependent on. As seen in India and Costa Rica, the impact of fuel tax will have far-reaching impacts on the price of basic goods and services.[48] Fuel price is the single most determinant of transport fares. For instance, the Ministry of Transport adjusts the fare for passenger transport simultaneous with the announcement of the pumping price. Hence, it is essential to include the impact of fuel tax on non-transport goods and services to determine its incidence on low-income societies.

Ethiopia's experience also shows that businesses are sensitive to the fuel price for several reasons. Very weak consumer protection laws and enforcement loopholes have left businesses to fix prices contingent on factors like currency exchange rate and fuel price. Often every round of fuel price adjustment is followed by a matching or higher rise in the

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[45] Alemu Mekonnen, Rahel Deribe and Liyousew Gebremedhin, 'Distributional consequences of fuel taxes in Ethiopia' in Thomas Sterner (ed) *Fuel Taxes and the Poor: The Distributional Effects of Gasoline Taxation and Their Implications for Climate Policy* (Routledge 2011).

[46] Ibid.

[47] Alemu Mekonnen, Rahel Deribe and Liyousew Gebremedhin, 'Fossil fuel and food tax incidence in Ethiopia' (2013) 29(2) Eastern Africa Social Science Research Review 1, 13-14.

[48] Allen Blackman, Rebecca Osakwe and Francisco Alpizar, 'Fuel tax incidence in developing countries: The case of Costa Rica' (2010) 38 Energy Policy 2208; Thomas Sterner, 'Distributional effects of taxing transport fuel' (2012) 41 Energy Policy 75; Randy Chugh and Maureen Cropper, 'The welfare effects of fuel conservation policies in a dual-fuel car market: Evidence from India' (2017) 86 Journal of Environmental Economics and Management 244.

price of goods and services. It was also claimed that the fuel price volatility had contributed to past inflation incidents especially after the removal of direct fuel subsidy.[49] Expectedly, many interviewed officials and experts in Ethiopia opposed additional fuel tax for fear that it will trigger inflation and affect the poor.[50] A marketing expert at MoTI warned that:

> Instability in fuel price triggers price hikes in basic services and products such as housing, agricultural and industrial products. Hence, fear of political instability and public dissatisfaction forced the government to control fuel prices rather than leave it for the market to determine it.[51]

Mekonnen and others finding that public transport is less progressive than private transport calls for distinct intervention on private and public transport which fuel tax cannot do.[52] But they recommended levying higher tax on gasoline than diesel as the latter is often used in public transport.[53] Diesel is already a little cheaper than gasoline in Ethiopia partly due to tax exemptions (e.g. excise) and a lower rate of tax applied to it.[54] Unlike other imports, petroleum products are generally exempted from many taxes including the surtax and excise tax (diesel only) but subject to VAT, municipality tax and road fund charges.[55] Such preferential treatment for diesel is considered to be pro-poor assuming that most trucks, buses, off-road machines and off-grid generators are run by diesel fuel while private cars use gasoline. Hence, a reduced tax rate on diesel than gasoline might help to appease public outrage. Likewise, theoretically, diesel fuel performs better than gasoline in per mileage travelled basis and relatively favoured in climate change terms.

But any favourable treatment of diesel over gasoline is likely to have rebound effects both on carbon emissions and discharges of other environmental pollutants. Contrary to past assumptions, cars in Ethiopia have increasingly become diesel-powered and larger in size.[56]

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[49] Dick Durevall, Josef L. Loening and Yohannes Ayalew Birru, 'Inflation dynamics and food prices in Ethiopia' (2013) 104 Journal of Development Economics 98, 104; Temesgen Tezera Biresaw, 'Determinant and Impacts of Dynamic Inflation in Ethiopia' (Master Thesis Norwegian University of Life Science 2013) 31.

[50] Interview with an expert in FTA (FTA-02) (Addis Ababa, Ethiopia 25 July 2019); Interview with an official at EPSE (EPSE-01) (2019); Interview with an expert at MoTI (MoTI-01) (2019).

[51] Interview with an expert at MoTI (MoTI-01) (2019).

[52] Mekonnen and others, 'Fossil fuel and food tax incidence in Ethiopia' (2013) (n 47) 14.

[53] Ibid 20.

[54] Excise Tax (Amendment) Proclamation No 570/2008, Art 3; Excise tax proclamation 1186/2020; Import Surtax Council of Ministers Regulations No 133/2007; Interview with an expert at MoTI (MoTI-01) (2019); Mekonnen and others, 'Fossil fuel and food tax incidence in Ethiopia' (2013) (n 47) 5.

[55] Mekonnen and others, 'Fossil fuel and food tax incidence in Ethiopia' (2013) (n 47) 3; Interview with an expert at MoTI (MoTI-01) (2019).

[56] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 9).

Furthermore, the local health impact of tailpipe air pollutants from diesel fuels including NOx, SOx, CO, particulates etc are significant.[57] Even if the air quality of Addis Ababa is still within WHO limits, dieselification of the fleet and high sulphur content in the fuel have forced air quality to deteriorate.[58] On these grounds, some high-income countries (e.g. the US and the UK) have moved away from favouring diesel to imposing higher tax on diesel and make it more expensive than gasoline.[59]

The basic purpose of fuel tax is to prompt cuts on distance travelled or limit private car ownership to the minimum, encourage the purchase of fuel-efficient technologies, and internalise the environmental and social cost of driving.[60] Fuel tax is also chosen for its simplicity of administration and sensitisation of climate actions. In the Ethiopian context, the objective of deterring the acquisition of new cars and distance travelled could be best achieved by other instruments like ownership taxes or mileage tax rather than a generic fuel tax. Improving the quality of fuel, notably decreasing the sulphur content, and removing indirect subsidy should get priority over fuel tax to improve the environmental condition and vehicle performance.[61]

Equally, political support for fuel tax is hard to get in many countries. The 'yellow vest protest' in France was initially prompted by the government's fuel tax hike but was able to garner wider social support including from labour unions. In 2008 the Chilean government was forced to reduce a fuel tax that was in force since 1986 due to the rise in the global fuel

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[57] Sandro Steiner and others, 'Diesel exhaust: current knowledge of adverse effects and underlying cellular mechanisms' (2016) 90(7) Archives of Toxicology 1541.

[58] Abera Kume and others, 'Magnitude and variation of traffic air pollution as measured by CO in the City of Addis Ababa, Ethiopia' (2010) 24(3) Ethiopian Journal of Health Development 156; Worku Tefera and others, 'Indoor and Outdoor Air Pollution- related Health Problem in Ethiopia: Review of Related Literature' (2016) 30(1) Ethiop J Health Dev. 5. See also Mekonnen Maschal Tarekegn and Tigist Yohannes Gulilat, 'Trends of Ambient Air Pollution and the Corresponding Respiratory Diseases in Addis Ababa' (2018) 2(1) Clin Pharmacol Toxicol Jour 5.

[59] Global Petrol Prices, <https://www.globalpetrolprices.com/> accessed 26 March 2019. See also Eugenio J Miravete María, J Moral and Jeff Thurk, ' Fuel taxation, emissions policy, and competitive advantage in the diffusion of European diesel automobiles' (2018) 49(3) RAND Journal of Economics 504; Danuše Nerudová and others, 'Sustainability-oriented Future EU Funding: Fuel taxation as future EU own resource' (FairTax WP-Series No 21, Nov 2018). Although it has become controversial, on the average the European tax favours diesel over petrol (€0.440 and €0.551 in 2014 for EU28).

[60] Sterner, 'Fuel taxes' (2007) (n 29); Govinda Timilsina and Hari Dulal, 'Fiscal Policy Instruments for Reducing Congestion and Atmospheric Emissions in the Transport Sector: A Review' (World Bank 2008); Sterner, 'Distributional effects of taxing transport fuel' (2012) (n 48).

[61] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 9) 10.

price.[62] Although the rise in fuel price has nothing to do with the fuel tax and economists suggest its progressive nature, the Congress and other political actors attacked the fuel tax claiming that it has stifled the poor and middle classes. We have also witnessed incidents where fuel subsidy cuts, rise in the fuel price or public transport costs have pushed masses to streets and then demanded other political reforms including regime change.[63] Thus, fuel tax reform requires considering the wider political economy and social dynamics in addition to its long term environmental and economic benefits. Any proposal for fuel tax has to face the inevitable hurdle of overcoming political resistance.

In summary, in the absence of robust evidence to show its impact on the poor and complementary instrument to adjust its trade-offs, fuel tax would likely inflict harm rather than justice in the short-term.[64] Furthermore, timing is key for introducing new climate instruments where their rejection and undesired consequences now might block their acceptability in the future even when circumstances favour their reintroduction.[65] Hence, a feasible sequential approach of improving fuel quality and scrapping the subsidy, which will ultimately rise its price, should come before attempting to levy fuel tax.[66]

## 6.3 Fuel Economy and Carbon Emissions Standards

### *6.3.1 Benefits of standards*

Fuel economy and emission standards are globally in use both in the developed and emerging economies inducing adjustments in the composition of sales and efficiency of individual cars.[67] The Ethiopian government promised to adopt fuel economy standard

[62] Claudio Agostini and Johanna Jiménez, ‘The distributional incidence of the gasoline tax in Chile’ (2015) 85 Energy Policy 243.

[63] Tom Moerenhout, Nikos Vezanis and Chris Westling, ‘Navigating political hurricanes in the MENA Region: Energy pricing reform in a context of changing social contracts’ (Columbia University Centre on Global Energy Policy April 2017) <https://energypolicy.columbia.edu/sites/default/files/Navigating_Political_Hurricanes_MENA_Energy_Pricing_Reform_Context_Changing_Social_Contracts_April17.pdf> accessed 13 November 2019.

[64] Mekonnen and others, ‘Fossil fuel and food tax incidence in Ethiopia’ (2013) (n 47) 5.

[65] For instance, Greater Manchester’s rejection of congestion charge in 2008 buried the possibility of introducing it anytime soon. Ziyuan Gu and others, ‘Congestion pricing practices and public acceptance: A review of evidence’ (2018) 6(1) Case Studies on Transport Policy 94.

[66] Interview with an official at EPSE (EPSE-01) (2019); Interview with an official at FTA (FTA-01) (2019).

[67] Thomas Klier and Joshua Linn, ‘The effect of vehicle fuel economy standards on technology adoption’ (2016) 133 Journal of Public Economics 41; Seung-Pyo Jun, Hyoung Sun and YooJi-Hui Kim, ‘A study on the effects of the CAFE standard on consumers’ (2016) 91 Energy Policy 148.

(FES) since the early inception of its climate strategies in 2010, but nothing has come yet.[68] As a result, Ethiopia has not benefited from the fuel economy improvements observed in other jurisdictions.[69] According to a 2012 study, the average fuel economy of newly registered LDV was estimated to be around 7.9 L/100Km with corresponding CO2 emissions of 212 gCO2/Km.[70] It had shown only a slight improvement on both parameters from the previous years - in 2005 and 2008, fuel economy were 8.4 L/100Km with corresponding CO2 emissions of 217 and 221 gCO2/km respectively.[71] The study also found that on average diesel LDV tend to be larger in size (like SUVs, station wagons, pick-ups and vans) and emit more CO2 per kilometre (245 CO2 gm/Km) than petrol engines (175 CO2 gm/Km).[72]

As a latecomer both to the standards and car production, Ethiopia has few advantages to benefit from. Primarily, countries from which Ethiopia principally imports cars (Japan, the EU, China, Korea and India) have adopted FES.[73] That opens the door for Ethiopia to adopt FES without adversely affecting the importation of cars. The exact standard could be set by considering the standards in these countries, global market experience, technology innovation, car price and national environmental goals. Secondly, local car producers often function with some sort of partnership (subsidiary, joint venture or in technology exchange agreement) with foreign-based auto manufactures.[74] Thus, as the parental companies operate in FES enforcing markets and are used to meeting stringent FES requirements, subjecting local producers to FES will not affect their competitiveness and production system. Instead, it will accelerate technology diffusion and boost the competitiveness of locally produced cars over used imported cars. In this respect, a deputy manager in one of the local assembly companies claimed that:

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[68] Ethiopia, *Climate-Resilient Green Economy (CRGE) strategy*, (MOFEC and EPA Addis Ababa September 2011) 26.

[69] Klier and Linn, 'The effect of vehicle fuel economy standards' (2016) (n 67).

[70] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 9). See also Chap 5.

[71] ibid 51.

[72] ibid 89.

[73] Felix Creutzig and others, 'Climate policies for road transporter visited (I): Evaluation of the current framework' (2011) 39 Energy Policy 2396.

[74] Interview with an official in MoTI (MoTI-02) (2019); Interview with Deputy Manager for Sales in car importing and assembly company (CI-03) (2019). The biggest local producers are tied with global auto manufactures. E.g. Belayab with KIA (South Korea), Marathon Motor with Hyundai (South Korea), Mesfin Industry Engineering with Geely (China) and Peugoet (France), YANGFAN-Lifan with Lifan (China), Nyala Motors with Nissan (Japan), and MOENCO with Toyota (Japan).

> Global competition and stringent standards have pushed our parental companies to adopt the latest technologies which are fuel-efficient and cleaner. We import cars which have met those stringent standards. They are doing it for their own global competitiveness and not because we required them to do so.[75]

However emission levels of these cars are not locally measured yet as companies are not required to do nor do the authorities try to test it.[76]

It is, however, vital to comprehend the limitation of the standard and tailor it to local needs. For instance, reducing the number of vehicles on the road and distance travelled can hardly be achieved through FES and carbon emissions standards. Likewise, such standards are not effective in regulating existing vehicle stocks but nicely suit a mid to long term environmental objectives. Hence, even in the presence of standards, the country still needs complementary instruments for the immediate future and to regulate existing fleets. It is also vital to draw the full implications from the fact, mentioned throughout the thesis, that Ethiopia is a car importing country with little domestic production and accounting for a very small share of the global car market. Given this, interventions should principally, at least for the time being, target importers and local producers rather than foreign companies that operate beyond the Ethiopian jurisdiction. That eases the administrative burden and reduces the cost of executing the standards.

Ethiopia could also adopt a step-by-step approach as seen in the EU and the US (Chap 4). This does not, however, mean starting with voluntary agreements (VAs) but rather with less stringent binding standards. VA with the industry has not worked in the EU and are not recommended for Ethiopia either for many reasons.[77] The absence of voluntary reporting culture, weak industrial association, weak involvement of civil societies in governance and environmental matters, undeveloped corporate transparency and accountability regimes etc would make VAs hard to envisage in Ethiopia.[78] However, a ratchet step-by-step FES with a targeted plan of five to ten years will give enough time for the government to build its monitoring and enforcement capacity, foster market certainty and send a clear message

[75] Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (2019).

[76] Interview with an official in MoTI (MoTI-02) (2019); Interview with an expert in FTA (FTA-02) (2019).

[77] Patrick ten Brink, 'Mitigating CO2 Emissions from cars in the EU (Regulation (EC) No 443/2009)' in Sebastian Oberthur and Sebastian Oberthür (eds) *The new climate policies of the European Union: Internal legislation and climate diplomacy* (VUB University Press 2010).

[78] See Janathan Golub (ed), *New Instruments for Environmental Policy in EU* (Routledge 1998) 14 & chap 8.

to industrial actors to adjust their business and behaviour. In this respect, the regulatory regime will benefit from robust discussion with industry representatives early in the designing process.[79]

Currently, the authorities have prioritised regulating the importation of used vehicle and have shown little enthusiasm to formulate FES and carbon emission standards.[80] However, there are many benefits of adopting the standards now rather than later, and could be complemented with other flexible instruments to induce behavioural change.

### *6.3.2 Flexible and integrated regulation – feebates and rebates*

Although standards are categorised as direct regulation, they could be designed as a flexible instrument and tied with incentive schemes.[81] For instance, standards could be complemented with carbon labelling that will enable buyers and authorities to make informed decisions.[82] Such labelling could be certified either by a local or designated foreign laboratory that will be evidenced by a sticker to be attached in the windscreen. This has been proven to have a complementary role even in DCs like Vietnam.[83]

Moreover, as discussed in the preceding sections, car taxes and charges could be aligned with its fuel economy and emission level that will enable better performing cars to benefit from flexible tax schemes. Cars that perform better than the standards could be incentivised with rebates while others with bad performance would be subject to administrative scrutiny and feebates, and possibly to penalties as a last resort if they continue to perform beyond certain ranges. Such combination and synergy of the flexibility of fiscal instruments (tax and charge) with direct regulatory instruments could reverse the limitation of the latter, i.e. rigidity and regulating supply side alone, and attract public

[79] Interview with managers of used car import and sales companies (CI-01) (Addis Ababa, Ethiopia 27 August 2019); Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (2019). Although there is a newly established Automotive Producers Association brokered by MIDI, the vast majority of small to medium sized importers are not a member to it.

[80] Interview with an official at Federal Transport Authority (FTA) (FTA-01) (2019); Interview with an official in the MoT (MoT-01) (2019)

[81] Steven E Plotkin, 'Examining fuel economy and carbon standards for light vehicles' (OECD and International Transport Forum, DP 2007-1).

[82] Gary Haq and Martin Weiss, '$CO_2$ labelling of passenger cars in Europe: Status, challenges, and future prospects' (2016) 95 Energy Policy 324.

[83] AS Silitonga, AE Atabani and TMI Mahliaad, 'Review on fuel economy standard and label for vehicle in selected ASEAN countries' (2012) 16(3) Renewable and Sustainable Energy Reviews 1683; Stefan Bakker and others, 'Low-carbon transport policy in four ASEAN countries: Developments in Indonesia, the Philippines, Thailand and Vietnam' (2017) 9(7) Sustainability 1217.

support and ease political challenges.[84] Thus, it affects car demand and commuter behaviour as fuel inefficient and high emitting cars will be subject to additional taxes thereby increasing its price.

Within flexible standards, companies can still produce or import cars that exceed the regulatory limit as long as their average performance is within the limits, i.e. offering the flexibility to sell a mix of high and low performing cars. In effect, cars' average performance is regulated by the standards while an individual car's level is subject to taxes. Furthermore, as observed in the EU, to allow special classes of cars and small importers and producers to survive stringent regulation, exceptions and flexible schemes could be designed subject to continued review and monitoring.[85] Yet the beneficiaries of such exceptions could still be subject to taxes adjusted to fuel economy and carbon emission levels. Thus, the economic effects (both burden and benefit) of the regulation would be shared between manufacturers or importers and commuters.

The base for standards – type, weight, function, fuel – is another matter that deserves decision. Given that most imports and local assembly factories have partnerships with either Asian or European auto manufacturers, Ethiopian standards should emulate these jurisdictions. Similarly, the geophysical character of the country, the purposes for which cars are used and types of cars on the road are important parameters. Both to reap the benefits of latecomers and environmental effectiveness, encouraging small-sized cars that are common in the EU and Japan could be favoured over large-sized cars of the USA.

Standards and other environmental instruments perform better when monitoring strategies are established and capacity are enhanced. The presence of functioning car inspection will support this and accrue numerous benefits in minimising the externalities of cars including carbon emissions.

## 6.4 Vehicle Inspection

### *6.4.1 Inspecting environmental compliance?*

Vehicle inspection during registration and the vehicle's lifetime complements other climate mitigation instruments. In Ethiopia, all vehicles are required to undergo a mandatory annual

[84] Jun, Sun and Kim, 'A study on the effects of the CAFE standard on consumers' (2016) (n 67).
[85] See Chap 4 on the EU's emissions standards.

inspection either with transport authorities or certified service centres.[86] Such inspections, as per the law, should monitor the vehicle's authenticity, roadworthiness, safety, compliance with its specification and environmental standards.[87] However, it is not clear as to how environmental compliance is judged in the absence of pollution control standards, which the transport authority was mandated to initiate.[88] Certainly, if there was the environmental standard, imported cars would be checked against the standard as part of the customs clearance or at least at the time of first registration wheras locally assembled vehicles would be checked during licensing. [89] However, the laws are silent as to whether environmental compliance is a requirement during first registration and how the authorities would ensure compliance after.

Similarly, the road traffic control regulation prohibits driving any vehicle 'which is not properly maintained, discharges smoke, vapour, oil or fuel of higher amount than the appropriate level and which is likely to cause annoyance or damage to other road users or the environment.'[90] Again, in the absence of standards, it is not clear as to how traffic control officers would determine 'annoyance to the environment' and 'higher than the appropriate level'. Neither the transport nor the environmental laws have defined yet what the 'appropriate level' is.

Practically, environment-related requirements have never been part of the registration and inspection processes.[91] An assessment done by FTA expert found that only four out of 24 inspection centres measure emission level while none of them measures fuel economy.[92] Even then, the expert was suspicious of some of these emission test results which reported zero readings for carbonmonoxide.[93] It is worth noting that inspection centres are not required to measure emissions or fuel economy, and any measurements they make have no effect on the inspection result. A further look into the import certificates issued to importers by FTA, called 'Letter of criteria for imported vehicles', that describe vehicle specifications mention only physical, dimension and weight requirements and none to

[86] Vehicles Identification, Inspection and Registration Proclamation No 681/2010.
[87] Ibid, Art 29(2).
[88] Ibid, Art 7; Transport Proclamation No 468/2005.
[89] Transport Proclamation No 468/2005, Arts 7(1)(j) & 7(2)(c).
[90] Road Transport Traffic Control Council of Ministers Regulation No 208/2011, Art 10(1)(a).
[91] Interview with an official at FTA (FTA-01) (2019); Interview with an expert at FTA (FTA-02) (2019).
[92] Interview with an expert in FTA (FTA-02) (2019).
[93] Ibid.

emission level or fuel economy.[94] That is due to the absence of the long-awaited emission and fuel standards that could have been informed these import, production, registration or annual inspection manuals.[95]

Arguably, initiating environmental standards for vehicles is a shared responsibility between transport and environmental authorities. Environmental authorities are mandated to issue ambient air quality standards and would certainly overlap with the vehicle exhaust tailpipe standard.[96] Moreover, climate change mitigation initiatives are nationally coordinated under environmental authorities rather than under sectoral offices. Yet transport offices are obliged to inspect, register and monitor vehicles and their performance against set environmental standards. This might have created a positive overlap of activities between the two offices. Given the expertise required to prepare environmental standards for vehicles and being the institution that will finally execute such standards, one would expect transport authorities to play a leading role in their design. Moreover, with the current structure and priorities, the environment commission has little desire or expertise to initiate regulatory tools for transport and auto sectors.

#### *6.4.2 Mending the defective system*

In addition to the absence of environmental standards to be enforced during the inspection, the inspection system itself is accused of corruption and inefficiency.[97] The annual inspection certificate is granted for a vehicle that fulfils basic requirements as specified in the 'Annual Inspection Form'. There were allegations where car owners borrow or hire different parts of a vehicle or decorate on the day of inspection only to cover up its defects.[98] Reports also surfaced that cars that have failed the inspection in one centre were made to pass the inspection in another centre without repairing the fault.[99] Thus, the annual inspection requirement is relegated into a procedure rather than a substantive

[94] Sample Import certificate obtained from Vehicle Certification Director of the FTA, (Unpublished Addis Ababa, July 2019).
[95] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 9) 29.
[96] Pollution Control Proclamation 300/2002, Art 6.
[97] Andualem Sisay, 'Speed and corruption, a fatal mix' (2010) <https://www.globalintegrity.org/wp-content/uploads/2019/01/GIRNotebook2010_Ethiopia.pdf> accessed 16 May 2019.
[98] Interview with an expert in FTA (FTA-02) (2019).
[99] Ibid.

practice. The annual inspection system requires a complete overhaul to integrate it with safety, quality and environmental standards.

The regulatory loopholes and ill-fitted enforcement have led to the importation and prevalence of unworthy used cars on Ethiopia roads, often dubbed as death agents.[100] Moreover, technical defects of vehicles were only second to drivers' fault for the fatal traffic accidents in Ethiopia.[101] Hence, Ethiopia would benefit from the design of a tailed inspection system that starts from pre-shipment throughout the entire life of the car until its final disposal. For instance, currently, the annual inspection is mandatory for all types of cars but the frequency could be changed for new cars, e.g. every two years for new cars until they reach certain age or mileage.[102] Whereas, in addition to inspection, cars older than a certain age or millage (e.g. 12 years) should be required to a periodic mandatory service. This could be complemented by creating vehicle database where records of inspection, periodic service, accident and emission and fuel efficiency level are entered. However, it requires enhancing the regulatory capacity of FTA and inspection centres, and synergy with regional transport authorities to enhance enforcement-related gaps.[103]

In summary, the inspection system needs a new approach in three areas: law, modifying working formats (mainstreaming) and capacity building (Figure 6-1). Augmenting a viable inspection system starts with filling the legal vacuum with environmental standards that determine the allowable limit for carbon emission, exhaust emission and fuel efficiency. This will be followed by mainstreaming the standards into operational manuals, guidelines and formats. Specifically, the standards should be reflected in the import and production specification; customs clearance manual; annual and spot-check (roadside) inspection formats; and enter measurement results into vehicle's database – during first registration and subsequent inspections. Thirdly, there is a need to strengthen the structural and institutional frameworks by enhancing the capacity of FTA and inspection centres;

[100] Yilak Akloweg, Yoshitsugu Hayshi & Hirokazu Kato, 'The effect of used cars on African road traffic accidents: a case study of Addis Ababa, Ethiopia' (2011) 15(1) International Journal of Urban Sciences 61.

