The Philippines Stocktaking Report on Sustainable Transport and Climate Change

Data, Policy, and Monitoring

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Tracking Sustainable Transport in the Philippines: Data and Policy Review for Energy Efficiency and Climate Change 2016

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The Project Context

The GIZ Programme on Cities, Environment and Transport (CET) in ASEAN seeks to reduce emissions from transport and industry by providing co-benefits for local and global environmental protection. The CET Project 'Energy Efficiency and Climate Change Mitigation in the Land Transport Sector in the ASEAN region' (Transport and Climate Change (TCC) www.TransportandClimateChange.org) aims in turn to develop strategies and action plans for more sustainable transport.

As presented to the ASEAN Land Transport Working group, TCC's regional activities are in the area of fuel efficiency, strategy development, green freight, and Nationally Appropriate Mitigation Actions in the transport sector. At the national level the project supports relevant transport and environment government bodies in the Philippines, Thailand, Vietnam, Malaysia and Indonesia, for the development of national action plans and improvement of policy monitoring systems. The project is funded by the German Federal Ministry for Economic Cooperation and Development.

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Abbreviations and Acronyms

ADB	Asian Development Bank
AJ-APEIT	ASEAN-Japan Action Plan on Environment Improvement in the Transport Sector
ALGAS	Asia Least-Cost Greenhouse Gas Abatement Strategy
ASBU	Anti-Smoke Belching Unit
ASEAN	Association of Southeast Asian Nations
ASIF	Activity-Structure-Intensity-Factor of Emissions
AusAID	The Australian Agency for International Development
BRT	Bus rapid transit
CAA	Clean Air Act
CBD	Central business district
CCC	Climate Change Commission
CH_4	Methane
CNG	Compressed natural gas
CO	Carbon monoxide
CO_2	Carbon dioxide
COC	Certificate of conformity
COP	Conference of Parties
CTF	Clean Technology Fund
DA	Department of Agriculture
DILG	Department of the Interior and Local Government
DOE	Department of Energy
DOST	Department of Science and Technology
DOTr	Department of Transportation
DPWH	Department of Public Works and Highways
DTI	Department of Trade and Industry
DTI-BPS	Department of Trade and Industry-Bureau of Product Standards
EDSA	Epifanio de los Santos Avenue
ERDT	Emergency Research and Development for Technology
ESITU	Environmentally Sustainable Initiatives Transport Unit
EST	Environmentally Sustainable Transport
GAA	General Appropriations Act
GHG	Greenhouse gas
GWP	Global warming potential
HC	Hydrocarbon
HDV	Heavy duty vehicle

INDC	Intended nationally determined contribution
IPCC	Intergovernmental Panel for Climate Change
ITPS	Institution for Transport Policy Studies
ITS	Intelligent transport system
JICA	Japan International Cooperation Agency
JUMSUT	JICA Update on Metro Manila Study on Urban Transport
Km	Kilometre
$ktCO_2e$	Kilo ton of carbon dioxide equivalent
KTOE	Kilo ton of oil equivalent
LCCAP	Local Climate Change Action Plan
LDC	Local Development Council
LDV	Light duty vehicle
LGU	Local government unit
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
LRT	Light rail transit
LRTA	Light Rail Transit Authority
LTFRB	Land Transportation Franchising and Regulatory Board
LTO	Land Transportation Office
MEPS	Minimum energy performance standard
MMBFOE	Million barrels of fuel-oil-equivalent
MMDA	Metropolitan Manila Development Authority
MMPTS	Mega Manila Public Transport Study
MMUTIS	Metro Manila Urban Transportation and Integration Study
MO	Manila Observatory
MRT	Mass Rail Transit
MRV	Measurement, reporting and verification
$MtCO_2e$	Million tons of carbon dioxide equivalent
MUCEP	MMUTIS Update and Capacity Enhancement Project
MVIS	Motor Vehicle Inspection System
MVUC	Motor Vehicle User's Charge
NAMA	Nationally appropriate mitigation action
NCCAP	National Climate Change Action Plan
NCR	National Capital Region
NEDA	National Economic and Development Authority
NEECP	National Energy Efficiency and Conservation Program
NESTS	National Environmentally Sustainable Transport Strategy

NFSCC	National Framework Strategy on Climate Change
NGO	Non-government organisation
NGVPPT	Natural Gas Vehicle Program for Public Transport
NIP	National Implementation Plan
NLRC	North Luzon Railways Corporation
NO_X	Nitrogen oxide
NRTSP	National Road Traffic Survey Program
NSCB	National Statistical Coordination Board
NTP	National Transport Policy
ODA	Official development assistance
OEB	