[101] A Persson, 'Road traffic accidents in Ethiopia: magnitude, causes and possible interventions' (2008) 15(A) Advances in Transportation Studies an international Journal 1.

[102] For instance in the EU, the first inspection is after four years and then every two years for cars but annually for commercial vehicles. Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC (Directive 2014/45/EU), Art 5.

[103] Interview with an expert in FTA (FTA-02) (2019).

monitoring testing equipment of inspection centres; and linking the inspection system with deregistration and scrapping systems.

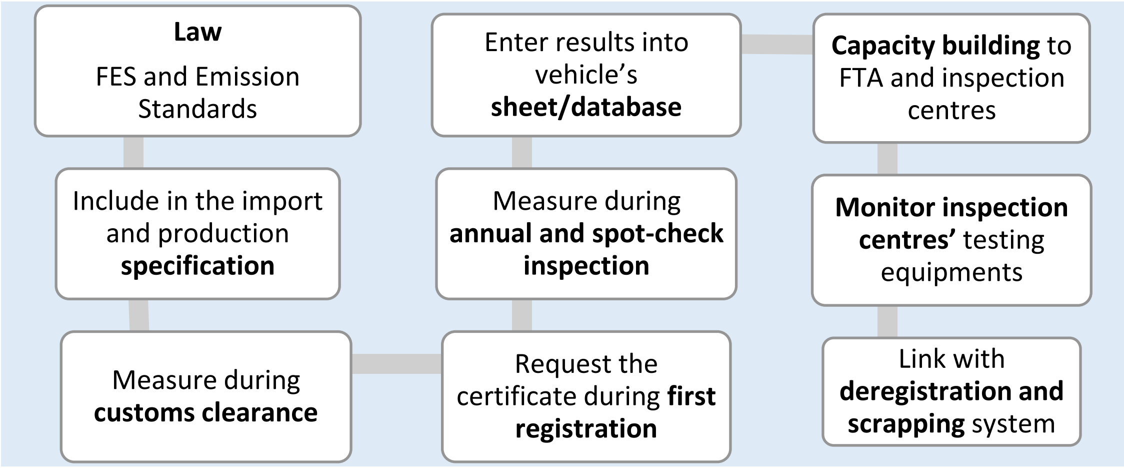


*Figure 6-1 Vehicle environmental inspection system design*

## 6.5 Vehicle Use Restrictions

### *6.5.1 Circulation restriction*

Restriction on vehicles ownership, driving or parking spaces complements other transport policies to bring about behaviour change and foster urban land use plans. Many megacities have put restrictions on driving in central areas, certain weekdays based on plate numbers, low emission zones, congestion charges, etc. These are primarily aimed at avoiding traffic congestion and improving air quality by encouraging non-motorised and public transportation and limiting the distance travelled with private cars.[104] However, the climate mitigation potential potential of such measures are not conclusive due to many reasons, including rebound effects and the inability to attribute changes to restrictions in the presence of multiple instruments executed simultaneously.[105] For instance, the perverse effect of plate-based driving restrictions (e.g. purchase of second vehicles) is well documented, especially in DCs.[106] Hence, nations are advised to select restriction instruments cautiously after a full assessment of the national situations.

[104] Justin Beaudoin and others, 'Environmental policies in the transportation sector: taxes, subsidies, mandates, restrictions, and investment' (Iowa State University WP 180122018) <https://lib.dr.iastate.edu/econ_workingpapers/54> accessed 20 March 2019.

[105] Ibid.

[106] Louis de Grange and Rodrigo Troncoso, 'Impacts of vehicle restrictions on urban transport flows: The case of Santiago, Chile' (2011) 18 Transport Policy 862–869; Wei Zhang, C.-Y. Cynthia Lin Lawell and Victoria I. Umanskaya, 'The effects of license plate-based driving restrictions on air quality: Theory and empirical evidence' (2017) 82 Journal of Environmental Economics and Management 181.

As discussed before, Ethiopia does not impose vehicle ownership or use restrictions.[107] Few restrictions have been observed in recent times but none to private cars. City administrations including Addis Ababa have recently stopped licensing three-wheeler taxis due to congestion and safety concerns.[108] Furthermore, Addis Ababa city imposed the controversial restriction on driving trucks in the city during daylight time (6 am to 8 pm) to improve traffic management.[109] The latter has received mixed responses from businesses, experts and commuters. It was condemned by businesses and truck owners whose activities were adversely affected by the restriction.[110] Whereas, residences and private car owners welcomed it as it eases traffic.[111] Both are a temporary and short-sighted solution to the growing traffic congestion and accident and were not supported with long term strategies and complementary instruments.

Although only 15% of Addis Ababa's trips are covered by private vehicles, the environmental problem and congestion created by private cars are enormous and are intensifying.[112] The only serious measure that was taken by the government so far is infrastructure expansion and restriction on trucks. Authorities argue that the low density of arterial roads compared with the high number of vehicles registered in the city has necessitated the road expansion programs.[113] Equally, it is understood that imposing wider zonal or geographic exclusion similar to other big cities such as London and Milan is difficult due to the current rate of motorisation and undependable public transport situation.[114]

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[107] Transport Proclamation No 468/2005; Vehicles Identification, Inspection and Registration Proclamation No 681/2010, Arts 4 & 5.

[108] Tesfaye Getnet, 'Bajaj in Addis to have fixed tariff based on new study' *Capital* (Addis Ababa 29 Jan 2018) <www.capitalethiopia.com/capital/bajaj-addis-fixed-tariff-based-new-study> accessed 13 March 2019

[109] Kalaeb Girma, 'Ban on heavy trucks frustrates businesses' Addis Fortune, Vol 20 No 1002, (Addis Ababa 13 Jul 2019) <https://addisfortune.com/ban-on-heavy-trucks-frustrates-businesses>; Muluken Yewondwossen, 'City truck ban affect exports' *Capital* (Addis Ababa 15 July 2019) <www.capitalethiopia.com/featured/city-truck-ban-affect-exports>; Yonas Abiye, 'Truck ban frustrates public, private operators' *Reporter* (Addis Ababa 20 July 2019) <www.thereporterethiopia.com/article/truck-ban-frustrates-public-private-operators> accessed on 15 Nov 2019.

[110] Ibid.

[111] Interview with an official at Addis Ababa Transport Management Agency (TMA) (TMA-01) (Addis Ababa, Ethiopia 8 August 2019); Interview with an expert in environmental consulting firm (EC-01) (2019).

[112] AA, 'Non-Motorised Transport Strategy 2019-2028' (Addis Ababa City Road and Transport Bureau November 2018) 4.

[113] Yonas Minalu, 'Performance evaluation of Addis Ababa City road network' (MSc thesis Addis Ababa University October 2014) 52-54.

[114] Claire Holman, Roy Harrison and Xavier Quero, 'Review of the efficacy of low emission zones to improve urban air quality in European cities' (2015) 111 Atmospheric Environment 161.

However, plans are underway to impose some sort of restriction on car use in the inner city centre. Addis Ababa City has already identified neighbourhoods to develop pedestrian priority precincts such as in Piazza and Merkato areas.[115] Ministry of Health, Addis Ababa City Government and youth associations have started a monthly campaign called 'Menged Le Sew' or 'Streets for People' (Car Free Streets) to reclaim streets from vehicles. On the last Sunday of every month, selected streets will be vehicle free and used for recreational, sporting and walking activities. It has improved peoples understanding of healthy lifestyle and garnered support from all walks of life, especially youth. This is, however, a sensitisation activity with complementary impact on other instruments rather than a standalone instrument.

### *6.5.2 Parking*

Parking restriction in public places, work areas or residences is believed to have certain impacts on car ownership, distance travelled and NMT use.[116] In addition, banning on-street and road-side parking in central areas (e.g. Merkato and Piassa) could boost road capacity, reduce congestion and encourage non-motorised mobility.[117] Parking prohibitions could be established either by law or administrative decision of a city council. Ethiopian law prohibits parking vehicles on any non-municipal roads with high traffic, on the opposite side of another parked vehicle, on a low visibility condition (50 meters), anywhere that may hinder traffic, on a pedestrian footpath, left side of a one-way road, within 12 meters of an intersection, curve and bus stop etc.[118] These are the normal traffic control rules that restrict parking so as not to obstruct traffic. Although there is a provision which states that roads in municipal areas should be left open 'as much as possible' for traffic rather than parking,[119] the language in the preceding provisions and the practice convey an opposite meaning. That is unless there is a clear prohibition by law or administrative action which often means posting signs on streets, on-street parking is allowable.[120]

[115] AA NMT Strategy (2018) (n 112) 14.

[116] Amruta Pandhe and Alan March, 'Parking availability influences on travel mode: Melbourne CBD offices' (2012) 49(2) Australian Planner 161; Zhan Guo, 'Does residential parking supply affect household car ownership? The case of New York City' (2013) 26 Journal of Transport Geography 18; Steve Melia and Ben Clark, 'What happens to travel behaviour when the right to park is removed?' (2018) 72 Transport Policy 242.

[117] AA NMT Strategy (2018) (n 112) 14.

[118] Road Transport Traffic Control Council of Ministers Regulation No 208/2011, Arts 29, 30 and 31.

[119] Ibid, Art 34(1).

[120] Interview with an official at TMA (TMA-01) (2019).

On the other hand, parking restrictions would be effective only if off-street parking is available in the vicinity to allow the accessibility of the area. The shortage of parking facilities leads to travelling extra distance and cruising in search of parking that triggers additional carbon emissions.[121] Contrary, the presence of a parking facility increases the accessibility of an area and its suitability for business and residences.[122] Hence, regulatory designs need to balance these seemingly competing interests by a mix of restrictive and fiscal instruments. The guiding principle should be that car owners should pay the price for parking and should not get priority over other uses of streets.

Designated parking areas are not common in Ethiopia. Commercial institutions often have fewer than the number of parking spaces demanded by their customers and the standard (one parking spot for every 70 m2 of commercial space, big apartment, five mid-sized apartments and ten small-sized apartments).[123] Moreover, although public or institutional building or any 12-metre high building is required to have their own parking facilities, few have observed the requirement partly due to conversion of parking to other uses and selective law enforcement by agencies.[124] This, coupled with the absence of private off-street parking forces drivers to use streets, footpaths and open public spaces (e.g. Meskel Square) for parking and create nuisance and congestion.[125] Municipalities are responsible for establishing off-street parking facilities but only recently has Addis Ababa City started constructing off-street and the multi-storey smart parking facilities (Megenagna and Merkato neighbourhoods).[126]

The Megenagna parking consists of surface off-street and smart parking facilities with a capacity of holding 180 cars at a time - 90 of them in the smart parking.[127] The multi-story smart parking facility is powered with an automated lift technology and provides easy, safe

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[121] Rachel Weinberger, 'Parking: not as bad as you think, worse than you realize' in Elizabeth Deakin (ed) *Transportation, Land Use and Environmental Planning* (Elsevier 2010), 189-205.

[122] WB, 'Ethiopia: Addis Ababa urban and metropolitan transport and land use linkages strategy review' (World Bank September 18, 2014) para 10 <http://documents.worldbank.org/curated/en/530551468252655573/pdf/ACS12347-WP-P147972-PUBLIC-Box391453B-ACS.pdf> accessed 11 Nov 2019.

[123] Ibid, para 14.

[124] Interview with an official at TMA (TMA-01) (2019); Building Proclamation No 624/2009, Art 2(8); Ministers Building Regulation No 243/2011, Arts 28(2) and 34(4).

[125] Interview with an official at TMA (TMA-01) (2019).

[126] Road Transport Traffic Control Council of Ministers Regulation No 208/2011, Art 34(2); ibid.

[127] Interview with Megenagna Parking Facility operator (TMA-02) (Addis Ababa, Ethiopia 9 August 2019).

and secure parking service. However, drivers choose surface parking over smart parking, although the latter offers better security against knocks and theft, and protection from direct sunlight and rain.[128] The operators claimed that those who have used it previously opt for the smart parking while others are afraid of trying the new technology.

Even then, as observed during data collection and reiterated by the respondents, the operation of this new facility is surrounded by many technical and systemic challenges. The absence of a skilled workforce and spare parts to repair and maintain the facility has posed an eminent operational challenge. Furthermore, in an errant electric blackout in the city, the cost of running the lift with diesel-generator is high, especially given that they charge only 6 ETB (£0.2) for the first hour and 9 ETB for each of additional hours of parking. However, the availability of on-street parking not very far from the off-street parking facility makes the smart facility less preferred for short duration parking. Hence, the facility provides service to only a maximum of 500 cars on peak days (Monday and Saturday).[129]

The city's Traffic Management Agency (TMA), which manages the facility, claimed that the smart parking facilities are only demonstrations on areas where non-stop pedestrian and vehicle movement, and land shortage have constrained traffic.[130] It further claimed that the construction (close to 100 million ETB) and maintenance cost of the smart parking is not matched by the parking fees collected.[131] The operators, on their part, claimed that they are struggling to make profits from the facility after covering running costs, paying out bills and agency fees.[132] It is understood that parking fees were set at a lower rate as a transition from free-parking to paid-parking and will be revised frequently. Hence, such facilities are not commercially viable for private developers unless supported by government initiatives through the provision of land and tax reliefs.

Even then, one questions whether such subsidised parking facilities would encourage private cars over public and active transport modes. Private parking facilities in multi-purpose buildings charge a little higher than the smart parking but are forced to compete

[128] Ibid; Field observation on 9 August 2019. On a Friday morning around 10 am, I've witnessed that the surface parking has about 50 cars compared with only 16 in the smart parking.

[129] Interview with Megenagna Parking Facility operator (TMA-02) (2019).

[130] Interview with an official at TMA (TMA-01) (2019).

[131] Ibid; Addis Ababa City Vehicle Parking Infrastructure Management Directive No 3/2019.

[132] Interview with Megenagna Parking Facility operator (TMA-02) (2019).

with free or cheap on-street parking. Thus, the city should restrict on-street parking, ban on-street parking near off-street parking, and raise the fees for the on-street parking to attract firms into the parking business. However, as reiterated in the city's parking directive and transport policy, on-street parking should be taken as a temporary solution and roads should be left to regular traffic flow.[133]

Certainly, any form of vehicle use restrictions would be challenged by the implementation cost and institutional efficiency of traffic management offices, which unfortunately is very poor. Traffic enforcement officers are often active during peak hours in the high traffic streets, not supported with digital technologies (e.g. CCTV camera) and are also accused of accepting bribes from lawbreakers.[134] Equally, self-regulation by drivers has proven to be difficult, if not impossible, as they often honour traffic regulations when enforcing officers are around and the risk of being caught is too high.[135] Hence, some of these restrictions could be costly unless balanced with enforcement capabilities and supported with technology and traffic control centre.[136]

Finally, Addis Ababa's parking directive has limited scope and defines only a few matters such as categories of parking facilities, parking fees for public parking facilities and the relationship between the agency and parking operators.[137] A comprehensive parking strategy, implementation plan and bylaws are needed to discourage on-street parking, establish off-street parking, and support private sector involvement.[138] Moreover, additional instruments that enforce market price for parking services such as council parking fee should be considered for mainstreaming the cost of public resource use.

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[133] Addis Ababa City Vehicle Parking Infrastructure Management Directive No 3/2019, Preamble; Ministry of Transport, 'Transport Policy of Addis Ababa' (Addis Ababa, Ethiopia August 2011) 4, 11, 21 and 31.

[134] Sisay, 'Speed and corruption, a fatal mix' (2010) (n 97).

[135] Wondwesen Girma Mamo and Deanna Haney, 'Attitudes and behaviors regarding traffic regulations in Addis Ababa, Ethiopia' (2014) 3(1) International Perspectives in Psychology 37; Teferi Abegaz and others, 'Effectiveness of an improved road safety policy in Ethiopia: an interrupted time series study' (2014) 14 BMC Public Health 539.

[136] Interview with an official at TMA (TMA-01) (2019).

[137] Ibid; Interview with Megenagna Parking Facility operator (TMA-02) (2019). Addis Ababa City Vehicle Parking Infrastructure Management Directive No 3/2019, Arts 8-12, 15-16, and 18-21. The troubled and awkward relationship between the agency and parking operators (SMEs) might have necessitated the directive. TMA accuses operators with many unethical behaviour and mismanagement of parking facilities while operators claim that the contract with TMA favours the agency.

[138] MoT, 'Transport Policy of Addis Ababa' (2011) 18, 20, 22, 39 and 46.

## 6.6 Conclusion

Evidence shows that Ethiopia has not done enough to transform its car regulation not only to stabilise carbon emissions but also mitigate other undesired consequences of cars. By the standard of modern complex regulatory regimes of the time, the Ethiopian system lacks a long-sighted and comprehensive strategy and tailored instruments. Besides, institutions and laws are not informed by the threats of climate change beyond a few quick-fix attempts. Hence, the preceding chapters proposed a comprehensive car regulation system that touches the different aspects of the ill-functioning system. Besides its mitigation effects, due consideration was given to the impact of policies on the broader economic, social, political and institutional set-up and its co-benefits such as reducing dependency on fossil fuels, reducing other pollutant emissions, reducing traffic accident, equitable use of public resources, enhancing modal choice and access to mobility.

We started the thesis with a promise that a comprehensive regulation is needed for Ethiopia. This starts with the understanding of the whole car regulation system - value chain and actors – and identifying and enhancing those activities which have a positive impact, and minimising those activities which harm the decarbonisation process.[139] Hence, a comprehensive assessment of the whole value chain along with the actors, barriers and opportunities within the system were made. This allowed us to identify, besides the conventional mitigation strategies, other interventions (e.g. car inspection and scrappage) that directly affect car performance and mobility but not often viewed as climate strategies. The approach is especially vital for Ethiopia that has an underdeveloped regulatory system which was outmuscled by the scale and complexity of the new challenge.

This and the preceding chapter recommended an end-to-end system and fixing the regulatory loopholes in the importation or production, during operation and final disposal of cars. This scheme requires modifying standards and working manuals, guidelines and templates that are used in the licensing production/importation, and inspecting products during customs clearance and conducting roadworthiness tests (inspection) before/after the car enters the road. Once the car starts operation, besides regular and random-spot

[139] Neil Gunningham and Peter Grabosky, *Smart Regulation: Designing Environmental Policy,* (Oxford Press 1998) chap 6; Neil Gunningham and Darren Sinclair, 'Regulatory Pluralism: Designing Policy Mixes for Environmental Protection, (1999) 21(1) Law & Policy 49.

checks, other support systems like service and maintenance requirements, fuel quality enhancement, traffic and parking regulation are key components for the efficiency of the fleet.

Such a system is regulated by a mix of complementary instruments that target different actors and both the supply and demand side of the car market. Improving the fuel specification, issuing FES and carbon emission standards, implement tailored vehicle inspection and parking and circulation restrictions are found to suit Ethiopian situation. Nevertheless, such direct regulatory instruments will not achieve and sustain broader environmental objectives unless integrated with economic instruments of vehicle tax based on carbon intensity, rebates for low emitting and high fuel-efficient cars, and price adjustment on parking fees. Carbon emission standards and FES will force automakers and importers to restrict gas guzzlers and used-cars and stimulate innovation in the low or zero-emitting cars. Whereas, ownership tax, tax rebates, labelling and inspection are vital to influencing demand behaviour tailored to climate requirements. Furthermore, the soft instruments such as car labelling and eco-driving could complement the regulation by fostering behaviour change among commuters.

On the other hand, it was found that although fuel tax will have mitigation potential, it is likely to hit the poor harder and fail to get political acceptability in Ethiopia. Similarly, a strategy of levying lower tax on diesel than petrol to support the poor should be avoided due to its rebound effects of increasing distance travel, health effects of dieselification and prevalence of large size and fuel-inefficient used diesel cars.

There are, however, other instruments mentioned in the literature but omitted from the preceding discussion for different reasons. These include low emission zone (LEZ), high-occupant vehicle (HOV) lane, road tolls (pricing), congestion charge etc.[140] These are omitted for their low emission abatement potential, suitability for the Ethiopian context or overlap with the already discussed instruments. For instance, road pricing, congestion charge and high-occupant vehicle (HOV) lane are principally imposed to ease traffic congestion rather than to limit carbon emissions. Furthermore, enforcing instruments like road pricing require good and alternative road networks that other users could take and

[140] Ethiopia, 'Ethiopia's Climate Resilient Transport Sector Strategy' (Ministry of Transport of Ethiopia, Addis Ababa, Ethiopia, *undated*) 59.

strong institutional enforcement capacity to monitor their performance, which is yet to flourish in Ethiopia.

Nevertheless, given the rate of emissions increase and its underlying causes, improving the efficiency of cars and its operations will not be enough to stabilise overall emissions from the transport sector. These regulations will only have incremental changes in the decarbonisation process, and hence additional reinforcements that harness the full mitigation potential of the sector are required. This additional potential should consider the interdependency of transport mode, explore the mitigation potentials available in the other low carbon transport modes, balance the 'Avoid, Shift and Improve' goals and embrace the leapfrogging paths in the adoption and diffusion of new technologies and modes such as electric vehicles (EVs). Hence, the following chapter discusses the strategies and instruments needed to embrace and diffuse EVs in Ethiopia, and opportunities for leapfrogging in this respect.

# Chapter 7
# Leapfrogging to Electric Cars

## Introduction

Apart from improving the internal combustion engine (ICE) car's efficiency and resulting in incremental emissions reduction, technologies are emerging for radical decarbonisation, among which is electric vehicles (EVs).[1] With a decarbonised electricity generation system, EV is an immediate solution to replace conventional car and with greater carbon abatement potential.[2] EVs also have health co-benefits of reducing local air pollutant (tailpipe) emissions and noise levels, especially in urban areas and busy roads.[3] Moreover, higher penetration of EV is considered as a leapfrogging path for developing countries (DCs) that have historically low rate of motorisation.

Although EV cars' share of the global fleet remains small, sales and stock are rapidly increasing in Europe, North America and East Asian countries where it reached the highest in Norway with 46% of new car sales in 2018.[4] Overall, the global fleet of EV has exceeded five million in 2018 (nearly 2.3 million of them in China) and is projected to reach 55 million in 2025 and 135 million in 2030.[5]

Leapfrogging to low carbon technologies such as adopting EVs was one of the four major mitigation strategies envisaged by Ethiopia's CRGE strategy in the transport sector.[6] The strategy estimated that EV adoption would have an abatement potential of 0.1 Mt CO2e

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[1] Filippa Egnera and Lina Trosvik, 'Electric vehicle adoption in Sweden and the impact of local policy instruments' (2018) 121 Energy Policy 584, 585. Depending on their technological attributes, electric vehicles (EVs) could be grouped as battery electric vehicle (BEV), hybrid electric vehicle (HEV), and plug-in hybrid electric vehicle (PHEV). BEV operates purely on battery power which is recharged through plug-in ports. Whereas, HEV and PHEV are powered by both internal combustion engine (ICE) and electric motor and hence uses both fossil fuel and battery where the battery is recharged either through plug-in cable (for PHEV) or by capturing waste energy from ICE (in HEV).

[2] Jose M Cansino, Antonio Sanchez-Braza and Teresa Sanz-Diaz, 'Policy Instruments to Promote Electro-Mobility in the EU28: A Comprehensive Review' (2018) 10 Sustainability 2507.

[3] Patrick Jochem, Claus Doll and Wolf Fichtner, 'External costs of electric vehicles' (2016) 42 Transportation Research Part D: Transport and Environment 60; Hector Campello-Vicente and others, 'The effect of electric vehicles on urban noise maps' (2017) 116 Applied Acoustics 59.

[4] IEA, 'Global EV Outlook 2019: Scaling-up the transition to electric mobility' (IEA, Clean Energy Ministerial and Electric Vehicles Initiatives, May 2019).

[5] ibid chap 1.

[6] Ethiopia, 'Carbon Resilient Green Economy (CRGE) strategy' (MoFEC, EPA Addis Ababa, 2011) [CRGE Strategy] 26.

per year by 2030.[7] It further set the ambitious target of reaching hybrid vehicles and BEV fleet shares of 13% and 2.2% respectively, and annual sales of 34% and 8% of hybrid and BEV respectively by 2030.[8] However, despite setting an ambitious target, there are only 50 imported EVs (mostly two/three-wheeled) and the government has not initiated a comprehensive framework to support and stimulate EV adoption.[9] Thus, Ethiopia's regulatory system, the thesis argues, is insufficient to achieve the target and even to benefit from the incidental leapfrogging.

Globally, major barriers to the purchase of EVs were said to be EV's high cost, limited battery capacity and availability of charging infrastructure.[10] Alleviating these barriers requires significant intervention from the government and stimulate both the supply and demand sides. Public policy instruments play a vital role to overcome these barriers. Equally, rapid technology development over the last few years of the decade has improved EVs acceptability by improving operational challenges and performance such as battery capacity, cost and charging time.[11]

This chapter is dedicated to analysing the barriers to EVs adoption and instruments that are used to change the trajectory. We will start with a discussion on the nature of incentive instruments adopted globally and the pros and cons of adopting the incentives in DCs. Among the various instruments Ethiopia could use to stimulate EV adoption, the fiscal incentives and how far that will change the initial cost and total ownership cost of EVs are discussed. This will be followed by the analysis of strategies and business models that Ethiopia could adopt to expand the charging infrastructure. Besides, the types of public support EV industries require such as public procurement targets, and industrial support is analysed. Finally, the overall environmental performance of EVs, notably its lifetime carbon emission and waste battery management, is discussed before closing it with conclusions.

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[7] Ibid 32 & 169.
[8] Ibid 174.
[9] Interview with an official at Federal Transport Authority (FTA-01) (Addis Ababa, Ethiopia 8 August 2019).
[10] Egnera and Trosvik, 'EV adoption in Sweden' (2018) (n 1).
[11] AAIT, 'Final report on pilot global fuel economy initiative study in Ethiopia' (Addis Ababa Institute of Technology, Federal Transport Authority 2012) 126-27; IPCC, *Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2014) [IPCC, AR5-WGIII] 614; Felix Creutzig and others, 'Transport: A roadblock to climate change mitigation?' (2015) 350(6263) Science 911.

## 7.1 Incentive Schemes

It is important to note that, the FES and carbon emissions standards and CO2 aligned vehicle ownership taxes implemented in different parts of the world, notably the EU, the US and Asian countries have forced companies to invest more in EVs to meet both the regulatory targets and demands.[12] Hence, more companies have announced EV production lines and new designs which would not have been possible without the stringent FES and emissions standards.[13] However, additional comprehensive regulatory tools and incentives are needed to lower EV's prices further down, expand infrastructure and support R&D.

### *7.1.1 Fiscal incentives*

The IAE reported that the price of a medium-sized EV is on average 40% higher than an ICE equivalent.[14] This is mainly due to the cost of a battery that takes at least around a fourth of EV's price.[15] Furthermore, the total cost of ownership (purchase price added to operational cost over the vehicle's lifetime) of an EV is still higher than an ICE vehicle.[16] Hence, a combination of instruments, notably incentives, is used to bridging the cost gap between EVs and ICEs, reducing risks associated with EV's use, changing consumers' behaviour and achieving a higher uptake of EVs.[17] Other evidence also shows that EV sales increased significantly when the incentive schemes were in place and struggled whenever fiscal incentives are withdrawn.[18]

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[12] Arjan van Velzen and others, 'Proposing a more comprehensive future total cost of ownership estimation framework for electric vehicles' (2019) 129 Energy Policy 1034; Markus Fritz, Patrick Plotz and Simon A Funke, 'The impact of ambitious fuel economy standards on the market uptake of electric vehicles and specific CO2 emissions' (2019) 135 Energy Policy 111006.

[13] Ibid.

[14] IAE, 'Global EV Outlook 2019' (n 4) 165.

[15] IEA, 'Global EV Outlook 2018: Towards cross-modal electrification' (IEA, Paris, 2018) 62ff. The price of battery relative to the EVs price various with the battery size and car power. Battery price ranges from USD 100 to 350/kwh with an average of USD 260/Kwh.

[16] IAE, 'Global EV Outlook 2019' (n 4) 165.

[17] Alan Jenn, Ines L. Azevedo and Pedro Ferreira, 'The impact of federal incentives on the adoption of hybrid electric vehicles in the United States' (2013) 40 Energy Economics 936, 942; Theo Lieven, 'Policy measures to promote electric mobility - A global perspective' (2015) 82 Transportation Research Part A 78; Erik Figenbaum, Terje Assum and Marika Kolbenstvedt, 'Electromobility in Norway: Experiences and Opportunities' (2015) 50 Research in Transportation Economics 29, 33; Peter Slowik and others, 'International Evaluation of Public Policies for Electro-mobility in Urban Fleets' (International Council on Clean Transportation (ICCT), 2018).

[18] Xingping Zhang and others, 'Policy Incentives for the Adoption of Electric Vehicles across Countries' (2014) 6 Sustainability 8056; House of Commons, 'Electric vehicles: driving the transition' (Business, Energy and Industrial Strategy Committee, 14th Report of Session 2017–19, HC 383, 19 October 2018).

After studying EV adoption in 30 countries, Sierzchula and others found that fiscal incentives, along with the expansion of charging infrastructure and local production, have a significant impact on EVs uptake.[19] Similarly, Lin and Wu reported that price acceptability was one of the main factors influencing EVs purchase in China.[20] Coffman and others argued that awareness-raising, along with fiscal and non-fiscal incentives and charging infrastructure expansion are also vital for promoting EV adoption.[21] In most of the studies, fiscal incentives come out as the single most determinant of early EV uptake.

Various fiscal instruments are used such as rebates (cash for clunker), income tax credits, sales tax exemptions and fee exemptions targeting either the cleaner technologies or selected beneficiaries.[22] These instruments are called 'second-best' as they only positively influence consumers and do not refrain consumers from buying polluting vehicles or affect the distance travelled (negative) as 'first best' instruments like ‘cap and trade’ or tax would do.[23] However, for an EV, as long as the energy source is green, distance travelled would not be the primary environmental externality deserving much regulation. Furthermore, these incentives achieve an optimal result when applied at the point of sale rather than at later stage (e.g. income tax credit).[24] For instance, EV buyers are encouraged more by tax rebates or registration tax exemption rather than by free parking, sharing bus lanes or exemption of annual road tax.[25]

These fiscal incentives are becoming universal instruments in the early stage of the adoption at least up until the cap was reached or the allotted budget was exhausted. As can be seen in the table below (Table 7.1), a growing number of countries have changed their vehicle tax system to consider carbon emissions level as one determining factor (indirect

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[19] William Sierzchula and others, ‘The influence of financial incentives and other socio-economic factors on electric vehicle adoption’ (2014) 68 Energy Policy 183.

[20] Boqiang Lin and Wei Wu, ‘Why people want to buy electric vehicle: An empirical study in first-tier cities of China’ (2018) 112 Energy Policy 233.

[21] Makena Coffman, Paul Bernstein and Sherilyn We, ‘Electric vehicles revisited: a review of factors that affect adoption’ (2017) 37(1) Transport Review 79.

[22] JR DeShazo, ‘Improving incentives for clean vehicle purchases in the United States: challenges and opportunities’ (2016) 10(1) Review of Environmental Economics and Policy 149.

[23] Ibid 157; JR DeShazo, Tamara L Sheldon and Richard T Carson, ‘Designing policy incentives for cleaner technologies: Lessons from California's plug-in electric vehicle rebate program’ (2017) 84 Journal of Environmental Economics and Management 18, 20.

[24] DeShazo, ‘Incentives for clean vehicle purchases in the US’ (2016) (n 22) 162.

[25] Joram Langbroek, Joel Franklin and Yusak Susilo, ‘The effect of policy incentives on electric vehicle adoption (2016) 94 Energy Policy 94, 96.

incentive) to the extent of exempting low emitting vehicles and penalising high emitting vehicles. However, it was underlined that although incentives have played a significant role in promoting the adoption of EVs, making the price competitive by its own is the long-term solution to its higher penetration.[26]

In Norway, in the early days of EV introduction (the 1990s), the incentives included exemptions from the registration tax, toll road charges and annual vehicle's license fee, free parking in municipal parking lots and reduction in the benefits tax on company cars.[27] Then was followed by VAT exemption and sharing bus lanes. Similarly, a review of Chinese policy revealed that Chinese policies of subsidy and tax exemptions effectively promoted the adoption of EVs.[28] In Sweden, fiscal incentives (e.g. free charging or free parking) were found to have greater incentive value than non-fiscal incentives like access to the bus lane.[29] Similarly, after surveying in 20 countries, Lieven found that access to bus or fast lane and free parking are not as attractive measures as the fiscal incentives and charging stations measures are.[30] Hence, Norway and Sweden have recorded the largest percentage of annual EV registration, while China has the highest number of EV cars in the world.

Some members vetoed the EU's ambition of enacting harmonised fiscal instruments to regulate car emissions due to the 'principle of subsidiarity', and hence only direct regulatory tools were used to support EVs.[31] Nevertheless, post-2020 regulation includes incentive mechanisms for zero- and low-emission vehicles (ZLEV), defined as cars or vans with an emission level of up to 50 gCO2/km.[32] Among other things, the regulation requires a 15%

[26] Petra Zsuzsa Levay, Yannis Drossinos and Christian Thiel, 'The effect of fiscal incentives on market penetration of electric vehicles: A pairwise comparison of total cost of ownership' (2017) 105 Energy Policy 524, 532; Shao-Chao Ma, Ying Fan and Lianyong Feng, 'An evaluation of government incentives for new energy vehicles in China focusing on vehicle purchasing restrictions' (2017) 110 Energy Policy 609.

[27] Figenbaum, Assum and Kolbenstvedt, 'Electromobility in Norway' (2015) (n 17) 30.

[28] Ma, Fan and Feng, 'An evaluation of government incentives' (2017) (n 26).

[29] Langbroek, Franklin and Susilo, 'The effect of policy incentives on EV adoption' (2016) (n 25) 99.

[30] Lieven, 'Policy measures to promote electric mobility' (2015) (n 17).

[31] Reyer Gerlagh and others, 'Fiscal policy and CO2 emissions of new passenger cars in the EU' (2018) 69 Environ Resource Econ 103.

[32] Regulation (EU) 2019/631 of the European Parliament and the Council of 17 April 2019 setting CO2 emission performance standards for new passenger cars and new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011, Art 3(1)(m). The definitions might slightly differ in individual states. For instance, in the UK Ultra-low emission vehicles (ULEVs) are cars and vans emitting below 75 gCO2/km which will be reduced to 50 gCO2/km only after 2021. The other group called zero-emission vehicles (ZEV) are those cars or vans with no GHG or local air pollutants emission. UK, 'The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy' (Department for Transport, 2018) 24.

and 35% share of ZLEV cars sales by 2025 and 2030 respectively, and a 15% and 30% share of ZLEV vans sales by 2025 and 2030 respectively.[33] The target was claimed to be insufficient, and some member states called for an EU-wide phase-out target of ICE cars and vans but could not get enough support.[34] Besides the EU level regulation, member states have set ICE phase-out targets and used diverse fiscal instruments to supplement the EU-wide regulation and its emissions targets.

For instance, the UK government issued the Road to Zero strategy in 2018 that plans to ban new sales of ICE cars and vans by 2040, which was later modified as 2035, and a mid-term target of 50-70% of new car sales and 40% of new van sales to be ultra-low emission by 2030.[35] It also provided a combination of grants and subsidies to EV buyers, R&D grant for industry (e.g. Faraday Battery Challenge), linking the Vehicle Excise Duty on carbon emission level (that ultimately exempt BEVs or less than 50g/km emission) and expansion and standardisation of charging infrastructure and set public procurement targets.[36]

However, a House of Commons commissioned report and Committee on Climate Change (CCC) criticised the targets for being too vague and insufficiently ambitious.[37] Besides the activities designed are contested for being insufficient and sometimes inconsistent with the strategy (e.g. charging infrastructures lack geographical coverage).[38] Its fiscal incentives were also blamed for being insufficient to support EV, benefiting only wealthier classes and responsible for the decline in PHEV sale at the end of 2018 and early 2019.[39]

It is worth noting that some researchers argued that the total cost of ownership of EVs is already less than that of ICE vehicles due to the many incentives and lower running costs like electricity cost and engine efficiency.[40] Assessing the total cost of ownership requires

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[33] Regulation (EU) 2019/631, Art 1(6) & (7) and Annex I.

[34] CCC, 'Reducing UK Emission: 2018 Progress Report to Parliament' (Committee on Climate Change, July 2018) 49 <www.theccc.org.uk/publication/reducing-uk-emissions-2018-progress-report-to-parliament/> accessed 10 Dec 2019.

[35] UK, 'The Road to Zero' (2018) (n 32) 7-9.

[36] Ibid 7-9 and 60.

[37] House of Commons, 'EV-driving the transition' (2018) (n 18); CCC, 'Reducing UK emissions: 2019 Progress Report to Parliament' (Committee on Climate Change, July 2019) <https://www.theccc.org.uk/publication/reducing-uk-emissions-2019-progress-report-to-parliament/> accessed 9 Dec 2019.

[38] Ibid.

[39] House of Commons, 'EV-Driving the transition' (2018) (n 18) 17-21.

[40] Langbroek, Franklin and Susilo, 'The effect of policy incentives on EV adoption' (2016) (n 25) 102; Levay, Drossinos and Thiel, 'The effect of fiscal incentives on EV' (2017) (n 26) 529.

considering many factors including the car's driving range, battery size and cost, energy cost, battery life, annual distance-driven, the car's life with its first owner and charging infrastructure cost (installing home charger). Hence, the difference among scholars on the total cost of ownership emanates from the selection of these factors, country situation and car type. Even then, it was widely understood that it was the initial cost of a car and not the running costs or the total cost of ownership that significantly influences EV adoption.[41] It was said that car buyers are often myopic where 'future savings in fuel costs is to a limited degree taken into account when buying a vehicle.'[42] Besides, the inconveniences and risks assumed by early adopters are higher due to infrastructure and technology limitations, and too early for buyers to weight the operational cost of a car over its initial purchase price.

These incentive instruments are becoming global phenomena but still difficult to fully diffuse into DCs. The immediate concern for DCs like Ethiopia is whether the government can afford these incentives now and what would be the environmental risks of delaying them.

### *7.1.2 Pitfalls of incentives*

The fact that EV adoption heavily relies on public support raises lots of issues regarding its revenue sensitivity, prioritisation and government capacity, especially in DCs. Delaying the introduction of EVs until the technology becomes competitive in the market with ICE vehicles is the widely-held opinion among government experts and officials in Ethiopia.[43] They argue that the cost of adoption is higher while its mitigation potential is lower than other transport strategies like used cars regulation. There is some evidence to support this. Yan found that on the average, only a 3% increase in the sale of EV was observed with an incentive of a 10% total tax decrease in European countries.[44] Although the data used were from 2012 to 2014 and EV technology has significantly progressed since then, such lower improvement of EV uptake even after fiscal incentives in more advanced countries is discouraging for budget-constrained countries like Ethiopia. Hence, transport experts argue

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[41] IAE, 'Global EV Outlook 2019' (n 4) 165.

[42] Figenbaum, Assum and Kolbenstvedt, 'Electromobility in Norway' (2015) (n 17) 32.

[43] Interview with an official in the Ministry of Transport (MoT) (MoT-01) (Addis Ababa, Ethiopia 22 July 2019); Interview with FTA official (FTA-01) (2019).

[44] Shiyu Yan, 'The economic and environmental impacts of tax incentives for battery electric vehicles in Europe' (2018) 123 Energy Policy 53, 61.

that current incentives that would cost Ethiopia in millions could be used in other potential sectors that have higher mitigation and co-benefits and would not be improved without state investment (e.g. agriculture and forestry).[45]

Besides, those who argue for delay of intervention refer to the speed of advancement of EV technology, especially in battery capacity that will bring EV's price closer to its ICE equivalent by mid-2020 to 2030.[46] By then, commuters are likely to choose EVs than ICE vehicles without any government incentives. Furthermore, a delay will enable countries to 'avoid missing out on further technological improvements' and build its capacity and system to sustain the penetration - build charging infrastructure, provide reliable electricity, expand local manufacturing, enhance human and regulatory capacity.[47]

However, others that advocate an immediate intervention warn that the cost of delaying climate actions is onerous.[48] ICE vehicles that are purchased today will be driven and continue emitting carbon for about 18 more years. Hence, unless we invest today to change the fleet composition and associated infrastructures when the rate of motorisation is comparably lower, the cost of shifting to EV later will be difficult and takes a longer time. More importantly, the co-benefits of EV (reduced fuel and maintenance cost) will make it economically feasible now. However, public instruments are required to balance these seemingly competing interests.[49]

Revenue generated in the transport system primarily comes from vehicle taxes, road charges and fuel taxes, and will inevitably decline in the transition to electromobility.[50] If the government cannot collect enough revenue, incentives for EVs and its infrastructure and support for other less carbon-intensive transport modes will be adversely affected. However, delaying the transition to electromobility for the sake of saving revenue will only be a short-sighted solution to the inevitable transition. Equally, it cannot levy the same rate

[45] Interview with an official in the MoT (MoT-01) 2019); Interview with FTA official (FTA-01) (2019).

[46] O Schmidt and others, 'The future cost of electrical energy storage based on experience rates' (2017) Nature Energy 2, Article No. 17110; House of Commons, 'EV-Driving the transition' (2018) (n 18) 17.

[47] Interview with an official in the MoT (MoT-01) (2019); Interview with FTA official (FTA-01) (2019); Samuel Pelletier and others, 'The electric bus fleet transition problem' (2019) 109 Transportation Research Part C 174, 175.

[48] Hamidreza Jahangir and others, 'Why Electric Vehicles?' in Ali Ahmadian, Behnam Mohammadi-ivatloo and Ali Elkamel (eds) *Electric Vehicles in Energy Systems* (Springer 2020).

[49] Figenbaum, Assum and Kolbenstvedt, 'Electromobility in Norway' (2015) (n 17) 32.

[50] IEA, 'Global EV outlook 2019' (n 4) 193.

of tax on EVs and electricityas it does on fuel, at least in the short- to mid-term, to make up the lost revenues.[51] Instead, the government needs to diversify its revenue sources and gradually increase taxes on carbon-intensive products or increase the vehicle registration and road use charges to off-set the loss of revenue due to less tax on EVs and decline in the use of fossil fuels.[52] For instance, Italy's 'bonus-malus' incentive policy provides bonus (subsidy) of up to €6,000 for cars emitting less than 20 gCO2/km but a malus (tax) of up to €2,500 for cars emitting more than 250 gCO2/km.[53] Thus, the revenue generated from high emitting cars is circulated back to subsidise the purchase of low emitting cars.

Critics also argue that further lowering the marginal cost of EV use and the non-fiscal incentives will have a rebound effect of encouraging private car use over mass and active transport modes.[54] Similarly, fiscal incentives are criticised for benefiting only high-income groups of society who are more likely to buy EVs.[55] Especially in DCs where only a few wealthy groups own private cars, a public incentive for an EV might prejudice the majority of taxpayers who use public transport and further deepen inequalities.[56]

However, understanding EVs as a part of the broader transport decarbonisation but with a specific objective will enable us to create synergy with other strategies like subsidising public transport and NMT that the majority uses. Like other strategies, the EVs and fiscal incentives harnessed to it have inherent limitations and should not be overloaded with objectives of solving the myriad problems of automobility. For instance, EV will not reduce driving culture and associated problems of congestion, traffic accident and land use management.

Furthermore, information instruments are vital to raise awareness and create political acceptability of such revenue sensitive instruments.[57] Likewise, a public-private partnership

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[51] Anthony Dane, Dave Wright and Gaylor Montmasson-Clair, 'Exploring the policy impacts of a transition to electric vehicles in South Africa' (Trade & Industrial Policy Strategies (TIPS), South Africa May 2019) 18.

[52] IEA,' Global EV outlook 2019' (n 4) 24.

[53] Gazzetta Ufficiale (2019), Legge di bilancio 2019 (Budget Law 2019) <https://ecobonus.mise.gov.it/-/media/bec/documenti/normativa/legge-di-bilancio-2019-pdf> accessed 17 February 2020; ibid 73.

[54] Langbroek, Franklin and Susilo, 'The effect of policy incentives on EV adoption' (2016) (n 25) 102.

[55] Egnera and Trosvik, 'EV adoption in Sweden' (2018) (n 1).

[56] Dane, Wright and Montmasson-Clair, 'Exploring the policy impacts of a transition to EV in South Africa' (2019) (n 51).

[57] Fabio Carlucci, Andrea Cira and Giuseppe Lanza, 'Hybrid electric vehicles: some theoretical considerations on consumption behaviour' (2018) 10 Sustainability 1302.

could be used where car dealers and producers will launch EVs in a public event and engage in targeted promotion on high-income groups who are believed to be risk-takers.

Nevertheless, there are ways that governments in DCs could provide incentives for the adoption of EVs depending on the context and capacity. Below is the discussion on what Ethiopia has done and ought to do in creating the enabling environment to pursue the leapfrogging path in EV.

## 7.2 Consumers Incentive in Ethiopia

Ethiopia is one of the countries that consider cars as luxury products and historically subject it to higher taxes, and until 2019 EVs were taxed the same as other vehicles. [58] Interviews undertaken for the thesis reveal that government officials recognise that Ethiopia had not shown any significant reform in providing frameworks for stimulating EV uptake.[59] A respondent from car importing and assembling company also reiterated that Ethiopia lacked customs classification for EV that has made starting EV production uncertain and risky investment.[60] This approach defeats the leapfrogging scenario envisaged in the CRGE and subject Ethiopia to the carbon-intensive development path the developed world has passed through. Embracing a leapfrogging path requires thorough planning, institutional and policy reform in the form of designing strategies, executing tailored instruments and seizing opportunities.[61]

In this respect, Ethiopia needs strategies to mitigate the higher purchasing cost, and change the infrastructure gap and enabling environment.[62] Although some of the investments are born by the private sector, diffusing EVs require additional public funding to create the enabling infrastructure.[63] The government has to demonstrate its commitment to leapfrog and desire to lead by example through sharing the additional cost of the initial investment. However, earlier recommendations for duty-free importation and excise tax exemption of

[58] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 11).

[59] Interview with an official in the MoT (MoT-01) (2019); Interview with an official at EPSE (EPSE-01) (Addis Ababa, Ethiopia 30 July 2019); ibid.

[60] Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (Addis Ababa, Ethiopia 26 August 2019).

[61] Langbroek, Franklin and Susilo, 'The effect of policy incentives on EV adoption' (2016) (n 25) 102.

[62] Interview with FTA official (FTA-01) (2019).

[63] Desta Mebratu and Mark Swilling (ed), *Transformational Infrastructure for Development of a Wellbeing Economy in Africa* (AFRICAN SUN MeDIA and STIAS, South Africa, 2019).

EVs were ignored for years.[64] However, the recent reform on customs duty and excise tax has given a lifeline for EV.

### *7.2.1 Customs duty and excise tax revision*

A piecemeal approach to the matter has continued unabated as the government revised the customs and excise tax laws. As part of the ongoing tax and customs duty revision, in July 2019 the government issued the new tariff classification and customs duties that have introduced a new classification and tariffs for electric and hybrid cars, CKD (complete knocked-down) and SKD (semi-complete knocked-down) kits, and used cars based on their age (Table 5-1 on chapter 5).[65] According to the new tariff, new ICE cars are subject to 30% customs duty while hybrid and battery cars are subject to 20% and 10% customs duty respectively. The new customs classification has given a 20% customs duty reduction for a new battery and a 10% reduction for new hybrid cars compared with its ICE equivalents. Besides, CKD and SKD kits of EVs are also subject to reduced custom duties. This customs duty was immediately followed by the new excise tax law in January 2020.

Like any other indirect taxes, the new excise tax came with packs of objectives such as raising additional revenue, reducing the importation of used vehicle and increasing taxes on products considered as luxurious or hazardous to health or cause social problems.[66] Unlike past experiences, the excise tax law provided a new classification for hybrid and battery cars and subjected them to different tax rates. It has also resolved the uncertainties by excluding new battery from excise tax, and offer a 30% to 100% price advantage over its ICE equivalent (Table 5-2 in Chap 5).

Nevertheless, that does not apply to used-BEVs which are subject to a 50% to 400% excise, but still 30% to 100% lower than its ICE equivalent. The economic and environmental benefits of younger used cars are not considered, and instead, the law discourages the purchase of used cars of more than one years old. It is still too early to assess the

[64] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 11) 132; EPCC, First Assessment Report - Working Group II- Climate Change Impact, Vulnerability, Adaptation and Mitigation VI: Industry, Transport and Infrastructure (Ethiopian panel on Climate Change, Ethiopian Academy of Sciences, Addis Ababa 2015) 71-74.

[65] MoFEC, 'Customs Tariff Amendment No. 8 Based on the 2017 Version of the Harmonised System' (Addis Ababa, July 2019,).

[66] Excise Tax Proclamation No 1186/2020 Preamble; MoFEC, 'Explanation Note for Excise Tax' (Unpublished, MoFEC, 2019).

environmental and economic benefit of used EVs, but early reports suggest that they are relevance for early adopters to stimulate EV uptake.[67]

EVs cost at least 40% higher than its ICE equivalents, and any reduction in the tax for the former will minimise the cost gap between them.[68] At the new tax rate, the final price of a BEV after all the duties and taxes applied, i.e. 10% customs duty, 0% excise and surtax, 15% VAT and 3% withholding tax, turns out to be equal or lower than its ICE equivalents. For instance, the price of a 1300 CC petrol sedan car in global market is around $18,000 (630,000 ETB) and its BEV equivalent is around $25,200 (882,000 ETB). After applying all the costs (freight and insurance), duties and taxes, the cost of the petrol car and BEV (without the profit) will become around $34,046 (1.19 million ETB) and $34,323 (1.2 million ETB) respectively in the Ethiopian market.[69] Hence, BEV's final price (cost) would nearly equal its ICE equivalent. However, with the increase in the size of the car, BEV will have a significant price advantage of up to 50% less than its ICE equivalent. Inherently, exemption from a flat rate tax favours big and expensive EVs more while lump-sum subsidies like rebates favour small EV cars.[70] Thus, bigger size BEV cars should have been subjected to a higher rate of the excise tax to balance the revenues lost in the other car categories.

Thus, the new classification and tax rates have effectively reduced the initial cost gap and will increase the competitiveness of BEV in the Ethiopian market. Such incentives are also comparable with those in high-income countries. For examples, the UK provides, inter alia, grants that cover up to £3,500 of the cost of a car, and other supports to the running costs including a grant that covers up to 75% of charge point installation costs, exempt from vehicle excise duty, road tax and congestion charge and access to ultra-low emissions zones.[71] Nevertheless, these incentives are reduced for hybrid cars. Similarly, in Norway, which has the highest percentage of EVs market share, EVs are exempted from import (registration) tax, VAT and re-registration tax, and subject to reduced company car tax and

[67] IEA, 'Global EV Outlook 2019' (n 4) 59.

[68] ibid 165. An EV costs around USD 35 600 and a standard ICE vehicle costs around USD 25 000 (IEA, 2019b).

[69] Currency conversion is taken at the rate of 1 USD to 35 ETB.

[70] Levay, Drossinos and Thiel, 'The effect of fiscal incentives on EV' (2017) (n 26).

[71] House of Commons, 'EV-Driving the transition' (2018) (n 18) 18.

half of the annual road tax, toll road and parking fees of its ICE equivalents.[72] Comparably, Ethiopia's new system offers more initial purchase incentive than the UK but comparable with Norway. Thus, as ICE cars are heavily taxed, BEV cars have a more considerable price advantage over ICE cars in Ethiopia than in these two countries. Indeed, both the UK's and Norway's systems are robust and precise in defining operational cost incentives than in Ethiopia, where the policy landscape is ambiguous.

The problem with Ethiopia's current incentive is its predictability and stability with the change in circumstances in the future. The law has not set targets or time limit when the incentive will end or has not defined the policy objective it wants to achieve. That void creates uncertainty in the market and gives broader discretion for the government to change the incentive whenever it wanted. It is certain, however, that the tax rate will change when the price gap between EV and ICE car reduces and EVs penetration increase in Ethiopia. Nonetheless, given the long-standing reluctance of the government to prepare a framework for EV adoption, the scale of incentives offered in the new excise tax surprised industrial commentators. However, unless the remaining barrier in the value chain is resolved, i.e. define the operational framework and expand EVs infrastructure, the penetration will still lag behind.

### *7.2.2 Hybrid cars*

The new tax reform has considered hybrid cars (HEV and PHEV) differently and subjects it to the full scale of taxes almost the same as ICE cars. Moreover, the excise tax on ICE and hybrid cars is based on engine size than carbon emissions level and punishes hybrid cars. Under the new system, hybrid cars are treated slightly different from ICE only in two instance – a reduced customs duty of 20% and a reduced excise tax on hybrid cars with a cylinder capacity of 1500 to 1800 compared with diesel cars.

For a country like Ethiopia that generates electricity from carbon-neutral sources, hybrid electric vehicles present a golden opportunity to transition to a fully electric vehicle

[72] Petter Haugneland, Christina Bu and Espen Hauge, 'Put a price on carbon to fund EV incentives – Norwegian EV policy success' (EVS30 Symposium Stuttgart, Germany, October 9 - 11, 2017); Karoline Steinbacher, Minke Goes and Korinna Jörlin, 'Incentives for Electric Vehicles in Norway: Fact Sheet' (Ecofys for Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of Germany, 03 September 2018) <https://www.euki.de/wp-content/uploads/2018/09/fact-sheet-incentives-for-electric-vehicles-no.pdf> accessed 23 January 2020.

system.[73] A hybrid electric car saves a significant amount of fuel, mostly when driven at lower speed and in and around cities where it mostly runs on electricity by automatically switching off its conventional fuel engine.[74] Although their fuel efficiency depends on the type of battery installed and the driving condition, most hybrid cars are twice fuel-efficient than conventional cars of a similar model, reduce exhaust emission (both carbon and local air pollutants) and improve the fuel efficiency of the fleet.[75]

Early adopters in high-income countries have been provided with fiscal incentives in different forms – tax credit, subsidy, tax cuts, registration waiver etc – for purchasing hybrid cars. Most have maintained the incentives until they have reached a certain percentage of sales or fleet of hybrid cars. For instance, Mauritius waives excise tax on cars with less than 550 cylinder capacity and set registration fees and taxes of hybrid-electric cars at nearly half the rate of conventional cars.[76] The UK has lifted the plug-in grant from hybrid, but other incentives (e.g. vehicle excise duty and annual road tax) still benefit hybrid cars as they take emissions level as a factor.[77] In Norway, although hybrid-cars do not enjoy the full range of incentives available to BEV, they enjoy incentives proportionate to their carbon abatement potential.[78] Hence, it was unjustifiable for Ethiopia to subject pro-environment hybrid cars to the same tax rates as conventional cars. Moreover, the erratic electricity black-out, absence of charging infrastructures and their higher initial price in Ethiopia will make leapfrogging directly to BEV cars onerous in short- to medium-term.

However, these fiscal incentives still cover only initial costs of EVs and other operational costs and barriers remained untouched by any of the recent reforms. In the following section, we will explore the additional operational cost and its advantage over conventional cars.

[73] Carlucci, Cira and Lanza, 'HEV' (2018) (n 57).

[74] Alexander Kapustin and Vyacheslav Rakov, 'Methodology to Evaluate the Impact of Hybrid Cars Engine Type on their Economic Efficiency and Environmental Safety' (2017) 20 Transportation Research Procedia 247; Ibid.

[75] Ibid.

[76] Anumita Roychowdhury, 'Clunkered: Combating Dumping of Used Vehicles—A Roadmap for Africa and South Asia' (Centre for Science and Environment, New Delhi 2018).

[77] House of Commons, 'EV-Driving the transition' (2018) (n 18).

[78] Steinbacher, Goes and Jörlin, 'Incentives for EVs in Norway' (2018) (n 72).

### *7.2.3 The operational cost of EV*

Operational cost is another component of the total cost of ownership that influences EV adoption, although not with the same level as the initial purchase price. Operation cost is the sum of the costs of home charger installation, electricity bill, maintenance and servicing costs, battery replacement (if any), road charges, registration fee and insurance cost. It is, therefore, essential to see the difference in operation cost between ICE and EV cars in Ethiopia to assess the required level of intervention.

In Ethiopia, road charges and registration fees are determined based on the car's utility, type and size while accident rate, car's price and utility are taken to determine the insurance premium. Besides, road charges and registration fees make up an insignificant amount of the operation cost and unlikely to influence ownership decision. Hence, EV and ICE cars are considered alike in determining these costs.

The most significant of all the operational costs is the electricity cost. Electricity cost of an EV car is calculated mainly based on its battery capacity, driving range and electricity rate (kWh). For example, an EV with a 36 kWh battery has a driving range of more than 200 km.[79] In Ethiopia, the electric cost at the household level is £0.028/kWh (ETB 1.1) in 2019.[80] Assuming an 80% charging efficiency (power wasted during charging and driving), the EV will take 45kWh of electricity and cost £1.26 (45kWh x 0.028£) to recharge fully.[81] With that charge, the EV should travel over 200 km (0.19 kWh for a km or 1 kWh for 5.56 km).[82]

To better understand the cost efficiency of an EV car, let us compare the electricity cost of an EV with the fossil fuel cost of an equivalent ICE car. The price of gasoline and diesel was £0.54 (21.53 ETB) and £0.47 (18.75 ETB) per litre respectively at the end of 2019. With a fuel economy of 12km/litre, a gasoline car will require 16.7 litres and costs around £9 (360 ETB) to complete a 200 km trip. Hence, the total cost of driving 200 km with an EV (£1.26) is significantly less than that of driving an ICE (£9). With the improvement in battery

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[79] EVI, 'Global EV Outlook 2019' (n 4) 169.

[80] Ethiopian Electric Utility, Current Tariffs <http://www.eeu.gov.et/index.php/current-tariff> accessed 2 Dev 2019) (I took the rate that applies to a home that consumes up to 200 KWh per month. Otherwise, the rate for the first 50 Kwh (£0.0069) and up to 100 KWh (0.014) are less.

[81] Mulugeta Gebrehiwot and Alex Van den Bossche, 'Electric Vehicle Possibilities using Low Power and Light Weight Range Extenders' (European Electric Vehicle Congress Brussels, Belgium, 3rd – 5th Dec 2014).

[82] IEA, 'Global EV Outlook 2019' (n 4) 167; Mulugeta Gebrehiwot and Alex Van den Bossche, 'Driving Electric Vehicles: as Green as the Grid' (IEEE Ghent University Ghent, Belgium, 2015).

efficiency and lifetime, an EV's running cost will further decrease and give advantage on its total cost of ownership. Energy security is another advantage of relying on local sources for running EVs as prices are less volatile compared with global fuel prices.

Furthermore, the weather condition in the vast majority of Ethiopia allows EVs to function at an optimal level all the year. EVs perform better in a moderate to warm temperature, but driving range decreases with cold weather and the use of AC. Summer is the main rainy season in most areas with shorter rain across February to May. Nevertheless, the temperature remains well above 20 $^{o}$C all year round and may go above 30 $^{o}$C in the low land areas in some months. Topography wise, the presence of high altitude and steep slopes in a few central (including Addis Ababa) and northern highland areas may affect EV's performance. Even then, the overall weather and topography in Ethiopia are favourable for EV to run on its designed capacity. Besides EVs have performed well in the cold and mountainous areas like Norway.

In contrast, there would possibly be additional costs of installing charging points at home, which is estimated to be £300 in the UK and should be much lower in Ethiopia due to cheaper labour cost. Some scholars, however, pointed out that the current standard household circuit breaker in Ethiopia has a lower capacity and may demand electric network system upgrading to enable efficient EV battery charging.[83] However, such costs depend on the type of network upgrade required and are often done by the state-owned Ethiopian Electric Utility Agency staffs with no or little cost.

Another possible operational cost could be for service and maintenance including battery replacement, often after 100,000 to 150,000 km or eight to ten years of service.[84] Recent improvements in EV battery lifetime are, however, expected to extend battery's utility further and make it 'compatible with the expected lifetime of the car'.[85] Furthermore, due to fewer moving parts in EV cars, the maintenance and service cost is understood to be 80% to 50% lower than conventional cars.[86]

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[83] Gebrehiwot and Bossche, 'Driving Electric Vehicles' (2015) (n 82).

[84] IEA, 'Global EV Outlook 2019' (n 4) 153 and 181; Lluc Canals Casals, Amante García and Camille Canal, 'Second life batteries lifespan: Rest of useful life and environmental analysis' (2019) 232 Journal of Environmental Management 354.

[85] IEA, 'Global EV Outlook 2018' (2018) (n 15) 59.

[86] Ibid, 65; Velzen and others, 'Comprehensive future total cost of ownership' (2019) (n 12) 1042.

Accordingly, the operational cost of EVs in Ethiopia is much lower than that of ICE cars. This added to the tax exemptions, and reduced custom duty offers a substantial advantage for early adopters. However, the rate of adoption will also depend on the expansion of charging infrastructure, availability of reliable electricity and battery technology innovation.

## 7.3 Charging Infrastructure

The absence of charging stations and range anxiety (the concern that an EV will not have sufficient charge to complete a given journey) is the other most significant determinant of EV adoption and diffusion.[87] The range is the factor of vehicles' energy storing capacity, the distance it will travel with it and access to replenishing facility.[88] Although some alternatives like battery swapping at charging stations are considered as a strategy to speed up battery charging times and respond to range anxiety, it was short of solving the challenge.[89] Expansion of public charging stations by municipalities and proximity to such facilities are found to have a more significant influence in EVs uptake.[90]

### *7.3.1 Technology choice and standardisation*

In Ethiopia, due to the low rate of motorisation, only a few households have cars and mostly a single car per household. Hence, for the EVs penetration to be higher, that single car should be able to cover both short and long-distance trips to satisfy the travelling demands of the whole family. Although the exact figure is unknown, the average daily/annual driving range is expected to be higher in Ethiopia than countries with more multi-car households and compact settlement. In its fuel economy study, the AAIT assumed the annual driving range to be 25,000 km, which is more than double the range in the UK (10,509 km) and higher than in the USA (16,357 km).[91] Although the estimation seems to be a little higher, Ethiopia's topography and settlement pattern where major urban areas are spread across

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[87] Henry A. Bonges III and Anne C. Lusk, 'Addressing electric vehicle (EV) sales and range anxiety through parking layout, policy and regulation' (2016) 83 Transportation Research Part A 63.

[88] ibid 64.

[89] Ibid 69.

[90] Egnera and Trosvik, 'EV adoption in Sweden' (2018) (n 1) 585; Cansino, Sanchez-Braza and Sanz-Diaz, 'Policy Instruments to Promote Electro-Mobility' (2018) (n 2).

[91] AAIT, 'Fuel economy initiative study in Ethiopia' (2012) (n 11) 139; US Department of Transportation: Summary of Travel Trends 2017 National Household Travel Survey (Federal Highway Administration, 2018) <https://nhts.ornl.gov/assets/2017_nhts_summary_travel_trends.pdf>; Department for Transport, 'National Travel Survey: England 2018' (31 July 2019) <www.gov.uk/government/statistics/national-travel-survey-2018> accessed 29 Jan 2020.

the country induces people to commute to long-distance trips. Furthermore, Addis Ababa, that hosts around 61% of the country's vehicles, is located in the centre and major cities are 100 to 700 km away from it.[92]

These facts impact the EVs technology choice, charging infrastructure design and electric network system. Thus, unless the car is exclusively required for urban trip, which is unlikely to be the case due to the tendency of travelling to the countryside over weekends, EVs need to have a 300 km driving range to have a greater chance of sales in Ethiopia. Nevertheless, as EVs with 250+ km driving range are widely available in the market, it will not be a barrier. Apart from driving range, availability of charging stations, access and compatibility of the charger and reliability of the power supply are other essential factors for EV adoption.

Accessibility refers to the physical access to EV chargers, the legal entitlements and duties associated with its use. Thus, there should be enough charging networks – both home charger and public charging stations – to keep the EVs running up to a required destination. It is difficult to find a threshold for the number of public chargers required as it depends on many factors including driving range, population density, availability of home and workplace charging facilities.[93] For instance, if owners have access to private parking fitted with EV charging, the demand for public charging will decrease, and a higher number of EV per public charging point is justified.[94] The EU recommends one public charger per 10 EVs.[95] However, one charger for 20 EVs could be sufficient as seen in the USA where most EV owners have private parking.[96] However, home chargers should be available at a ratio of not more than 1 for every 1.5 EVs to reduce the demand for public charging and associated challenges.[97] Even then, expansion of public charging station is vital to boost range confidence, promote EV and eliminate uncertainties over EVs utility.

[92] MoT, 'Ethiopian Vehicle database' (Ethiopia Ministry of Transport 8 July 2019).

[93] Dale Hall and Nic Lutsey, 'Emerging Best Practices for Electric Vehicle Charging Infrastructure' (ICCT White Paper, October 2017) 22.

[94] Ibid.

[95] EC (European Commission) (2014), Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure.

[96] IEA, 'Global EV Outlook 2019' (n 4) 40.

[97] ibid 39.

Likewise, recharging time which is the factor of battery capacity and charging station is another attributes of EV for its preference.[98] Slow charging posts (Level 2) that are often installed at home, workplace, parking or shopping centres take 6-8 hours to fully recharge a standard EV (25-35kWh battery) while fast-charging posts (DC or Level 3 chargers) take 15-30 minutes to recharge the EV up to 80%.[99] Slow and fast chargers have their own pros and cons. Slow chargers put little pressure on the electricity network due to its use during the off-peak night time and the slow speed. Nevertheless, too many fast public chargers may constrain the electric network capacity and stress power system during peak hours.[100] As a result, many countries install fast chargers on highways and densely populated areas and instead prioritise slow chargers at home, workplace and service centres. Scholars reiterated that home charging is the most important of all for increasing EV penetration, economic efficiency and tackle range anxiety.[101] Thus in leading EV markets, fast chargers constitute only about 10% to 20% of the public chargers except in few counties like China, where a higher percentage of fast chargers are observed.[102] Equally, in the EU, the US, Japan and China, about 50-80% of EV charging occur at home while 25% at the workplace, and only less than 25% at public charging points.[103] The experience so far accentuates that public fast charging points are commercially viable only with higher penetration of EV, and even then along densely populated areas and highways.[104] Thus, Ethiopia may not need many fast-charging stations at this stage and could be served with slow public charging points and home chargers.

Charger compatibility is equally critical as battery technologies are fast changing to improve its capacity and driving range.[105] Standardisation refers to the many aspects of EV chargers

[98] Fanchao Liao, Eric Molin and Bert van Wee, 'Consumer preferences for electric vehicles: a literature review' (2017) 37(3) Transport Reviews 252, 261.

[99] Ibid.

[100] IEA, 'Global EV Outlook 2019' (n 4) 60.

[101] Patrick Morrissey, Peter Weldon and Margaret O'Mahony, 'Future standard and fast charging infrastructure planning: An analysis of electric vehicle charging behaviour' (2016) 89 Energy Policy 257; Simon Arpad Funke and others, 'How much charging infrastructure do electric vehicles need? A review of the evidence and international comparison' (2019) 77 Transportation Research Part D 224.

[102] Hall and Lutsey, 'Emerging best practices for EV' (2017) (n 93) 15.

[103] Scott Hardman and others, 'A review of consumer preferences of and interactions with electric vehicle charging infrastructure' (2018) 62 Transportation Research Part D: Transport and Environment 508.

[104] Erik Lorentzen and others, 'Charging infrastructure experiences in Norway - the worlds most advanced EV market' (EVS30 Symposium Stuttgart, Germany, October 9 - 11, 2017).

[105] III and Lusk, 'Addressing EV sales and range anxiety' (2016) (n 87) 65.

that make it accessible by different EV motorists - the power output range of the charger (level), the socket and connector used for charging (type) and the communication protocol between the vehicle and the charger (mode).[106] Standardisation requires a thorough assessment of current and future developments in EV and link it to the EV manufacturers to enable existing physical infrastructures serve future EVs. The Ethiopian Standard Agency (ESA) should spearhead the enactment of standards soon while the EV adoption is low, and before institutions start fragmented approaches.

#### *7.3.2 Stimulating a cooperative approach*

Ethiopia awaits the massive task of constructing these charging infrastructures that have attracted little attention and with no responsible agency for its construction and monitoring so far. Addis Ababa city started constructing modern bus depots in two areas (Shegole and Kality) which have charging stations for their future e-buses.[107] EVs are new to many Ethiopians and deserve a proactive government and guiding framework to encourage private investment. An expert has said that:

> Infrastructure is in its early stage. Facilities are not constructed and only done by individuals. Although EV technology and its use is new, people have shown interests. However, there is no framework to support these efforts and initiatives.[108]

At this early stage, policies should prioritise and support the installation of home, marketplace and workplace chargers for the reasons mentioned above. That will allow the government to harness the capacity and resources of EV owners to aid public policies. Simultaneously, authorities should map demands and design plan for installing public charging stations in major cities (provincial cities) across the country (estimated to be 80) and highway networks. The cost of installing public charging stations is prohibitively expensive, and the government should collaborate with local authorities and other stakeholders to pursue a gradual expansion of charging points. Experiences demonstrated that a collaborative approach among government at federal, national and local, electric utility company, technology innovators and charging point operators, EV car producers, and other service providers would successfully promote the expansion of charging

[106] IEA, 'Global EV Outlook 2019' (n 4) 169.
[107] Interview with FTA official (FTA-01) (2019).
[108] Ibid.

infrastructure.[109] However, although most agree on the public-private-partnership for the expansion and administration of charging points, countries differ on the business model they would adopt and the roles of government and other stakeholders.[110]

In Norway, the government's generous support offered to EV adoption was extended to the expansion of the charging station.[111] Early in the adoption of EV, 2009-10, the government fully funded the installation of about 1800 household EV chargers followed by similar support for companies wanting to install public fast-charging stations.[112] Among these were the 2015 government initiative to fund the installation of fast-charging stations along the main road in every 50 km. This initiative stimulated private charging operators to expand the fast-charging stations along other highways and urban centres without public funding.

Similarly, expansion of charging stations in China was driven mainly by generous government funding where both central and local governments have installed large numbers of public-funded charging stations.[113] In addition, the state electricity utility company has installed fast-charging stations along corridors and cities. Some EV auto manufacturers (e.g. BYD) have also installed dedicated charging points although its compatibility with other users posed a barrier. Scholars argued that the high involvement of government enterprises or holdings in the development of charging infrastructures allowed for the expansion of charging station during the initial stage but has now threatened its sustainability, efficiency and future innovation.[114] China is also known for designing and updating its policies, strategies and targets for the deployment of EV charging points, and recently opened the door for public-private-partnership to flourish.[115] These decisions have contributed to the proliferation of local EV production in China.

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[109] Hall and Lutsey, 'Emerging best practices for EV' (2017) (n 93).

[110] Ying Li and others, 'Business innovation and government regulation for the promotion of electric vehicle use: lessons from Shenzhen, China' (2016) 134 Journal of Cleaner Production 371, 381.

[111] Figenbaum, Assum and Kolbenstvedt, 'Electromobility in Norway' (2015) (n 17); Lorentzen and others, 'Charging infrastructure experiences in Norway' (2017) (n 104).

[112] Ibid.

[113] Hall and Lutsey, 'Emerging best practices for EV' (2017) (n 93) 8.

[114] Li and others, 'Business innovation' (2016) (n 110); Lin Ma, Yuefan Zhai and Tian Wu, 'Operating Charging Infrastructure in China to Achieve Sustainable Transportation: The Choice between Company-Owned and Franchised Structures' (2019) 11(6) Sustainability 1549.

[115] Zhenya Ji and Xueliang Huang, 'Plug-in electric vehicle charging infrastructure deployment of China towards 2020: Policies, methodologies and challenges' (2018) 90 Renewable and Sustainable Energy Reviews 710.

A different business model and government role were observed in South Africa, which has an infant but the largest EV fleet in Africa, where a passive government was overtaken by an active private sector investment in expanding charging points. Private individuals and companies (e.g. Jaguar Land Rover, BMW, Tesla and Shell) have taken the lead to expand EV charging station at home, service centres and highways.[116] At times, these companies have partnered with commercial and public enterprises (e.g. supermarkets, hotels, airports and highway administrators) to install charging stations. Most importantly, GridCards business, local technology innovators and charger operator, is at the heart of installing and operating many of the South African public charging points.[117] However, reviews reiterated that EV penetration in South Africa was constrained by the absence of public policy support like EV standard, comprehensive strategy and incentive package.[118]

The Ethiopia government should find a middle ground to stimulate the expansion of charging infrastructure as it cannot afford to splash massive public funding as observed in China and Norway. Similarly, the South African experience will not work due to Ethiopia's underdeveloped auto manufacturing sector and lower purchasing power of commuters to be early movers without financial incentives. However, the government could harness the capacity of existing car and auto technology dealers, and collaborate with its state enterprises to design a PPP business model.

#### *7.3.3 Institutional and regulation frameworks*

Primarily, institutional responsibilities should be defined, and multi-sector coordination team should be established to oversee infrastructure expansion and standardisation. Currently, Ethiopian Electric Power (EEP) holds the monopoly over the construction and administration of power generation plants, transmission lines and substations. In contrast, the electricity distribution networks are constructed and managed, and electricity tariffs fixed and collected by another state monopoly enterprise, Ethiopian Electricity Utility (EEU).[119] These enterprises should be entrusted with new roles and responsibilities

[116] Dane, Wright and Montmasson-Clair, 'Exploring the policy impacts of a transition to EV in South Africa' (2019) (n 51).

[117] Ibid.

[118] Lindiwe Bokopane, Kusakana Kanzumba and Herman Vermaak, 'Is the South African Electrical Infrastructure Ready for Electric Vehicles?' (2019 Open Innovations (OI), Cape Town, South Africa, 127-131).

[119] Ethiopian Electric Power Establishment Council of Ministers Regulation No. 302/2013; Ethiopian Electric Utility Establishment Council of Ministers Regulation No. 303/2013.

regarding charging stations. Nevertheless, highway administrators should also construct charging stations along their corridors and assign operators until a national or regional charging station register is established. Whereas, SMEs (small and medium-sized enterprises) could be supported to serve as technology innovators and operators of charging facilities.

An incentive package like tax exemption or subsidy for chargers could stimulate instalment of home chargers. Much is to be seen as to whether the existing electric network supplied to homes can host slow-charging point for an EV. However, data suggests that a household socket is supplied with a 220 V at a frequency of 50 Hz and the maximum current on a socket outlet is 15A or 3.4kWh. In that case, seven hours are sufficient to charge a 24kWh battery with a slow charger (Level 2). However, the improvement of the electric network is needed to run fast charging points and avoid power interruption during peak hours. In South Africa which has the same network capacity as Ethiopia, it was suggested that charging outlets require double the existing load and a stand-alone charging point for the new car models which has larger battery capacity and more extended driving range.[120] Hence, the electric utility operator, Ethiopian Electric Utility (EEU), should consider future developments of EV technologies and the country's intended path for EV adoption when constructing local grid systems. Meanwhile, the EEU should map areas where fast-charging stations could be established without much pressure on the grid and ensure the safety of home-charging points.

Likewise, strategies should be designed to encourage and incentivise private actors to participate in the business of charging infrastructure. For instance, commercial centres, public institutions, parking facilities, mixed-use buildings, and commercial centres have the capacity and opportunity to install charging stations to encourage EV penetration. That might require, among other things, revising road and construction standards and guidelines to require developers to install EV charging points and stations in new or refurbished buildings (e.g. houses, multi-occupant buildings) and highways. The standard should further indicate how many slots or charging points are required for each type of development. In addition, local operators and councils should consider installing charging station on areas

[120] Bokopane, Kanzumba and Vermaak, 'Is the South African electrical infrastructure ready for EV?' (2019) (n 118).

where overnight on-street parking are practised so that drivers who do not have dedicated parking or workplace charging facilities are not left behind.

Besides, the issue of design, location and administration of charging stations, charging fees, users' right and responsibilities like the priority of parking in slots which are fitted with charging machines requires detailed legal instruments.[121] The law should, inter alia, determine charging owners for hours spent on the EV-charging slots after fully charged (than per kWh) but left charger unplugged, and allow unplugging the charger cable from an already charged car without the permission of the latter.[122] Indeed, payment for kWh is preferred by drivers as they pay the actual price for the energy they get but detrimental for the system as the total price depends on many external factors like the condition of battery on-board and charger temperature.[123] Moreover, per minutes charging fee deters drivers from leaving their car plugged-in for long after it was fully charged and hence avoid idling and queues. Regulation could also require EV to display 'charging complete' sign visible for other users to unplug the charger and use in other EV. Such regulations will give confidence to early adopters and certainty to potential investors in the sector.

Finally, visibility of public charging stations should be enhanced such as by posting clear signs along main streets leading to urban areas and around petrol stations to minimise cruising time in search of charging station and minimise range anxiety. Besides installing public charging points in or close to existing petrol stations is both attractive and practical for some users as observed in other countries.[124]

Leapfrogging requires committed government structure and pro-active decisions. Until charging stations can run on market price, the government would find and cultivate a feasible business model to support and stimulate them. Furthermore, the government has additional duties of becoming risk-taker by greening its own fleet to build purchasers' confidence in EVs.

[121] III and Lusk, 'Addressing EV sales and range anxiety' (2016) (n 87) 70.
[122] Ibid.
[123] Lorentzen and others, 'Charging infrastructure experiences in Norway' (2017) (n 104).
[124] Morrissey, Weldon and O'Mahony, 'Future standard and fast charging infrastructure' (2016) (n 101).

## 7.4 Support to EV Industries

### *7.4.1 Public procurement target*

Investment in innovation like EVs involves risks for investors. Nevertheless, the government could reduce and share this risk by designing policies that support investors such as by reducing the purchase cost gap between EVs and conventional cars and executing public procurement programmes and awareness campaigns.[125] When government institutions and companies use EVs, it increases visibility and awareness, accelerates the diffusion and builds trust in EV's utility through their social capital to influence.[126] Municipalities in Norway and central and local governments in China are among the primary buyers of EVs, especially at the beginning of its introduction.[127] The UK government decided to improve the government's fleet by purchasing only ultra-low emission vehicles unless exceptionally required.[128] Once public institutions and companies assume a greater risk by becoming first movers in EV adoption, private owners will gradually develop the confidence to purchase EVs.[129]

In a DC like Ethiopia and with a developmental state political economy, public procurement constitutes a significant share of GDP.[130] Evidence also suggests that government and company cars make up a significant number of the existing fleet in Ethiopia,[131] and hence public procurement target and company purchase could yield positive results on EV adoption and promotion. Currently, car purchase requests of government institutions pass through a central pull system executed by the Public Procurement and Property Service Agency and supervised by the Ministry of Finance.[132] A single regulation that gives

[125] IEA, Energy technology perspectives 2017: catalysing energy technology transformations (IEA/OECD, 2017) 86.

[126] Egnera and Trosvik, 'EV adoption in Sweden' (2018) (n 1) 591.

[127] Figenbaum, Assum and Kolbenstvedt, 'Electromobility in Norway' (2015) (n 17) 31; Yan Zhou and others, 'Plug-in electric vehicle market penetration and incentives: a global review' (2015) 20 Mitig Adapt Strateg Glob Change 777, 788.

[128] UK, 'The Road to Zero' (2018) (n 32) 60.

[129] Shu Yang and others, 'Which group should policies target? Effects of incentive policies and product cognitions for electric vehicle adoption among Chinese consumers' (2019) 135 Energy Policy 1, 7.

[130] Baynesagn Asfaw Ambaw and Jan Telgen, 'The Practice of Performance-Based Contracting in Developing Countries' Public Procurement: The Case of Ethiopia' (2017) 17(3) Journal of Public Procurement 402.

[131] Interviewed new car importers and assemblers have identified government and companies as their primary clients. Interview with Deputy Sales Manager of vehicle import and assembly company (CI-03) (2019).

[132] Public Procurement and Property Service Agency Establishment Council of Ministers Regulation No 184/2010.

preferential treatment to EVs during such procurement process will change the adoption pattern of EVs.

Moreover, in consultation with local producers and importers, these regulatory institutions can set a future target of EV purchase and how government institutions should manage their requests. However, this is a tough decision to make because of EV's cost and the additional finance it requires. Nevertheless, the low operational costs of EVs will make public institutions to be the ultimate beneficiaries of EV purchase. Besides, the government can use the scheme to stimulate local EV car production and further job creation in the value chain.

Ethiopia can also roll out EVs in the urban mass transport sector which is currently operated by public enterprises with government subsidy.[133] The government could start it by adopting electric buses at least in big cities like Addis Ababa and regional cities. Charging points could be installed in depots, garages and terminals to allow slow over-night recharging and fast charging points in selected terminals. Central and local governments are already investing in the expansion of urban buses and could use the opportunity to show its climate change commitment that will encourage other early adopters. Furthermore, the local company METEC that assemblies most of the current buses will benefit from the technology transfer and R&D investment, and could expand it to its other automotive production lines.

In addition to a government institution, EV could be adopted in corporate fleets as businesses can pay the higher initial cost, assume more significant risks, be early adopters and are open to innovations.[134] Such EVs could be used as company cars supplied to its employees or in their commercial fleets, especially in urban and semi-urban areas. On their part, firms could use their green fleet to demonstrate their environmental sensitivity, influence social behaviour and as a marketing strategy. Furthermore, firms would benefit from the lower operational cost of EVs that are otherwise higher in the corporate ICE fleets

[133] Interview with FTA official (FTA-01) (2019).

[134] Sigal Kaplan and others, 'Intentions to introduce electric vehicles in the commercial sector: A model based on the theory of planned behaviour' (2016) 55 Research in Transportation Economics 12; Jens Klauenberg, Christian Rudolph and Jürgen Zajicek, 'Potential users of electric mobility in commercial transport – identification and recommendations' (2016) 16 Transportation Research Procedia 202.

due to higher distance-travelled and regular maintenance requirements.[135] Government enterprises like telecom, power and electricity, water, health, financial institutions etc should spearhead the initiative and set a fleet target. However, not all firms are proactive, and the government might need to design incentives and information instruments, or link EV fleet share with pre-existing incentives to stimulate procurement decisions of such firms.

Compulsory EV sales requirement of major auto manufacturers or importers is attempted in well-developed EV markets like China and California with a considerable success of forcing auto manufacturers to invest in the EV production line, marketing strategy and design.[136] Nevertheless, such measures are detrimental and coercive to an early market like Ethiopia that has no meaningful local EV car producer. However, the government could design other instruments to stimulate local production of EVs.

#### *7.4.2 Industrial support*

In the well-developed EV market, industries are supported by public instruments in the form of direct subsidy to R&D, tax credits, adjustment of the tax system, government purchase, and co-financing promotional events.[137] Given the nature of the local industry, the government could contribute to industrial efforts with different public policies although not necessarily through a direct grant to R&D. Local assembly of conventional cars has started a few years ago and needed government support to launch EV production lines.[138]

The new tax reform is conducive to stimulate local production of vehicles in general. CKD kits for BEVs could be imported free of customs duty and excise tax, while SKD is subject to a 5% customs duty and no excise tax.[139] The incentives might be too little to bridge the cost gap between locally assembled BEVs and ICE vehicles, especially for the smaller cars with a cylinder capacity (CC) of less than 1300 where CKD and SKD kits of ICE vehicles are subject to 5% excise and 5-10% customs duty (Table 5-1 on Chap 5). However, for the larger cars,

[135] Kaplan and others, 'Intentions to introduce EV in the commercial sector' (2016) (n 134).

[136] Slowik and others, 'International Evaluation of electromobility policies' (2018) (n 17) 16.

[137] Zhang and others, 'Policy Incentives for the adoption of EV' (2014) (n 18).

[138] For instance, Betret International plc assembles cars produced by BYD Auto, a leading Chinese EV producer. Likewise, Marathon Motors is assembling Hyundai cars and announced its first-ever locally-assembled EVs recently and expanding its market to the region.

[139] Excise Tax Proclamation No 1186/2020.

the excise tax on the ICE vehicle kits will go from 60% to 100% while the kits for BEVs remain free from excise taxes.

Furthermore, the excise tax does not make a distinction between those produced with local products and imported kits. This is in contrast to the bill's explanation that it envisages encouraging taxpayers to use local raw materials to benefit from a lower excise tax rate. It is right in other products such as beer and wine where using local raw materials beyond a certain percentage will entitle producers to a lower excise tax rate, but such is not observed in vehicle production. The MoTI envisages to augment production of local components and parts and be able to produce local cars destined to local and foreign markets. However, under the excise tax, locally produced cars and imported cars will be taxed similarly as it implicates that all cars are produced with imported CKD or SKD kits. However, there is a slight difference in the customs duty that indirectly encourages local production of cars and importation of CKD over SKD and completed cars (Table 5-1 on Chap 5).

One of Ethiopia's many industrial parks under development, Dire Dawa Industrial Park, in the Eastern city of Dire Dawa is planned to host, inter alia, automotive assembling plants.[140] Linking such industries with publicly funded higher institutions fosters technology adoption and diffusion. The government may not have the financial means to provide direct R&D subsidy or enough to match the investment in major EV producing countries but can allow public higher institutions to partner with vehicle or component producing companies.

Ethiopia also has the potential to emulate Chinese and Indian cities in three/two-wheeled EV fleets.[141] Regional cities are already flooded with Indian and Chinese made conventional three-wheeled vehicles that are used as taxis. Nevertheless, investors have shown interest in establishing assembling electric two/three-wheeled vehicles.[142] These EVs are rechargeable at home with a conventional plug-in socket or via extension cords that will relieve governments from massive charging infrastructure expansion. The additional requirements of public charging could be supplied by local SMEs that are involved in two/three-wheeled vehicle maintenance and repair services. Local governments can set a

[140] Ethiopia, Industry Park Development Corporation (IPDC) <www.ipdc.gov.et> accessed 20 June 2020.
[141] IEA, 'Global EV Outlook 2019' (n 4) 43.
[142] Japanese Company Manufactures Electric Car for Ethiopia, ENA, Addis Ababa, 26 April 2019 <www.ena.et/en/?p=7543> accessed 4 Dec 2019.

short, mid and long-term target and adopt strategies for encouraging the adoption of three-wheeled EVs in their cities. For instance, cities can ban conventional three-wheeled taxis from accessing artery roads and entering city centres.[143]

Unfortunately, Ethiopia has not attracted investment in the exploration of lithium, nickel, cobalt and copper that are used to produce EV battery and other essential components despite few mentions of its presence albeit in a smaller quantity.[144] Instead, if well tapped, the presence of higher education institutions and technical and vocational training institutions across the country are conducive for the expansion of SME that could produce parts and components.

Generally, Ethiopia has the potential to leapfrog into EVs by stimulating local production of EVs. However, although it has started to reform its laws to support low-carbon mobility, more is required in the areas of designing clear and comprehensive strategy, institutional setup, tailored incentive schemes and predictable targets.

## 7.5 Environmental Impact of EV

Climate interventions are weighted not only based on their mitigation potential but also the possible disruption they might inflict on the ecosystem. Thus, we discuss the two possible environmental effects of EVs - lifecycle carbon emission and waste battery management system.

### *7.5.1 Lifecycle emissions*

In the decarbonisation of cars, the source from which EV battery drains its energy determines the mitigation potential of an EV. Studies show that the lifecycle mitigation potential of an EV is a factor of 'the GHG emissions from electricity, the percentage of fossil fuel in the electricity mix and the electricity consumption of the BEV [EV] during use.'[145] If

[143] Interview with FTA official (FTA-01) (2019).

[144] Getaneh Assefa, 'The Mineral Resources Potential of Ethiopia' (1991) 5(2) Bull. Chem. Soc. Ethiop. 111-137; Solomon Tadesse, Jean-Pierre Milesi and Yves Deschamps, 'Geology and mineral potential of Ethiopia: a note on geology and mineral map of Ethiopia' (2003) 36 Journal of African Earth Sciences 273; MoM, 'Strategic Assessment of the Ethiopian Mineral Sector: Final Report' (Ministry of Mines of Ethiopia and World Bank July 2014) <http://documents.worldbank.org/curated/en/490391468029355059/pdf/891390REVISED00260201400FOR0WEBF002.pdf> accessed 17 Jan 2020.

[145] Zhixin Wu and others, 'Life cycle greenhouse gas emission reduction potential of battery electric vehicle' (2018) 190 Journal of Cleaner Production 462.

the grid is supplied with fuel or coal-powered electricity, EVs decarbonising potential will be off-set by higher GHG emissions in the electricity production stage.[146] On the average, the lifecycle carbon emissions of ICE car is estimated to be around 250 gCO2/km whereas for BEV it ranges from 75 to 300 gCO2/km depending on the source of electricity (renewable, mixed or coal-powered).[147] Thus, EVs that draw energy from a coal-powered electric grid have higher lifecycle carbon emission than a fuel-powered ICE car.[148] A study in Malaysia where 92% of the electricity is sourced from fossil fuels (coal and natural gas) concluded that the country could not count on EVs mitigation potential until it improves the high carbon electricity source.[149] Hence, as much as we advocate for changing the fleet composition, the source of electricity should be considered to assess the real mitigation potential of EVs and avoid shifting the problem.[150]

Ethiopia's energy plan has focused mainly on utilising its vast hydroelectric potential along with wind, solar and geothermal energy sources.[151] Its five-year economic plan, Growth and Transformation Plan II (GTP), planned to increase the power generating capacity from 4,180MW in 2015 to 17,208MW by 2020 - of which 97% will be from green sources like hydropower (80%), wind (7%) and geothermal (3%).[152] Due to the delay of completing the Grand Ethiopian Renaissance Dam (GERD), the country's generating capacity stalled at 4,244 MW in 2019.[153] Out of this installed capacity, 90% of it comes from hydroelectric power while wind (7.6%) and geothermal (0.2%) sources.[154] With no coal plant added to the

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[146] Chiu Chuen Onn and others, 'Greenhouse gas emissions associated with electric vehicle charging: The impact of electricity generation mix in a developing country' (2018) 64 Transportation Research Part D 15.

[147] ICC, 'Effects of battery manufacturing on electric vehicle life-cycle greenhouse gas emissions' (Briefing, International Council on Clean Transportation, February 2018) <https://theicct.org/sites/default/files/publications/EV-life-cycle-GHG_ICCT-Briefing_09022018_vF.pdf> accessed on 27 August 2020.

[148] Gebrehiwot and Bossche, 'EV Possibilities' (2014) (n 81) 8-9; IEA, 'Global EV Outlook 2019' (n 4) 8.

[149] Onn and others, 'GHG emissions associated with EV charging' (2018) (n 146).

[150] Linda Ager-Wick Ellingsen, Bhawna Singh and Anders Hammer Strømman, 'The size and range effect: lifecycle greenhouse gas emissions of electric vehicles' (2016) 11(5) Environmental Research Letters.

[151] Getachew Yilma Debela, 'Critical success factors (CSFs) of public-private partnership (PPP) road projects in Ethiopia' (2019) International Journal of Construction Management. See also Public-Private Partnership Proclamation No 1076/2018.

[152] Ethiopia, 'Growth and Transformation Plan (GTP) II 2014/15 to 2019/20' (MoFEC, 2015) 179.

[153] Ethiopian Electric Power, Power Generation, <www.eep.com.et/en/power-generation/> accessed 2 December 2019.

[154] Ibid.

grid and less than 3% sourced from fossil fuels, the Ethiopian electric grid is considered as green that would make the lifecycle emissions of EVs to the minimum.

### *7.5.2 Waste battery management*

The existing waste management system in Ethiopia is rudimentary and insufficient to safely dispose of waste battery that poses a severe environmental threat.[155] The legal frameworks are very generic and would require a comprehensive system to deal with wastes like the battery.[156] With the increase in EV intake, Ethiopia needs to create a new waste battery management system built on Reduce, Reuse and Recycle (3R) frameworks than landfill or incineration as often practised.[157]

Technologies and system are evolving to avoid putting end-of-life batteries into landfills through secondary use of EV batteries for stationary storage purposes, and recovering important components and feed to battery production lines through the 'extended producers responsibility' (EPR) schemes.[158] Secondary uses of EV batteries are proven to have a positive environmental impact by enabling the use of low price off-peak clean electricity and improving energy and material efficiency.[159] The EPR schemes will allow battery producers to redesign their structure and content to allow easy recovery at end-of-life. For instance, the EU already banned incinerating and landfilling waste battery (with some exceptions), set the minimum rate of recovery and established producers' responsibility.[160] Among other things, the directive requires the establishment of waste battery collection centres and producers to finance such a scheme.[161]

The recommended new system for Ethiopia provides end-to-end regulation that eliminates undesired environmental impacts of the technology. The disposal of waste battery could be considered along with scrapping and end-life-vehicle systems discussed under Chapter 5

[155] Pollution Control Proclamation No 300/2002; Solid Waste Management Proclamation No 512/2007

[156] Israel Deneke Haylamicheal and Solomon Akalu Desalegne, 'A review of the legal framework applicable for the management of healthcare waste and current management practices in Ethiopia' (2012) 30(6) Waste Management & Research 607.

[157] IEA, 'Global EV Outlook 2019' (n 4) 180.

[158] Ibid; Leila Ahmadi and others, 'A cascaded life cycle: reuse of electric vehicle lithium-ion battery packs in energy storage systems' 2017 22(1) International Journal of Life Cycle Assessment 111.

[159] Casals, García and Canal, 'Second life batteries lifespan' (2019) (n 84).

[160] EC Directive 2006/66/EC on batteries and accumulators (2006), Arts 14, 8, 16, Annex III, IV.

[161] Ibid, Arts 8 and 16.

above. Whereas, battery and EV retailing stores, maintenance and service centres, and garages could be entrusted with the task of collecting waste battery as well.

Finally, it is noted that the socio-environmental problems associated with private cars are only reduced but not entirely eliminated with EV.[162] Hence, EV is only a second-best option for transport mitigation as it has less potential than avoiding motorisation and shifting to NMT and public transport. The extraction of materials and emissions during the production and disposal of EV battery, congestion and land use issues associated with the use of private EV cars will make EV less sustainable than the other mitigation options.

## 7.6 Conclusion

EVs are considered to be one of the solutions for leapfrogging to a low carbon transport system. Countries have enacted strategies, road map and regulatory frameworks to support technology innovation and encourage early adopters. These frameworks address the three fundamental barriers of EV adoption – higher initial cost, driving range and charging infrastructure. Although the cost of an EV is reducing significantly, many high-income countries have used a range of fiscal incentives, subsidies to R&D and expanding charging infrastructure to encourage EVs uptake. As a result, EV adoption is increasing, and EV manufacturers have expanded their product line. However, much has to be done in car-importing and DCs to benefit from the mitigation potential of EV. Apart from China and to a limited extent in India and most recently, Chile, strategies to support the adoption of EV in the context of low-income countries is incomplete.[163]

EV might seem to be costly to Ethiopia, given its reliance on public investment but is with great climate mitigation potential and other co-benefits. It is essential to consider EV as an integral part of transport decarbonisation than as an isolated stand-alone solution to the many problems of automobility. Ethiopia’s green electricity source, lower electric fare and reduced operational cost make EVs attractive to buyers. The government could save billions of its dwindled foreign currency by replacing fuel with locally sourced electricity to power the cars on the road. Besides, as high-income countries are accelerating the phase-out of

[162] Daniel Newman, ‘The Car and the Commons’ (2016) 48(1) Review of Radical Political Economics 53.

[163] WB, ‘Electric Mobility and Development: An Engagement Paper from the World Bank and the International Association of Public Transport’ (World Bank, Dec 2018) 23.

ICE cars, lagging behind this pace will make Ethiopia either a dumping place for ICE cars or costly process to catch up others later.

Ethiopia was a pioneer in enacting comprehensive climate policy, CRGE, in 2011 that also indicated adopting EV as one strategy, but its implementation has lagged. It has not designed enforcement instruments, assigned responsible institutions or set mid-term targets for EV adoption. However, the recent revision of its fiscal laws, i.e. custom duty and excise tax, has signalled the beginning of the long-overdue incentive scheme that could help the penetration of EVs. The fiscal incentives offered to EV will successfully reduce the price gap, and give BEVs competitive advantage over its ICE equivalent. This, coupled with the low cost of electricity and other EV operational costs in Ethiopia, will contribute to the massive task of encouraging EV uptake. Although the proposed laws are indications that the government is committing resources to EVs adoption, they will have limited effect unless the charging infrastructures are expanded.

EVs diffusion requires understanding the whole system and addressing it through a comprehensive strategy rather than the piecemeal approach Ethiopia chose to do. Ethiopia needs to design an electric mobility strategy to spearhead EV adoption and avoid a possible lock-in situation resulted from the current fragmented approaches as part of a grand transport decarbonisation process. The strategy will, inter alia, map the path Ethiopia should adopt, instruments required to redress barriers, cost of doing so, and define the role and responsibilities of different institutions – public, private and community. The strategy should then be followed by specific legislations to fill the legal vacuum, including revising the standards for road and building construction to include EV charging points and craft new standards for EV charging stations.

Broad and proactive engagement of different stakeholders, including manufacturers, utility suppliers, transport providers, local government and civil societies is a preferred approach.[164] Among these stakeholders, only the latter one is missing in the Ethiopian system in general and in the transport sector in particular. Besides, the isolated efforts made by businesses and association need to find a joint platform to contribute to the much-needed EV adoption and diffusion.

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[164] ibid

The proposed instruments and new regulatory system on EV follows a comprehensive system design and cover every aspect of EV operation. This includes incentivising local production of EV through tax relief and fiscal measures, additional financial incentives for buyers, issuing standards for EV cars and charging stations, designing a tailored business model for expanding charging infrastructure, priority for EV cars on essential operating services (e.g. parking), and establishing waste EV battery disposal scheme.

*Table 7-1 Types of instruments for supporting EV adoption*

| Incentive types | Effect | Example countries | Requirement |
|---|---|---|---|
| ***Fiscal*** | | | Revenue sensitive |
| 1. Rebates (e.g. Cash for clunkers, other subsidies) | High | Austria, Belgium, Bulgaria, Cyprus, France, Ireland, Italy, Luxemburg, Portugal, Spain, Sweden, UK, China, Japan, Korea, USA, | Comes with cap and fixed-term; requires ear-marked budget; lowers the price of EV and expand adoption |
| 2. Ownership Tax exemption/reduction (e.g. VAT) | High | Austria, Cyprus, Denmark, Finland, Germany, Greece, Hungary, Ireland, Italy, Luxemburg, Portugal, Sweden, UK, China, Japan, Norway, | Could be on any form of ownership tax; narrow the gap between ICE car & EV; |
| 3. Registration fee exemption/reduction | High | Austria, Belgium, Cyprus, Finland, France, Hungary, Ireland, Latvia, Netherlands, Norway, Romania, Spain | Could be registration or license fee; very strong in countries with high registration fee like N |
| 4. ACT or road tax exemption/reduction | Moderate | China, France, Germany, Japan, Netherlands, Norway, Sweden, UK | Second to ownership tax reduction/exemption |
| 5. Income tax credit (e.g. company car) | Low | Portugal, Belgium, the UK, the Netherlands, Sweden, Germany, Portugal | Tax credit for the cost of company EV car; encourage EV intake by companies |
| 6. R&D subsidy | Moderate | Austria, Germany, Denmark, Finland, France, Italy, Spain, the UK. | Accelerate innovation and diffusion; reduce EV cost; encourage EV investment by companies |
| ***Traffic Regulation*** | | | Less expensive |
| 7. Preferential lane access (e.g. bus & HOV lane) | Low | China, Netherlands, Norway, California, (USA) | Often taken by regional or city governments except in Norway; good for congested cities like in China |
| 8. Preferential parking access | Low | China, Denmark, France, Germany, Netherlands, Norway, UK, USA | Often applied at regional or sub-regional level in a smaller amount |
| ***Infrastructure*** | | | |
| 9. Expanding public charging stations | High | Germany, Japan, France, Netherlands, Norway, Spain, Luxemburg, UK,[*] Malta, Greece, Hungary, | Lower operation cost; a key factor for high EV uptake; reduce range anxiety; extend driving range; few provide free charging |

[*] UK doesn't support public ownership of charging stations but designed strategies to support businesses, community groups and homeowners to expand charging infrastructure networks. UK, 'The Road to Zero' (2018) (n 32) 15.

| | | | |
|---|---|---|---|
| | | Ireland, Latvia, Portugal, USA, Korea, Japan, China | |
| 10. (Public) procurement target | High | Belgium, France, Canada, China, France, Germany, Spain, Sweden, Japan, Netherlands, Norway, UK, Korea, USA, India | Sends clear signal to stakeholders; foster investment by EV industry; nurture early adopters (e.g. government) |
| 11. Public outreach and demonstration programs (educational programs) | Moderate | Belgium, Estonia, China, Finland, Germany, Netherlands, Norway, Poland, UK, California, | Increase commercialisation of the new product; increase exposure; improve consumers perception & experience; break the technology anxiety |

Source: Extracted from different sources[†]

[†] Slowik and others, 'International Evaluation of electromobility policies' (2018) (n 17); Cansino, Sanchez-Braza and Sanz-Diaz, 'Policy Instruments to Promote Electro-Mobility' (2018) (n 2).

# Chapter 8
# Approaches to Strategy and Instrument Choices

**Introduction**

In both the best and worst-case scenarios, carbon emission from Ethiopian transport is projected to increase for the foreseeable future and road transport accounts about three-fourth of the sector's emissions.[1] This was not, however, matched with proper mitigation measures and implementation schemes to halt the emissions trajectory. Ethiopia's Carbon Resilient Green Economy (CRGE) and other mitigation strategies provided the initial frameworks for mitigating emission from the transport sector. However, this thesis revealed significant gaps both in the design and execution of these mitigation measures.

Thus, decarbonising the road transport sector necessitates a new approach that characterises new contexts pertinent to the nature and cause of the emissions, provides a framework for tackling the cause, detailed mitigation strategies and tailored instruments. That requires not only improving the efficiency of cars but also additional reinforcements to utilise the full mitigation potential of the sector.

Hence, this chapter is devoted to discussing further the opportunities for combining the various approaches and strategies to stimulate the decarbonisation process. The conventional path of mitigation attains incremental change, but there are opportunities for transformation through the integration of modes and leapfrogging across most transport components. Accordingly, BRT and NMT are discussed below not only as essential mitigation strategies by their own but also as complementary strategies whose integration with car regulation will accelerate the decarbonisation process. Ethiopia's readiness to go the leapfrogging path, the requirements and challenges to it are also discussed. The chapter reiterates that, along with EV, the BRT and NMT systems are considered as leapfrogging paths for DCs like Ethiopia. Besides the principles and approaches that have guided the choice of instruments that would stimulate integration and leapfrogging, as presented in

[1] Ethiopia, 'Carbon Resilient Green Economy (CRGE) strategy' (MoFEC, EPA Addis Ababa, 2011) [CRGE Strategy]; MoT, 'Transport Sector National GHG Inventory 2014-2016' (Unpublished, Ministry of Transport, Addis Ababa, 2019).

the preceding chapters are summarised. Finally, the chapter closes with a discussion on the importance, limitations and prospects of the current work.

## 8.1 Integration of Strategies

Although car regulation is central to any transport decarbonisation discourse, it alone could not solve the complexities of transport emissions and respond to the growing challenges of mobility demands. Hence, decarbonisation efforts should inevitably consider the potential of other transport modes and enhance the capabilities and efficiencies of green transport so that additional commuters will not shift from green to carbon-intensive modes. This argument is fundamental for Ethiopia where most daily trips, nearly 85% in Addis Ababa, are done through walking and public transport rather than private cars.[2]

Integration in transport regulation is the design, coordination and synergy of different transport modes, operational systems and mitigation strategies to achieve all of the 'Avoid, Shift and Improve' (ASI) transport goals.[3] In this context, the strategies and instruments that were discussed in the preceding chapters (Chapter 5-7) aimed at discouraging car ownership have also the potential to stimulate the use of other modes (e.g. bus or NMT).[4] Equally, besides its lower or zero per capita emissions, NMT and public transport services has the spin-off effect of minimising private car use. However, this integration could be scaled up with a proper design and conscious decision making.

This section discusses how the NMT and BRT systems could be integrated with car regulation to enhance the mitigation efforts further. The discussion also highlights how innovative design and operational efficiency in these two modes could make them the future leapfrogging scenario. In this sense, leapfrogging refers to the ability and resilience of the transport system to maintaining and improve the current high rate of public transport and NMT shares that high-income countries were not able to attain.

[2] AA, 'Non-Motorised Transport Strategy 2019-2028' (Addis Ababa City Road and Transport Bureau, November 2018, Addis Ababa).

[3] Michael Howlett and Jeremy Rayner, 'Design Principles for Policy Mixes: Cohesion and Coherence in 'New Governance Arrangements' (2007) 26(4) Policy and Society 1, 7; Felix Creutzig and others, 'Towards demand-side solutions for mitigating climate change' (2018) 8 Nature Climate Change 260, 262.

[4] Hari Bansha Dulal, Gernot Brodnig and Charity G. Onoriose, 'Climate change mitigation in the transport sector through urban planning: A review' (2011) 35 Habitat International 494.

### *8.1.1 BRT*

A review of BRT in DCs found significant cost savings, social equity impacts due to enhanced access, reduced time and cost of travel, lower emissions, increased health and traffic safety to the lower segments of the community.[5] Hence, BRT networks have grown exponentially in DCs in the last decade both as a decarbonisation measure and urban mobility solutions including in African cities (e.g. Johannesburg and Dar es Salaam).[6]

Addis Ababa is planning to operationalise its first 17.5 km long BRT corridor (BRT II project) by 2023.[7] According to a respondent who works in the project, when constructed, the BRT will have integrated electronic fare collection, ticket scanning at the stations, priority in the intersection, lanes segregated by curve and stations tailored to the cities master plan.[8] At the design level, the BRT corridor is aligned with other mass transport services so that the latter would feed the BRT system. Hence, construction of inter-modal hubs that will bring regular bus, taxis and BRT in close distances are planned. More importantly, the new corridor crosses suburbs and centres that the existing light rail transit (LRT) does not cover.[9]

Integrating BRT services with other modes, especially NMT networks, will make BRT a pro-poor and socially equitable urban solution.[10] These include providing feeder networks to and from BRT stations to neighbourhoods and improving footpaths and cycling infrastructures along the BRT corridors.[11] As witnessed in Curitiba and Beijing, integration with other modes and provision of feeder bus services from low-density residential areas to the BRT stations have improved its operational efficiency and carrying capacity.[12] Besides

[5] Taotao Deng and John Nelson 'Recent Developments in Bus Rapid Transit: A Review of the Literature' (2011) 31(1) Transport Reviews 69, 86; Felix Creutzig and others, 'Transport: A roadblock to climate change mitigation? Urban mobility solutions foster climate mitigation' (2015) Science 350 (6263) 911; Christoffel Venter and others, 'The equity impacts of bus rapid transit: A review of the evidence and implications for sustainable transport' (2018) 12(2) International Journal of Sustainable Transportation 140.

[6] Luis Antonio Lindau, Dario Hidalgo and Daniela Facchini, 'Curitiba, the Cradle of Bus Rapid Transit' (2010) 36(3) Built Environment 274; Fabio Duarte and Tatiana Gadda, 'Curitiba: The intended/unintended co-benefits of investing in public transport' in Christopher N H Doll and Jose A Puppim de Oliveira (eds), *Urbanization and Climate Co-Benefits Implementation of win-win interventions in cities* (Routledge 2017).

[7] Interview with a project manager at Addis Ababa Transport Project Management Office (TPMO) (TPMO-02) (Addis Ababa, Ethiopia, 24 July 2019).

[8] Ibid.

[9] Ibid.

[10] Venter and others, 'The equity impacts of BRT' (2018) (n 5).

[11] Ibid 149.

[12] Taotao Deng and John D Nelson, 'Bus Rapid Transit implementation in Beijing: An evaluation of performance and impacts' (2013) 39 Research in Transportation Economics 108; Fiona Ferbrache, 'The value

such integration would eliminate the last-mile dilemma of commuters that are often cited as reasons for private car use, and extend the alternative transport to door-to-door service.[13]

Integration of BRT with other modes is crucial for improving the overall transport service and mitigation. For instance, studies indicated that BRT's impact on reducing private car use was negligible as most of the BRT users were those who have shifted from conventional bus services and not from private car uses.[14] Different reasons were mentioned for that such as the absence of complementary instruments (e.g. restrictions, ownership charges etc) that make car ownership expensive and inconvenient.[15] Likewise, evidence revealed that wrongly designed infrastructure, operational inefficiency and absence of integration with other modes have exacerbated congestion and increased travel time for other transport modes along the BRT corridor (e.g. Jakarta, Indonesia).[16]

Addis Ababa has taken a vital lesson from others and has planned to improve and maintain roads along the BRT corridor to allow smooth traffic flow of other users and avoid congestion.[17] However, as the BRT runs through one of the city's busiest market places, providing alternative routes to other road users (vehicles and pedestrians) and preventing them from encroaching in to the BRT lane requires new infrastructure and traffic regulation.

Perhaps despite a commendable political will to establish BRT, technical and institutional capacity to design and operationalise integrated BRT system will be the major challenge for Ethiopia.[18] For instance, the planners have prioritised the physical infrastructure but overlooked creating a regulatory system such as defining rights and responsibility of actors

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of bus rapid transit in urban spaces' in Fiona Ferbrache (ed), *Developing Bus Rapid Transit: The Value of BRT in Urban Spaces* (2019).

[13] Deng and Nelson, 'Bus Rapid Transit implementation in Beijing' (2013) (n 12).

[14] Ibid; Synthia Angelina, Dirk Vallée and Conny Louen, 'The barriers in the implementation process and the operation of innovative urban transport: The case of BRT Jakarta' in S Ricci and CA Brebbia (ed), *WIT Transactions on The Built Environment* (WIT Press 2017, Vol 176).

[15] Thaned Satiennam and others, 'Potential for modal shift by passenger car and motorcycle users towards Bus Rapid Transit (BRT) in an Asian developing city' (2016) 39 IATSS Research 121, 129; Angelina, Vallée and Louen, 'The Barriers in the implementation process' (2017) (n 14); Arya Gaduh, Tadeja Gracner and Alexander D. Rothenberg, 'Improving mobility in developing country cities: evaluating bus rapid transit and other policies in Jakarta' (November 2017) <http://barrett.dyson.cornell.edu/NEUDC/paper_284.pdf> accessed 02 March 2020.

[16] Gaduh, Gracner and Rothenberg, 'Improving Mobility in DC Cities' (2017) (n 15).

[17] Interview with a project manager at TPMO (TPMO-02) (2019).

[18] Ibid; UNEP, 'Terminal Evaluation of the UN Environment-GEF Project "Promoting Sustainable Transport Solutions for East African Cities"' (Evaluation Office of UN Environment January 2019).

(including road and BRT users), its interaction/integration with other modes, real-time passenger information systems and the personal safety of commuters.[19]

### *8.1.2 NMT*

Well-designed NMT is immune from many of the modern transport problems such as congestion, predictability of travel times, and health and environmental effects.[20] A study also found that cyclists are happier than people who use other modes of transport.[21] Its multiple economic and social co-benefits make NMT a pro-poor and equitable strategy: the cheapest mode of transport, enhancing the mobility of suburbs which otherwise are inaccessible with other modes, and improving connectivity with socio-economic opportunities.[22] Likewise, a report found that shifting current Addis Ababa's trips covered by walking and motorisation to cycling could save cost and time, enhance personal safety and improve health conditions of commuters.[23]

Ministry of Transport (MoT) and Addis Ababa city have recently prepared their own NMT Strategies.[24] Unfortunately, the strategies have not discussed how NMT will be integrated with other modes of transport but focused on a single component of expanding infrastructure network. [25] Even then, they focused on building new corridors rather than reclaiming spaces from street vendors, on-street car parking and other activities that use footpaths and road lanes. Besides, the strategies were prepared by consultants, and it is not known how sectoral offices (road, urban planning and construction agencies) have

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[19] Interview with a project manager at TPMO (TPMO-02) (2019); Lee Chapman, 'Transport and climate change: a review' (2007) 15 Journal of Transport Geography 354, 363.

[20] Katherine Pérez and others, 'The health and economic benefits of active transport policies in Barcelona' (2017) 4 Journal of Transport & Health 316; Becky P Y Loo and Alhassan Siiba 'Active transport in Africa and beyond: towards a strategic framework' (2019) 39(2) Transport Reviews 181.

[21] Eric Morris and Erick Guerra, 'Mood and mode: does how we travel affect how we feel?' (2015) 42(1) Transportation 25.

[22] Elliot Fishman, Simon Washington & Narelle Haworth, 'Bike Share: A Synthesis of the Literature' (2013) 33(2) Transport Reviews 148; John Pucher and Ralph Buehler, 'Cycling towards a more sustainable transport future' (2017) 37(6) Transport Reviews 689.

[23] Getu Segni Tulu, M Hadgu and AG Tarekegn, 'Bicycling in Addis Ababa, Ethiopia: Opportunities and challenges' (2019) 4(2) Journal of Sustainable Development of Transport and Logistics 50, 53.

[24] MoT, 'Ethiopia Non-Motorised Transport Strategy 2020-2029' (Ministry of Transport, Addis Ababa, 2020).

[25] AA, 'NMT Strategy 2019-2028' (2018) (n 2) 11.

contributed to it and committed to its integration with their respective activities (e.g. revise construction standards and manuals).[26]

NMT system inextricably intertwines with the regulation of cars. Research asserts that affordability and accessibility of cars threaten the viability and attractiveness of NMT, i.e. motorisation is inversely related to trips covered by walking and cycling.[27] Although longitudinal data is not available for Ethiopia to trace the effect of the recent surge in the rate of motorisation on NMT use, the situation will likely not be different from the rest of the world: as income increases those who walk or cycle will shift into purchasing motorcycles or cars.[28] Evidence from secondary cities of Hawassa and Bahir Dar found that an increase in social status and income reduced the viability and preference of NMT.[29]

Hence, an integrated transport system that links the effects of each measure to the whole system rather than to a specific mode should be preferred. For instance, NMT is an ideal solution for last-mile connectivity, and to offer uninterrupted and door-to-door services for public transport users who otherwise will use cars for the whole journey.[30] This requires horizontal and vertical coordination among different transport mode providers and infrastructure designers - BRT and LRT systems with their feeder bus, NMT and mini-bus service operators; NMT operators with BRT planners and operators; and beyond.[31]

Unfortunately, past NMT projects have failed due to proper planning and integration problems. A pilot bike project was launched in 2015 in Addis Ababa on three corridors (*Imperial*, *CMC* and *Ayat*) as a last-mile connectivity to the public transport (especially LRT)

[26] Interview with an expert at TPMO (TPMO-01) (2019); MoT, 'Existing conditions for pedestrians and cyclists in Ethiopia' (Ministry of Transport, UNEP and ITDP, Addis Ababa, Ethiopia June 2019) 18.

[27] Chapman, 'Transport and climate change' (2007) (n 19) 363; Dulal, Brodnig and Onoriose, 'Climate change mitigation in the transport sector' (2011) (n 4).

[28] Arve Hansen, 'Consuming doi moi: Development and middle-class consumption in Vietnam' (2017) 3(2) Journal of Social Sciences and Humanities 171, 177.

[29] Gebrechristos Nuriye, SSA Jafri and Melesse Asfaw, 'Trends and Factors Affecting the Use of Non-Motorized Modes of Transportation in Hawassa City, Ethiopia' (2014) 6(5) Civil and Environmental Research 103; Getnet Mequanint, 'Assessing challenges and opportunities of non-motorized transport in Bahir Dar city' (MSc thesis, Addis Ababa University, March 2019); MoT, 'Existing conditions for pedestrians and cyclists in Ethiopia' (2019) (n 26).

[30] Chaitanya Kanuri and others, 'Leveraging innovation for last-mile connectivity to mass transit' (2019) 41 Transportation Research Procedia 655; Ting Zuo and others, 'First-and-last mile solution via bicycling to improving transit accessibility and advancing transportation equity' (2020) 99 Cities 102614.

[31] Clelie Nallet, 'The Challenge of Urban Mobility: A Case Study of Addis Ababa Light Rail, Ethiopia' Notes de l'Ifri, Ifri (February 2018) 19.

consisting of bike lanes and bike rental scheme.[32] This externally funded project has failed due to poor planning, infrastructure design and implementation decisions.[33] Interviews revealed that city officials and MoT admitted that the project was executed without much preparation, robust assessment and consultation with stakeholders.[34] For instance, the bike scheme was implemented in affluent suburbs where car ownership was high, and shared-bike usage was unrealistic.[35] Hence, the underused bike lanes were encroached and damaged by other uses like waste dumping, parking, walking and construction material storage.[36]

Another bike scheme is under implementation in one of the secondary cities, Dire Dawa, with 15 km segregated bike lanes along a newly constructed artery road linking the city with an industrial and new residential suburb. Interview with an official and report prepared on the project reveals that this pilot project too has many integration deficiencies related to the corridor choice, track design and operating system.[37] Primarily, a 15 km long semi-urban route would be best served by mass transport than cycling which is widely preferred for short-distance trips along an interactive corridor. Although the draft national NMT strategy envisages to 'implement bicycle sharing systems in dense, mixed-use areas of primary and secondary cities to serve short trips and improve last-mile connectivity to public transport,' the project was executed as a long-distance bike corridor.[38] Furthermore, the cycling lanes were completed long ago, but other infrastructures and operational systems have not been installed to operationalise the scheme.

The two projects revealed the weaknesses in NMT design and planning, institutional capacity and the shortfalls of pursing project-based approach than creating integrated networks with other transport services. However, the country has tremendous potential

[32] Nallet, 'The Challenge of Urban Mobility' (2018) (n 31) 19; MoT, 'Existing conditions for pedestrians and cyclists in Ethiopia' (2019) (n 26).

[33] Ibid; Interview with an official at the MoT (Ministry of Transport) (MoT-01) (Addis Ababa, Ethiopia 22 July 2019); Tulu, Hadgu and Tarekegn, 'Bicycling in Addis Ababa' (2019) (n 23) 56.

[34] Interview with an official at MoT (MoT-01) (2019); Dawit Endeshaw, 'Non-motorized transport project in shambles' The Ethiopian Reporter, 26 August 2017 <www.thereporterethiopia.com/content/non-motorized-transport-project-shambles> accessed 27 July 2019.

[35] Ibid; MoT, 'Existing conditions for pedestrians and cyclists in Ethiopia' (2019) (n 26).

[36] Ibid.

[37] Interview with an official at Federal Transport Authority (FTA) (FTA-03) (Addis Ababa, Ethiopia, 8 August 2019); FTA, 'Dire Dawa Bike Transport System preparation monitoring reporting' (Federal Transport Authority, Unpublished, Addis Ababa 18 July 2019).

[38] MoT, NMT Strategy (2020) (n 24) 19.

and opportunities to establish a smart bike system. High-income countries have struggled to shift private car users to green transport modes, especially to NMT, due to higher rate of motorisation and cultural barriers but Ethiopia's commuters present an excellent opportunity for achieving this with a lower cost.[39]

In high-income countries, BRT and NMT are designed to induce 'shift' results, due to the current high rate of motorisation. Nevertheless, in Ethiopia due to the already higher share of public transport and NMT users and the recent trend of motorisation, these are a 'maintain' strategies as much as they are 'shift'. Hence, NMT and mass-transit along with electric vehicles and integration of the modes, open up another opportunity for a transport leapfrogging that high-income countries have unable to attain. For instance, seamless integration of smart-bike, e-buses and BRT could be designed where the former two serve as feeder routes to the latter to provide a door-to-door transport service. The next section discusses the basic requirements for achieving this leapfrogging.

## 8.2 Leapfrogging

Leapfrogging includes both inventing new modes or technologies (e.g. EV) and redesigning the low carbon mass and active transport modes by improving its features to offer the virtues of modern transport, i.e. accessibility, reliability, quality and efficiency. Adoption and diffusion of EVs are often considered as transport leapfrogging, especially in the context of DCs that have lower per capital motorisation. In addition to EVs, evidence shows that favourable opportunities exist for DCs to leap over the resource and carbon-intensive transport systems and pursue a green transport system through mass transit and NMT.[40] This, however, demands a clear understanding of the opportunities, breaking the barriers and expanding the enabling environment.[41] Considering the general political, economic and

[39] Tulu, Hadgu and Tarekegn, 'Bicycling in Addis Ababa' (2019) (n 23) 56.

[40] IPCC, Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, UK & USA, 2014) 7 (IPCC, 'AR5 WGIII' (2014), 1086; Desta Mebratu and Mark Swilling (eds), Transformational Infrastructure for Development of a Wellbeing Economy in Africa (AFRICAN SUN MeDIA and STIAS, South Africa, 2019) 28 & 117.

[41] Carlota Perez and Luc Soete, 'Catching up in technology: Entry barriers and windows of opportunity' in Giovanni Dosi and others (eds), *Technical Change and Economic Theory* (Pinter Publishers 1988), 478; Daniel Sperling and Deborah Salon, 'Transportation in developing countries: An overview of greenhouse gas reduction strategies' (2002) <https://escholarship.org/uc/item/0cg1r4nq> accessed 16 May 2020.

social contexts of Ethiopia, this section summarises the opportunities and the required infrastructure for leapfrogging to occur in the transport sector.

### *8.2.1 Opportunities to embrace*

The enabling environment and steps required for leapfrogging to occur in DCs and the transport sector are extensively discussed in the literature.[42] By analysing the Korean development path, Lee described that latecomers should build a certain level of capabilities (R&D and higher education), and ensure government commitment, national consensus and business discipline before launching leapfrogging.[43] Likewise, Wang and Kimble, Walz and Tukker referred to sound strategy, favourable regulation, coordination among different government ranks and entities, tailored business model, investment in R&D and infrastructure, and strong foundation in the skill base as driving forces for transport system innovation.[44] Regarding the physical structure, citing Curitiba's (Brazil) integrated public transport system, Tukker argued that DCs do not require the same level of infrastructure expansion and skill set achieved in high-income countries for achieving transport leapfrogging.[45]

Generally, researchers concur that sound strategy, favourable regulation, government commitment, coordination among agencies and entities, R&D and higher education base, and conducive business environment are the basics of transport leapfrogging. It is then vital to assess the availability of these enabling environment and their forms in Ethiopia to drive the leapfrogging path. The previous chapters revealed many of these opportunities and are summarised below.

The existence of a mitigation policy and clear target is the crucial foundation for embarking on any leapfrogging path. Ethiopia's ambitious target of achieving zero net carbon emission

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[42] Perez and Soete, 'Catching up in technology' (1988) (n 41); Mebratu and Swilling, *Transformational Infrastructure in Africa (2019)* (n 40). See also WB, 'Leapfrogging: the key to Africa's development - from constraints to investment opportunities' (Washington, D.C.: World Bank Group 2017).

[43] Keun Lee, Economic catch-up and technological leapfrogging: The path to development and Macroeconomic Stability in Korea (Edward Elgar Publishing, 2016).

[44] Arnold Tukker, 'Leapfrogging into the future: developing for sustainability' (2005) 1(2) Int. J. Innovation and Sustainable Development 65, 74; Rainer Walz, 'Competences for green development and leapfrogging in newly industrializing countries' (2010) 7 Int Econ Econ Policy 245, 247; Hua Wang and Chris Kimble, 'Leapfrogging to electric vehicles: patterns and scenarios for China's automobile industry' (2011) 11(4) Int. J. Automotive Technology and Management 312.

[45] Tukker, 'Leapfrogging into the future' (2005) (n 45) 76.

by 2030, as set in the CRGE and its broader global support are key opportunities. Furthermore, the CRGE embraced leapfrogging as one of its four-pillar economic-wide mitigation approaches and the single most in the transport sector.[46] Although CRGE considered only innovative hardware such as EV and electric rail and omitted other possibilities, the presence of a net-zero emission target could be used as an overarching framework to entertain other leapfrogging opportunities. Indeed, such a target enables the government to galvanise technical and financial support from global development partners, and mobilise internal resource into the cause.

Besides the policy and target, there is a growing investment in R&D and enhancing the skill-base both by government and the private sector. The establishment of new eco-industrial parks (including one dedicated for ICT and car assembling), higher and vocational institutions that have specialised in technology and engineering and the growing involvement of small and medium enterprises (SMEs) in the ICT sector are examples.[47] There is also a growing interest by auto manufacturers to start businesses, open subsidiaries, and stimulate technology solutions.[48] However, most of these initiatives are at the early stage of a challenging and intensive process of building the foundation and capacity of technology innovation.

For example, in a significant shift away from the developmental state political economy, the government is improving the enabling environment for private businesses and is opening up the market in areas that were once closed for private or foreign businesses.[49] Although much is to be seen, the government has taken bold measures to liberalise, inter alia, financial, energy generation and telecom sectors that will stimulate private investment in the clean transport system and technology solutions. Thus, ICT and artificial intelligence that supports the green transport system will flourish with the liberalisation of telecom and

[46] CRGE Strategy (2011) (n 1) 19, 26 & 165.

[47] Alebel Bayrau and others, 'Study on Industrial Park Development: Issues, Practices and Lessons for Ethiopia' (EDRI Research Report 29. Addis Ababa: Ethiopian Development Research Institute 2017) <http://www.edri.org.et/Resources/Research_Reports/Research_Report_029.pdf> accessed on 15 Feb 2020; Xiaodi Zhang and others, 'Industrial park development in Ethiopia Case study report' (UNIDO WP 21/2018) (Vienna, 2018). <https://www.unido.org/api/opentext/documents/download/10694802> accessed on 15 Feb 2020.

[48] MoU between Ethiopian Investment Commission (EIC) and Volkswagen Group (Unpublished, EIC Addis Ababa January 2019).

[49] Abiy Ahmed, *Medemer*, (Tsehai Publishers 2019 published in *Amharic*).

improved financial services (e.g. revolving innovative fund or entrepreneurial seed money). Technology-supported mobility solutions such as car-sharing, smart bike-sharing and e-commerce are already flourishing.

Such innovative technologies and operational solutions also benefit from the clean energy sources, for which Ethiopia has a natural advantage. With about 97% of the country's electric grid sourced from hydroelectric, wind and geothermal stations, Ethiopian's electric grid is considered as green and sustainable, and its carbon footprints are nearly zero.[50] More green energy sources are commissioned to utilise the untapped energy potentials to enhance its accessibility and reliability, which is the bottleneck at the current time.[51] This fosters leapfrogging paths that utilise the green energy potential of the country such as EVs, e-buses, e-bikes and electric train.

Furthermore, the current low rate of motorisation and the higher proportion of trips covered by walking and public transport (85% of the daily trips) makes decarbonisation appealing to DCs than in high-income countries with a locked-in situation.[52] Besides, the presence of a high proportion of the young population who are not yet gripped by automobility but commute through active and mass transport modes would make adapting to innovative mobility patterns easier. Moreover, to the satisfaction of these youth and poor communities, leapfrogging paths are expected to open up job opportunities and enhance social-inclusiveness and equity of the transport services.[53]

Finally, the introduction of new regulatory instruments that will stimulate the introduction and diffusion of new technologies in green transport solutions are witnessed in recent times. Ethiopia revised its excise tax and customs duty classification that gives price advantage to EV over conventional cars.[54] As discussed in Chapter 7 above, under the new excise tax law, new EV cars are exempted while conventional cars are subject to up to 100%

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[50] Ethiopian Electric Power, Power Generation, <https://www.eep.com.et/en/power-generation> accessed 2 December 2019.

[51] Ibid.

[52] MoT, 'NMT Strategy' (2020) (n 24).

[53] WB, 'Leapfrogging: The key for Africa's development' (2018) (n 42).

[54] Excise Tax Proclamation No 1186/2020 (Ethiopia); MoFEC, Amendment to the Harmonised System Nomenclature based on the 2017 version' July 2019, Addis Ababa, Ethiopia, chap 87108-144.

excise tax. Beside the tax advantage over conventional cars, the statutory recognition of EV and the new tariff classification has clarified the uncertainties over future transport paths.

These opportunities highlight that some of the necessary ingredients for the leapfrogging paths exist in Ethiopia and could be used as foundations. However, these opportunities are not enough to scale-up and consolidate the path unless the following barriers are lifted, the gaps are filled, and the leadership, regulatory and capacity limitations are rectified.

### *8.2.2 Challenges to overcome*

Scholars warn that despite the opportunities, not every latecomer can leapfrog because of the accompanying diverse risks and capacity to utilise the opportunities.[55] Many latecomers are the beneficiaries of incidental leapfrogging, i.e. technology and operational innovation imported incidental to international transactions. However, consolidating leapfrogging and using it for far broader mitigation requires readiness and pro-active engagement in policy and institution designs that many countries lack.[56] As presented below, Ethiopia is not immune from these challenges that deserve immediate attention.

It was mentioned that leapfrogging requires leadership and political commitment that is determined to withstand the social, political and corporate pressures that call for car-oriented and slow incremental changes. Perkins argued that a strong political commitment is required to 'challenge entrenched domestic and foreign interests' that are keen to pursue the business-as-usual path and view leapfrogging as their adversary.[57] Such political commitment, for instance, includes the desire and determination to cover the higher cost of technology innovation that has a long-term benefit and impact beyond electoral terms than short-lived tangible results. It is yet to be seen, however, whether such a coordinated and institutionalised political commitment is embraced by the current Ethiopian administration which has not taken any significant environmental measures but preoccupied with introducing political and economic reforms.

[55] Lee, *Economic catch-up and technological leapfrogging* (2016) (n 43).

[56] Jose Goldemberg, 'Technological leapfrogging in the developing world' (2011) 12(1) Georgetown Journal of International Affairs 135; Mebratu and Swilling, *Transformational Infrastructure in Africa (2019)* (n 40) 35.

[57] Richard Perkins, 'Environmental leapfrogging in developing countries' (2003) 27(3) Natural Resources Forum 177, 185.

This has resulted in the absence of a tailored and comprehensive transport strategy that provides the framework, certainty and predictability of future leapfrogging paths. A proactive strategy that defines the path, sets the enabling environment for businesses to flourish and invest in mobility solutions, mainstream, guide and monitor different stages and aspects of the leapfrogging process, and define the institutional set up is vital for Ethiopia.[58] However, the slow policy-making process prevalent in Ethiopia due to capacity and institutional fragmentation continued to be a barrier.

Beside clear strategies, leapfrogging requires regulatory instruments that will execute policies and strategies through the definition of rights and responsibilities. Currently, transport decarbonisation is regulated by fragmented laws that are inadequate and incomplete in many areas. This piecemeal and quick-fix approach was manifested in the recently enacted excise tax that, inter alia, provided a fiscal incentive for EV cars but without a single mention about charging equipment. Numerous legal vacuum is observed in the emerging topics such as car parking, car-sharing platforms, responsibilities of different road users, EV infrastructure uses, ICT uses in transport, scrappage and recycling scheme etc. In some of these areas, even a broader framework within which these topics could be defined and interpreted are absent.

The absence of tailored and comprehensive regulatory instruments, in turn, is the basis for the lack of institutional capacity. Needless to say that any change and new system, such as leapfrogging, requires strong and tailored institutional set up staffed with a skilled labour force. However, in Ethiopia, the capacity of institutions and critical leadership (both at government and firm) and fragmentation of institutions will become a bottleneck to execute leapfrogging.[59] For instance, interviews have revealed that Addis Ababa city does not have a permanent structure responsible for implementing NMT related activities.[60] Instead, it has an ad-hoc team where staffs from different departments and units were brought together temporarily to execute NMT related projects. Likewise, at the federal level, automotive and EV related matters are scattered across different regulatory offices

[58] WB, 'Leapfrogging: the key to Africa's development' (2017) (n 42).
[59] See Chap 2 above.
[60] Interview with an expert at TPMO (TPMO-01) (2019).

where none of them is capable of making strategic decisions beyond routine monitoring activities.[61]

Finally, although the private sector could raise some of the financial requirements, many of the leapfrogging scenarios require additional public funding for creating the enabling infrastructure.[62] BRT, EV charging infrastructure, power generation and other mass transport services demand significant investment that the private sector are often reluctant to contribute to.[63] For instance, the purchase cost of an electric bus is still about 40% higher than a conventional bus, and any decision of purchasing e-bus might require additional investment or slashing bus routes or fleet frequency (accessibility).[64] However, numerous low-cost and private sector-initiated leapfrogging paths can still flourish without much public financing. A renewed effort in promoting Ethiopia's green strategies and potential for leapfrogging may also attract additional funding through foreign direct investment. However, the flow of carbon finance is reported to be unsatisfactory compared with the scale of funds required to finance green investments.[65]

To sum up, creating the enabling operational and regulatory environment is vital for leapfrogging to a low-carbon transport system. Certainly, a country's success in the leapfrogging progress is mostly determined by its success in creating the required knowledge base, institutional and regulatory environment.[66] Ethiopia lags in this respect, and the political commitment observed during the early stages of CRGE strategy has weakened over the years.[67] However, leapfrogging paths that do not require higher capital and complex enforcement capabilities could flourish if some of the gaps such as regulatory, institutional and infrastructures are filled.

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[61] Interview with an expert in Ethiopian Metal Industry Development Institute (MIDI) (MIDI-01) (Addis Ababa, Ethiopia 27 August 2019); Interview with an official in Ministry of Trade and Industry (MoTI) (MoTI-02) (Addis Ababa Ethiopia, 24 July 2019).

[62] Mebratu and Swilling, *Transformational Infrastructure in Africa* (2019) (n 40).

[63] Creutzig and others, 'Transport: A roadblock to CC mitigation?' (2015) (n 5) 911-912.

[64] IEA, 'Global EV Outlook 2019: Scaling-up the transition to electric mobility' (IEA, Clean Energy Ministerial and Electric Vehicles Initiatives, May 2019) 45; Samuel Pelletier and others, 'The electric bus fleet transition problem' (2019) 109 Transportation Research Part C: Emerging Technologies 174.

[65] Interview with an expert at CRGE Facility (MOFEC-01) (Addis Ababa, Ethiopia, 25 July 2019).

[66] Mebratu and Swilling, *Transformational Infrastructure in Africa* (2019) (n 40) 49.

[67] Interview with an expert in an environmental consulting firm (EC-01) (Addis Ababa, Ethiopia, 8 August 2019); Interview with an expert at CRGE Facility (MOFEC-01) (2019).

This thesis has also analysed the regulatory instruments that could be utilised to execute broader mitigation strategies. It has identified significant gaps in the transport and car regulation systems and proposed new designing approaches for redressing it.

## 8.3 Mix of Instruments and Complementarity

Regulations in Ethiopia were practically command and control with little to no experience of using economic instruments, soft-instruments and co-regulation. However, the use of the mixes of instruments after a careful assessment of their complementarity and involvement of third parties in the regulatory system is proven to have a far-reaching impact.[68] Complementarity here refers to the positive interaction and synergy among the instruments used to achieve the desired mitigation. The discussion below highlights the approaches employed in the preceding chapters (Chaps 4-7) in designing the proposed transport regulatory system.

### *8.3.1 Public expenditure vs other instruments*

The overall developmental state political economy considers government as the major actor in many walks of life and public expenditure as a vital stimulant of the economy.[69] This was reflected in climate strategies as well that has prioritised public-funded mitigation strategies such as railway network expansion, biofuel development and BRT. This thesis, however, argued that although there is some truth in prioritising infrastructure expansion for a country which has the lowest coverage of transport and road density, the approach exhibited numerous limitations.

First, it failed to assess and then remedy the undesired consequences, limitations and sustainability concerns of such strategies. Road infrastructure expansion has fuelled motorisation and then congestion, traffic accidents, air pollution and carbon emissions. Besides the country found itself trapped into unprecedented foreign debt burden that has forced both loan providers and government to minimise future loan schemes. Secondly, the mitigation potentials of other mitigation strategies and instruments that require less government funding were overlooked and underestimated. As a result, introducing FES and

[68] Georgina Santos, Hannah Behrendt and Alexander Teytelboym, 'Part II: Policy instruments for sustainable road transport' (2010) 28 Research in Transportation Economics 46.

[69] Meles Zenawi, 'African Development: Dead Ends and New Beginnings' (Preliminary Draft dissertation, 2012).

carbon emission standards, restricting the importation of used cars, economic incentives for green transport modes and infrastructure expansion for NMT were delayed. Had these strategies been executed early on along with the transport network expansion (albeit with a different approach), Ethiopia could have significantly reduced transport emissions with improved accessibility.[70]

### *8.3.2 Comprehensiveness of the car regulation system*

Designing car regulation requires the understanding of the whole car system and identifying and enhancing those activities which have a positive impact, and minimising those activities which have a negative impact across the system.[71] Hence, a comprehensive understanding of the whole value chain, the nature of actors and how each actor could contribute to emission mitigation (barriers and opportunities), and identifying the possible regulatory instruments tailored to each actor and problems are crucial.[72] This enables to identify, besides the conventional mitigation strategies, other interventions (e.g. car inspection and scrappage) that are not often viewed as climate strategies but affect car performance and mobility. Such interventions have a complementary role in creating the enabling environment for conventional climate strategies to perform better. Likewise, the approach will not result in overregulation or layering of instruments as each of the instruments are designed to regulate a component/part of the system. The method is especially vital for DCs like Ethiopia that has an undeveloped policy and regulatory environment to match the scale and complexity of the climate challenge. Besides comprehensive assessment will provide regulators with the necessary evidence to make strategic prioritisation, and design reviewing and learning processes.

In a car regulation, this involves fixing loopholes and creating a system in the importation or production, during operation and final disposal. The proposed scheme requires modifying standards and working manuals, guidelines and templates that are used in the licensing production/importation, and inspecting products during customs clearance and conducting roadworthiness tests (inspection) before/after the car enters the road. Once

[70] Chapman, 'Transport and climate change' (2007) (n 19) 357.

[71] Neil Gunningham and Peter Grabosky, *Smart Regulation: Designing Environmental Policy,* (Oxford Press 1998).

[72] Neil Gunningham and Darren Sinclair, 'Regulatory Pluralism: Designing Policy Mixes for Environmental Protection, (1999) 21(1) Law & Policy 49; See also ibid, chap 6.

the car starts operation, besides regular and random-spot checks, other support systems like service and maintenance requirements, fuel quality enhancement, insurance scheme, traffic and parking regulation are critical components for the efficiency of the fleet.

Another feature of comprehensive regulation is to influence both the supply and demand side of a car market. Thus, carbon emission standards and FES will force automakers and importers to restrict gas guzzlers, and used-cars and stimulate innovation in the low or zero-emitting cars. Whereas, ownership tax, tax rebates, labelling and inspection are vital to influencing demand behaviour tailored to climate requirements.

In this regard, the 2020 new excise tax subjects vehicles to different tax rates based on their engine size, age (for used-cars), utility (mass transport or private passenger) and propulsion type (fuel, EV or hybrid-EV).[73] The major changes observed in it were subjecting electric vehicles to low (5% - 100%) and used cars to higher (50% to 500%) excise tax rate relative to conventional cars. Although the revision will discourage used-car importation, this thesis argued that it was a missed opportunity for incorporating other environmental features in the car regulation sector. To mention one, although environmental mitigation was mentioned as one reason for the revision in the preamble, fuel efficiency and carbon emission level were not considered as parameters in determining the tax rate and only the engine size and age were taken as proxy indicators of emissions level.

Car regulation also contains safely disposing of the car when its emissions level increases and economic value dwindles. Scrapping schemes, recycling of parts and extended producers responsibilities (EPRs) are some of the interventions needed but have not got enough attention in the mitigation discourse. The apparent regulatory gap in disposing of ELV and creating scrappage systems allowed clunker and unworthy cars to remain in the registration with all its technical deficiencies and high emissions level. The key actors of this process ought to be vehicle certification authorities, road transport authorities, scrapping centres and producers and importers of the cars. This is the stage where the private sector plays a crucial role with close supervision from agencies. A marketing linkage between car owners, scrapping centres, and car manufacturers and importers would foster a timely removal of clunker cars and recycling of their essential materials. A tailored version of

[73] Excise Tax Proclamation No 1186/2020.

extended-producers responsibility (EPR) could also help regulate the supply side of the used-car market and account importers and producers to the performance, recycling, reuse and disposal of used-cars.[74] In each of these stages, intervention is guided by synergy among multiple parties (agencies and third parties) and complementarity of instruments (ranging from fiscal incentives to standards, labelling to self-reporting).

Apart from regulating new cars, the thesis has revealed that used-cars and EV cars need similar regulatory systems that address every aspect of their demand and supply side. The absence of international regulation, the nature of car regulation in high-income countries and their cost contributed to the proliferation of used and sometimes waste cars in DCs that forces them to restrict and control the importation of used cars.[75] Regarding EVs, comprehensive regulation involves creating the enabling environment both for producers and buyers to be early movers. This includes incentivising local production of EV through tax relief and fiscal measures, additional financial incentives for buyers, issuing standards for EV cars and charging stations, designing a tailored business model for expanding charging infrastructure and establishing waste EV battery disposal scheme.

This increasing complexity of regulations and the emergence of new matters susceptible to intervention brought the discussion on the capacity of government and the necessity of sharing the regulatory burden with stakeholders. However, as discussed below, the restrictive enabling environment in Ethiopia, such as the political economy, slow democratisation process and inexperience of private actors constrains the role of stakeholders in the transport regulation.

### *8.3.3 Third-party participation*

Third-party stakeholders can fill the inherent limitation of government in the regulatory process due to resources, expertise, prioritisation or the nature of governance.[76] For

[74] Thomas Lindhqvist, 'Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems' (PhD thesis Lund University 2000).

[75] EC, 'Assessment of the implementation of Directive 2000/53/EU on end-of-life vehicles (the ELV Directive) with emphasis on the end of life vehicles of unknown whereabouts' EU DG Env, 2018, Brussels, 9; Anumita Roychowdhury, 'Consumer demand doesn't let countries ban the import of cheap used cars' Down To Earth, 15 November 2018 <www.downtoearth.org.in/news/africa/consumer-demand-doesn-t-let-countries-ban-import-of-cheap-used-cars-62135> accessed 23 March 2019.

[76] Julia Black, `Decentring Regulation: Understanding the Role of Regulation and Self-Regulation in a `Post-Regulatory' World' (2001) 54 Current Legal Problems 103; Carolyn Abbot, 'Bridging the Gap - Non-state Actors and the Challenges of Regulating New Technology' (2012) 39(3) Journal of Law and Society 329.

instance, in emissions level and roadworthiness tests, the government does not have the expertise or resources to comprehend the growing complexities involved in car design and the environmental threats posed by it. Hence, the state could let firms to do the tests but create the enabling environment, monitor their performance closely and reward or penalise them whenever necessary.

Accordingly, car manufacturers and importers, car owners, vehicle inspection centres, drivers' training institutions, service and maintenance centres, financial institutions and their associations could participate in the furtherance of public policy. Unfortunately, VAs (e.g. in the EU) and self-regulation that would have empowered car manufacturers on emissions regulation had failed in different jurisdictions and have not been suggested for Ethiopia too. The dieselgate scandal showed that in the absence of close monitoring and back stock, self-regulation and public shaming had yielded very little in the auto industries' environmental performance.[77] The incidence will remain as a vital lesson on how to balance flexibility with environmental effectiveness and involve businesses in the process.

However, co-regulation, where agencies will have an active role than in self-regulation but still from a distance relative to direct regulation, are a viable option to balance efficiency with effectiveness.[78] The co-regulator business will also enjoy the flexibility of designing and executing regulatory instruments subject to agency oversight and audit. The design could include rewarding over-compliance such as by waiving some reporting requirement or priority in agency service. However, agencies should devise mechanisms to monitor that regulatory flexibility are not abused and create counterproductive effects.

Similarly, the involvement of independent auditors (third party oversight) strengthens co-regulation by serving as mediators between agency and firms. Again, to avoid conflict of interest between the auditor and firms to be audited, the audit report could be submitted simultaneously to the regulatory agency for monitoring and take measures if necessary. Although it will not be simple in practice, the involvement of independent auditors and other third parties will block the alleged corrupt practices rampant in the regulatory system.

[77] VW's brands share in the UK car market were 8.39% (2010), 8.67% (2014), 8.57% (2015), 7.69% (2016), 8.21% (2017), 8.58% (2018) and 8.61% (2019). It has slightly declined in 2016 but remained stronger after that.

[78] Gunningham and Grabosky, *Smart Regulation* (1998) (n 71) 209.

For instance, independent auditing could be done in drivers training and car inspection centres which are currently monitored by the outstretched transport agencies. Based on the audit report and feedbacks from third parties, the agency may prepare accreditation and rank the centres based on pre-agreed criteria (e.g. car's performance after annual inspection, results from random spot-check, audit report). The centres could use the audit report and accreditation for their promotional purpose, which will create healthy competition among the centres and economic return on the investment made on the audit.

Similarly, financial institutions could play a complementary role with their market power and expertise by stimulating green consumptions. Tighter policies adopted by banks on vehicle credits, especially on personal vehicles, have contributed to the current low level of motorisation. Such could be complemented with a flexible loan disbursement for EVs, low emission vehicles and mass transport vehicles. Equally, insurance companies could redesign their auto policies to support low emissions cars and tighten up the requirements for older vehicles of certain years (e.g. require inspection certificates).

Apart from the business, civic societies and the public could contribute to the transport regulation. Unfortunately, the Ethiopian climate strategy was accused of following a top-down approach with no or little participation of the public and community leaders.[79] As a result, interviews revealed that climate mitigation efforts are not mainstreamed in sectoral plans, and the public has a poor understanding of the strategies, especially in the transport sector.[80]

Public consultation on government policy instruments before its enactment or implementation is rare despite the constitutional provision that requires the public 'to be consulted for policies and projects affecting their community'.[81] Public participation and consultation with the actors in the auto sector and the public while designing mitigation instruments could help to galvanise public support and change the attitude of commuters towards green transport. Very recently, a draft excise bill was presented before the Parliament for approval without engaging the public in the process. Businesses such as

[79] Interview with an expert at CRGE Facility (MOFEC-01) (2019); Christopher John Paul and Erika Weinthal, 'The development of Ethiopia's Climate Resilient Green Economy 2011–2014: implications for rural adaptation' (2018) Climate and Development 1.

[80] Interview with an expert in an environmental consulting firm (EC-01) (2019).

[81] Ethiopian Constitution, Proclamation No 1/1994, Arts 43(2) and 89(6).

used-car importers lodged complaints to the government which has later called a series of meetings with stakeholders.[82]

One way that the communication gap between government and the public could be bridged is through the participation of civic societies in environmental governance. Civic societies are an essential aspect of modern democratic society, and help to educate communities, hold regulators to account and monitor the performance of private actors. It is an effective strategy of 'harnessing non-state actors and resources in furtherance of public policy'.[83] However, the landscape was hostile in Ethiopia for civic societies to flourish and discharge their unmatched social obligations.[84] Hence, this thesis reveals that there is hardly any civic society that works on transport subjects and those that operate on subjects of environment, energy and urban communities rarely design transport emissions-related activities.

The draconian laws on media, professional associations, think-thank groups, charities and other civic societies have started to change since 2018 but will take time to cultivate the practice, redefine their role and enable them to support the regulatory efforts.[85] Equally, the long-practised governance culture in Ethiopia should gradually change to create mutual trust between agencies and civic societies and understand civic societies' potential to complementing environmental regulation.

Accordingly, it is unrealistic to envisage a regulatory system with significant participation of the civic societies for now. The regulatory design should instead understand their minimal capacity and prioritise on capacity-building efforts to strengthen their future involvement. It was witnessed that international partners have shown greater interest in urban mobility, transport emission and green transport subjects in recent times. For instance, the Car Free Roads (*Menged Le Sew*) initiative, a monthly campaign linked with similar global climate initiatives, have garnered the support of top politicians, public figures and urban

[82] Mulugeta G Sisay, 'Excise Tax: Reasons for Concern' Ethiopia Reporter, 11 January 2020 <https://www.thereporterethiopia.com/article/excise-tax-bill-reasons-concern> accessed 27 March 2020.

[83] Gunningham and Grabosky, *Smart Regulation* (1998) (n 71).

[84] Kendra E Dupuy, James Ron and Aseem Prakash, 'Who survived? Ethiopia's regulatory crackdown on foreign-funded NGOs' (2014) 22(2) Review of International Political Economy 419.

[85] Iginio Gagliardone, 'New media and the developmental state in Ethiopia' (2014) 113(451) African Affairs 279.

communities alike.[86] Such social movements have a more substantial social media presence and would also benefit from the improving mainstream media landscape to sensitise communities about climate change.

Furthermore, other information instruments (e.g. labelling, targeted educational campaign and eco-driving) could be used to sensitise the public and encourage green consumers who are early movers and risk-takers.[87] It is, however, rarely used in the Ethiopian context. For instance, labelling of car's fuel economy and emissions level both at production and their importation, especially for used-cars, should be an essential component of the regulatory design. Similarly, educational campaign on the leapfrogging paths such as EV and NMT stimulates early movers, accelerate diffusion and garner political support to the strategy.

Equally, eco-driving lessons that instruct car owners to be climate-sensitive during purchase and operation, besides the immediate economic return for the owners, reduce emissions.[88] Accordingly, drivers training curriculums should be checked against such eco-driving requirements and the changing mobility patterns and road-sharing such as NMT and BRT systems. A guiding manual that requires training institutions to include the topics and dedicate sessions for the same could be prepared by the industrial associations or transport offices.

### *8.3.4 Flexibility*

Finally, a regulatory system that is flexible and encourages innovation is desirable than rigid and uniform system due to the rapidly evolving environment and different situations of the subjects. Given the slow policy-making process exhibited in Ethiopia, continuous review of the regulatory instruments and amending it as required will be a daunting task. However, such flexibility could be included early in the design by mixing complementary instruments so that implementing agencies would escalate or deescalate the instruments whenever needed.

[86] It has not become a monthly campaign in selected streets of Addis Ababa where the Mayor and other public figures would join.

[87] Fabio Carlucci, Andrea Cira and Giuseppe Lanza, 'Hybrid Electric Vehicles: Some Theoretical Considerations on Consumption Behaviour' (2018) 10 Sustainability 1302.

[88] Yuhan Huang and others, 'Eco-driving technology for sustainable road transport: A review' (2018) 93 Renewable and Sustainable Energy Reviews 596, 597.

For instance, FES and carbon emission standard are proposed to be complemented with a different tax rate for those who exceed and fall short of meeting the standards. Equally, the proposed age restriction on imported used ICE cars could be ratcheted over the years with a clear insight of policy goals where used ICE car will be banned entirely. The tax incentives on EV should be contingent on the attainment of certain thresholds (e.g. percentage of fleet or price parity with ICE cars) to protect the revenue that is essentially used for supporting low emission transport system (e.g. bus, BRT, NMT). This is called attaching the carrot and stick closer together so that the carrot becomes more attractive when the alternative is the stick.[89] Thus, actors with rational decision making and capacity will respond to the carrot while the sticks will deter others.

In setting emissions and fuel economy standards, linking it with taxes and charges will encourage 'beyond compliances' and system innovation. For instance, if tax and duties were to be levied based on the car's emissions and fuel economy level, those who perform better than the requirement will be incentivised by a reduced tax while those who exceed the standards will be taxed heavily to internalise the environmental cost. However, the standards alone would struggle to create effective 'beyond compliance' incentive. Such flexibility also creates revenue balance where the revenue lost due to reduced tax for green cars are matched by the higher tax levied on high emitting cars. For the regulatory system to continue encouraging 'beyond compliance' and avoid 'regulatory trap', the system should be reviewed regularly to update the upper and lower limit of the standard based on global technology innovation, revenue and diffusion rate in the country. Determining the ceiling too high will have unnecessary economic cost while slashing it to too low will prejudice the mitigation efforts.

## 8.4 Looking Forward

### *8.4.1 Importance*

The current study only considered an aspect of the broader transport system and should not be taken as a representation of the whole road transport regulation or even car regulation. The research questions posed at the beginning of the thesis have guided the discussions which have started with exploring the multifaceted environmental and socio-

[89] Gunningham and Grabosky, *Smart Regulation* (1998) (n 71) 128.

economic implications of road transport. It then moved into analysing the strategies and mixes of instruments that would decarbonise Ethiopian road transport and cars. Finally, the leapfrogging potentials in the sector that would uplift the incremental changes of mitigation are explored. In so doing, besides the environmental discourses, it cuts through legal, social, political and economic aspects of the road transport and cars.

Hence, it has brought new perspectives relevant both for academicians and practitioners involved in environmental regulation and transport. It explored the unique challenges Ethiopia faces in achieving its mitigation target and possibly improve its potential. The discussions and findings are also vital for understanding the situations of other DCs that have relatively similar context with Ethiopia.

In terms of scope, the thesis entertained many new perspectives in the field. First, it showed the drawbacks and limitations of Ethiopia's much-celebrated massive road infrastructure expansion – such as social inequality, debt burden and increase in motorisation. Secondly, by using the lessons and politics involved in the EU and the US car regulation, the thesis argued that global regulation of car emissions is inconceivable in the short-term. Thirdly, in the used-car markets, not only the pull factors within the DCs but also the push factors, i.e. marketing strategies and instruments implemented in exporting countries that have made it impossible for the former to restrict its use were analysed. Fourthly, after a comprehensive analysis of the system, the thesis proposed an end-to-end regulatory framework for EV adoption and diffusion - starting with its production, through operation and safe disposal of wastes.

It also advocates a comprehensive and systemic approach of regulating car emissions than the post-crisis quick fix approach often practised. Hence, it provides an end-to-end approach, i.e. from production to disposal, in a manner that each intervention contributes to the mitigation efforts. The policy options proposed in each of the core areas presented alternatives for decision-makers together with the required enabling environment and sequencing. Thus, the methodologies employed could be replicated in other studies of environmental governance and mitigation in other sectors.

This thesis is different from most instrumental choice works that often apply economic modelling to understanding social phenomena and recommend instruments or a mix of instruments. The current work, however, used empirical and comparative methods such as key-informant interview, document review, observation and case studies to understand the phenomena and evaluate the instruments. Besides, it tried to apply instrumental choice theory in the context of a DC which has limited resource, implementation capacity and underdeveloped civic society. Hence, it adds perspectives to the works of John Braithwaite, Ian Ayres, Neil Gunningham, Peter Grabosky, Michael Howlett, Peter Van Gossum, Julia Black and Robert Baldwin.

Climate mitigation instrumental choices in DCs, especially in the transport sector, are overlooked in many academic, industrial and institutional works. For instance, the IPCC reports were shallow in characterising the transport situation of DCs and short of proposing viable alternatives that suit their context. Equally, the Ethiopian Panel on Climate Change (EPCC) reiterated the lack of scientific evidence and lack of experience in utilising various climate instruments in Ethiopia.[90] Hence, the current work will contribute to the ongoing discussion and filling the knowledge vacuum.

### *8.4.2 Challenges and limitations*

The political and economic dynamics in Ethiopia has affected the current work and was a constant challenge in developing some of the sections. Let us see a few of the contexts that have changed dramatically since the project started and how unsettling they were. Firstly, the 'developmental state' political economy seemed to reign Ethiopia for the coming decades when I began the work until a new model called *Medemer* (Amharic word for 'Addition' or 'Synergy') was announced in early 2019.[91] The real impact of it on transport is still uncertain, but *Medemer* leans to the free-market economy than the developmental state model. Secondly, the political commitment to climate mitigation was unwavering at the beginning but less clear and unsettled under the current leadership. Thirdly, the country's debt rating was favourable for large-scale foreign borrowing early on but fast deteriorated in the last few years. As a result, international donors and the parliament

[90] EPCC, First Assessment Report - An assessment of Ethiopia's policy and institutional frameworks for addressing climate change (Ethiopian Panel on Climate Change, Ethiopian Academy of Sciences, Addis Ababa 2015).

[91] Zenawi, 'African Development' (2012) (n 69); Ahmed, *Medemer* (2019) (n 49).

imposed strict scrutiny of foreign loan which has stifled the government's ability to invest in large scale infrastructure projects (e.g. power and road).

These and other dynamics have complicated the ability to predict the governance structure and recommend systems that suit the context. However, an insightful analysis was made based on not only the past and current but also foreseeable future scenario to maintain the relevancy of the work, strengths of the arguments and viability of the recommendations. Hence, literature, statistics and scenarios were updated to maintain the contemporariness of the work at the date of the submission.

The availability of empirical data on some parameters was limiting. Data were obtained from relevant offices but were incomplete or outdated such as on cars, trips made by different modes and purpose, parking use and vehicle emissions level. In other respects, some institutions have refused to share information that was kept under their custody – parameters used in road prioritisation and discussion minutes, fuel pumping price determination and minutes, vehicle tax revision reports, car producers' data etc. An attempt to trigger freedom of information act to obtain the data were rebuked as offices were not cooperative. These data could have improved our understanding of the subject and also triangulate the evidence obtained from interviews.

The absence of developed civic societies (e.g. independent media, NGOs, professional association etc) in Ethiopia has been limiting to test and recommend additional instruments to the regulatory mix. Regulatory designs presuppose the support (necessary for some and supplementary for others) provided by civic societies to monitor performance, enhance accountability and fill resource and capacity constraints of agencies.[92] Hence, instruments that heavily rely on third parties' oversight, like VAs and co-regulation, could not be discussed in details in the current work. Hence, given their infant development in DCs, the thesis presented alternatives to define the role of third parties in the regulatory system.

In terms of scope, the current work skipped various strategies that were used in the transport sector, such as biofuel production, hydrocarbon cells, car-sharing, road-pricing, e-commerce etc. This was made based on their suitability or mitigation potential to

[92] Neil Gunningham, 'Environment Law, Regulation and Governance: Shifting Architectures' (2009) 21(2) Journal of Environmental Law 179, 207; Neil Gunningham 'The New Collaborative Environmental Governance: The Localization of Regulation' (2009) 36 Journal of Law and Society 145.

Ethiopia, word limits, and to make the work a practicable recommendation than a wish-lists. Likewise, the discussion on NMT and public transport looked at only the integration and leapfrogging aspect of it than as a separate climate mitigation instrument due to the desire to focus on cars and private sectors than public expenditure in the current work. Otherwise, they were standalone climate strategies with significant abatement potential worthy of further inquiry.[93]

Another aspect that was not discussed to a significant detail is the implementation of the regulatory instruments mentioned and how that affects its success at last. Enforcement capacity and legal culture indeed determine the success of an instrument.[94] On the other hand, there are instruments which are easier to implement but with less mitigation potential. If implementation capacity were to be considered as the single most determinant of instrument choice, at the expense of the other parameters (like environmental effectiveness, economic efficiency and distributional equity), the thesis would have ended differently. Hence, implementation capacity was considered case-by-case only when it looks to be vital or when the other parameters are less important. Moreover, whenever possible instruments that stimulate cooperative regulatory system are favoured over coercive, punitive and criminalising instruments. Nevertheless, future work could look into the enforcement mechanisms (administrative, civil and criminal) in further detail to complement the preparation of regulatory toolkit.

Moving forward, I want to take the research further and design detailed regulatory toolkits for the car and the road transport regulation. Doing so will require additional analysis of the legal and institutional cultures to integrate the strategies with the existing system. The regulatory toolkit will provide alternative regulatory systems with detailed analysis of the requirements, strengths and weaknesses of each instrument. It then could be used by practitioners like development partners, policy-makers and civic societies as a practical example of regulatory design, and academicians to evaluate assumptions behind theories.

Lastly, there are lots of unexplored areas in the subject for future research, among which are the effect of the country's political economy on environmental governance and

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[93] Creutzig and others, 'Transport: A roadblock to CC mitigation?' (2015) (n 5).

[94] David S Zalob, 'Approaches to Enforcement of Environmental Law: An International Perspective' (1980) 3(2) Hastings Int'l & Comp. L. Rev. 299.

transport decision making. Furthermore, an environmental policy-making in DCs, African Union's role in climate governance, challenges and prospects of global used-car trade and adoption of EVs in DCs remained to be researched.

Nevertheless, it is hoped that this thesis has laid some of the foundations for a future study looking at these and other areas. Ethiopia's ambition for becoming a leader among DCs in decarbonising lives and 'green capitalism' is emerging as a global phenomenon. Thus, even in the absence of a working international regulatory framework applying to the decarbonisation of cars, many big global corporations and countries appreciate that carbon has less of a future than it once had. In these circumstances, support for robust climate policy and practice in Ethiopia can be found from both within and outside. It is hoped that this can be harnessed to the central argument of the thesis, advocating a diverse range of complementary instruments, tailored to 'local' conditions.

# Chapter 9 Conclusion

The thesis is concluded by presenting the complexities of the subject and the unfinished business of searching for an optimal mix of instruments and strategies.

## The complexity of transport regulation

The transport system is inherently complex as it involves multiple interests and actors and is linked with multiple policy objectives. Improved transport and enhanced mobility accrue economic and social benefits to communities such as better access to markets, education and health, supporting trade and competitiveness, and opportunities to reduce poverty and increase equity.[1] Among all the available modes, transport services are currently dominated by motorised transport that has become an inseparable part of daily lives.[2] However, unsustainability (socially and ecologically) and disruptive characteristics of motorisation have become evident and unbearable, and the enhanced understanding of climate change has only added a layer to that. More importantly, the extensive use of fossil fuel and the dominance of cars triggered critical discourses on how a civilised society should evaluate the virtues of existing transport systems and its impacts.[3]

However, greening transport is intrinsically intertwined with other socio-economic and political objectives that have garnered significant political support. In DCs, the socio-economic importance of transport is considerable due to the existing poor services and infrastructure deficit.[4] In rural Ethiopia, for instance, social services are still highly inaccessible, farmers travel long distances to access the market, the youth travels long distances on foot to reach schools and jobs markets, and health posts are hours and sometimes days away from communities.[5] This has forced governments to prioritise enhancing accessibility through massive construction of roads, reducing the cost of road

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[1] Kennedy K Mbekeani, 'Infrastructure, Trade Expansion and Regional Integration: Global Experience and Lessons for Africa' (2010) 19 Journal of African Economies 88; IPCC, *Mitigation of Climate Change.* Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge University Press, UK, 2014) 641.

[2] Daniel Carl Newman, 'Alienation and mobility. New Proposals' (2016) 9(1) Journal of Marxism and Interdisciplinary Inquiry 28, 29.

[3] See for instance Daniel Newman, 'Cars and consumption' (2013) 37(3) Capital & Class 457.

[4] Ibrahim Worku, 'Road Sector Development and Economic Growth in Ethiopia' (2010) 29(2) Ethiopian Journal of Economics 101.

[5] David Stifel and Bart Minten, 'Market Access, Well-being, and Nutrition: Evidence from Ethiopia' (2017) 90 World Development 229.

transport such as through fuel subsidy and reduced tax for vehicles even at the cost of ecological unsustainability.

Thus, an attempt to decarbonise transport and cars will be required to address multiple policy objectives - promote accessibility as much as mitigate emissions.[6] Multiple objectives are best addressed by a carefully selected combination of strategies and instruments. The thesis attempted to find an optimal mix of regulatory instruments by combining different frameworks and approaches that are used in transport systems, climate mitigation, and regulation. Thus, integration, leapfrogging, complementarity, comprehensiveness, etc are the approaches repeatedly referred and utilised in the thesis. This enables us to characterise the complexities of transport regulation, understand wide ranges of transport externalities, and identify specific instruments to rectify its pitfalls.

Discussions on transport mitigation lean towards improving cars and seeking solutions from future innovations. For instance, in high-income countries that are in a carbon-lock in situation, improving car efficiency through measures such as road pricing, taxation and standards are more prominent both in policy and literature than instruments that stimulate alternative transport modes. Even then, as observed in the US and the EU, enacting stringent standards and mitigation measures has faced fierce lobbying and pressure from companies whose influence has delayed the transition to green transport. Companies have used different techniques to force the government to enact lenient regulation and preserve the importance of cars in our daily lives such as threatening job reductions, sponsoring climate change denial research, lobbying for soft regulation, delaying the introduction of EVs, manipulating regulatory loopholes, and evading emission measurements. Hence, although alternative transport modes (e.g. NMT and mass transit) are attempted in some cities, the lobbying power of companies and the political acceptability of cars have restricted its utility and mass adoption.

The circumstance has equally affected regulatory approaches and the stringency of mitigation measures in car importing countries like Ethiopia. Gas guzzlers and used cars which were withdrawn from the roads of high-income countries are exported to low-

[6] OECD, *Instrument Mixes For Environmental Policy*, (OECD, Paris 2007) 25-27; Zifei Yang and others, 'On a pathway to de-carbonization – A comparison of new passenger car CO2 emission standards and taxation measures in the G20 countries' (2017) Transportation Research Part D.

income countries that have little restrictions. In the latter market, the cost of purchasing newly produced low emitting cars is prohibitive while used cars are sold at a significantly lower price. In the absence of import regulation, DCs like Ethiopia has become dumping places for such low cost high emitting cars.[7] Likewise, those exporting countries have done very little to design international regulation of the used car markets that could have restricted the marketing of high emitting cars. Equally, when DCs attempt to restrict entry to used cars on environmental grounds, exporting countries have threatened to retaliate through diplomatic warnings, trade wars, and WTO litigations.[8]

On the other hand, mobility demands of the growing population, western cultural influences to car obsession, and the state's ability to stimulate greener modes have retarded the country's ability and commitment to execute alternative transport modes and impose stringent car regulations. Moreover, stagnant policies that seek to replicate the carbon-intensive transport paths exhibited in high carbon-emitting countries and catch up others through the importation of obsolete car technologies have contributed to the situation. Thus, DCs have not benefited enough from the incremental fuel efficiency and emissions reduction improvements achieved over the past few decades partly due to slower technology diffusion and importing of emissions to DCs. The structural and strategic changes required in DCs to decarbonise transport could be difficult to achieve with the current pace of policy development and understanding. Similarly, a sequential approach of reducing carbon in advanced economies will not stabilise global carbon unless matched with an urgent action in DCs.

There is no one single solution to the ever-increasing transport emissions and other externalities that characterise current transport systems. Instead, the approach could be to assess the opportunities, evaluate the current system, and design one that responds both to mobility problems and redress other pitfalls of motorisation. So far, no single country has won the fight and designed a perfect regulatory system. However, the fight has continued, and literature has documented the best experiences. This thesis has used comparative studies to explore these experiences in selected countries that have documented/advanced

[7] Anumita Roychowdhury, 'Clunkered: combating dumping of used vehicles—A roadmap for Africa and South Asia' (Centre for Science and Environment, New Delhi 2018).

[8] See for instance WTO Panel, Brazil – Certain Measures Concerning Taxation and Charges' (Brazil-Taxation) WT/DS472/R WT/DS497/R 30 August 2017.

experience in implementing a specific mitigation instrument and could be replicated to Ethiopia. The comparative discussion revealed that countries have adopted different instruments depending on their respective circumstances, and no single instrument fits all. The heterogeneity of these instruments complicates the comparison of different jurisdictions and attribution of success or failure to a single instrument.

In the car regulation system, the thesis argued that some of these instruments like FES and ownership taxes could be adapted to Ethiopia with some modification while others such as fuel taxes are not conducive partly due to its burden on low-income groups and how the fuel market operates in Ethiopia.

### Ethiopian strategy

Ethiopia has embarked the climate mitigation strategy in 2011 and has attempted to implement them with a target of achieving a carbon-neutral economy by 2030. With a combination of mitigation measures, the strategy, inter alia, has estimated to reduce transport emission by 20% from the business-as-usual emissions of the target year. However, commentators and empirical evidence obtained for this thesis revealed that mitigation measures and strategies are predominantly capital intensive activities that require the public provision of goods and services.[9] Even then, the implementation of these mitigation strategies lags behind.[10]

Overall, climate strategies in Ethiopia exhibit two deficiencies. Primarily, the strategies have limitations in identifying more comprehensive ranges and cost-effective mitigation strategies and instruments and leaned towards capital intensive public expenditure measures. Strategies such as the construction of electric rail networks, bus-rapid transit (BRT) routes, and expansion of biofuel accounted for more than three-fourths of the country's mitigation potential but failed to materialise due to a shortage of funding.[11] Even then, these instruments are designed primarily to achieve socio-economic objectives where environmental goals are ancillary. Hence, its limited execution has an unsatisfactory effect on the environment and the authorities' flexibility to respond to growing concerns.

[9] Ethiopia, 'Climate-Resilient Green Economy (CRGE) strategy' (MoFEC and EPA, Addis Ababa, September 2011) [CRGE Strategy].

[10] MoT, 'Ethiopia: Transport Sector National GHG Inventory 2014-2016' (Unpublished, Ministry of Transport, Addis Ababa, 2019).

[11] CRGE Strategy (2011) (n 9) 169.

Moreover, these strategies addressed only the supply side of transport with little impact on the demand such as on commuters' behaviour or modal choice.[12] A regrettable omission in the mitigation strategies, for instance, was the cost-effective and green mode of non-motorised transport (NMT) that accounts for a majority of commuters' daily trips, e.g. 54% in Addis Ababa.

Secondly, even the strategies identified were not complemented with detailed implementation instruments nor were measures executed in due time, casting doubt on the government's commitment to the mitigation agenda and capacity to design and execute measures.[13] The experts and officials interviewed and documents reviewed for the thesis also revealed that authorities are not confident about the socio-economic effects of new strategies and instruments that diminish the importance of motorisation. After nearly ten years of implementation and halfway to the target year of 2030, most of the strategies mentioned in the CRGE were either not executed at all or only partially accomplished. Many examples could be mentioned on this such as the delay of the long-awaited fuel emission standard (FES) and construction of BRT routes and the fiscal incentives promised for electric vehicles (EVs), which only came in 2020.[14]

Besides the government has not shown enough urgency to decarbonise transport. Instead, a sequential approach of prioritising high emitting sectors – such as agriculture and forestry – has left the transport sector with a surge in emissions. Hence, a car system left unregulated for years have created layers of problems that touch every aspect of the car regulation system from its importation, across its operation and disposal. This thesis reveals that unless significant measures are taken to make up for the lost time and potential, Ethiopia is likely to miss its transport mitigation targets set for the transport.

The current rate of motorisation and dependency on fossil-fuel powered cars have, in turn, forced governments to invest in road developments both in urban and rural areas. Road transport and motorisation has been taken as the preferred and cheapest modes to

[12] EPCC, First Assessment Report - An assessment of Ethiopia's policy and institutional frameworks for addressing climate change (Ethiopian Panel on Climate Change, Ethiopian Academy of Sciences, Addis Ababa 2015) 21 (EPCC, AR1 Policy and Institutional) 65-68.

[13] Interview with an expert in an environmental consulting firm (EC-01) (Addis Ababa, Ethiopia, 8 August 2019).

[14] Excise Tax Proclamation No 1186/2020.

enhance accessibility. For many years both in developed and developing countries, motorisation and private cars have attracted political support. The government provides significant support to motorisation, sometimes at the cost of other modes, through road construction, land allocation, fossil fuel subsidy, public procurement of cars, allowances on used-cars, conversion of open/public spaces into car parking and roads, etc.[15] Similarly, cities have invested in improving road networks but little in public transport and NMT infrastructures. However, the evidence is growing to show the debacles of road transport and the virtues of alternative transport modes that have significant co-benefits beyond enhancing mobility. Such measures implemented for years were considered appropriate and remain widely unchallenged and supported by private actors.

Such was in contradiction with other policy objectives of reducing the externalities of motorisation - health, environmental, and social. On its part, the climate strategy has not envisaged to change the importance of cars or reduce the rate of motorisation. Hence, bringing structural change was not part of the strategy, and that led to the presence of contradictory policy objectives in different sectors. Instead, the strategy envisaged introducing measures aiming at improving emission levels. These policies convey different meaning in a country where only wealthy families owe cars.

According to the discussions in this thesis, one reason for the presence of competing objectives in policies is sectoralism – the failure of mainstreaming environmental objectives into other policies, development programs, and activities. Thus, interviews revealed that transport mitigation was left for transport offices – who in their part are less empowered to introduce significant policy and structural change but engaged in ordinary routine activities.[16] Vital policy decisions are made at higher government levels and often by the Prime Minister with the little involvement of experts at lower government offices.[17] This

[15] Interview with an expert in an environmental consulting firm (EC-01) (2019); Interview with an official at Ethiopian Petrol Supply Enterprise (EPSE-01) (Addis Ababa, Ethiopia 30 July 2019).

[16] Interview with an official at Federal Transport Authority (FTA) (FTA-03) (Addis Ababa, Ethiopia 8 August 2019).

[17] Christopher John Paul and Erika Weinthal, 'The development of Ethiopia's Climate Resilient Green Economy 2011–2014: implications for rural adaptation' (2018) Climate and Development 1; Philipp Rode, Biruk Terrefe and Nuno F da Cruz, 'Cities and the governance of transport interfaces: Ethiopia's new rail systems' (2020) 91 Transport Policy 76.

has contributed to the slow policy-making process and outdated measures that have handicapped implementation plans.

The thesis also revealed that the country lags behind in using various mitigation instruments that address different aspects of the transport sector. Overreliance in the conventional public expenditure (public provision of selected goods and services) such as electrification of rail networks and biofuel development has a limited effect on the decarbonisation process.[18] However, it is not the number of instruments used, but a careful mix of the instruments that would enable us to address different aspects of transport and enhance the co-benefits. More importantly, when such strategies and instruments foster systemic integration of modes, innovation, and leapfrogging, emissions could be reduced without compromising transport accessibility. Besides improving the car efficiency, structural transformation that stimulates the transition to green transport modes and diminishes the importance of motorisation are sought. Hence, beyond the traditional strategies and instruments that are often used in climate mitigations, innovative and tailored instruments are required. This thesis has recommended such instruments and the design of new systems to address different aspects of the sector, including car registration and deregistration and waste car disposal system.

Finally, decarbonisation requires extraordinary leadership, sound policy, and robust implementation instruments that remove the advantage cars have benefited over other modes and support the greener modes. Transport solutions are not only found in future innovations but embedded in past and present systems. Ethiopia has the potential to thrive in decarbonising transportation and cars through understanding these systems that will enable to establishing of low carbon transport modes, integrating it with car regulation, and embracing leapfrogging opportunities. This thesis contributes to the pursuit of strategies and instruments that will stimulate such paths and enhance transport accessibility.

[18] EPCC, *AR1 Policy and Institutional* (2015) (n 12) 67-68.

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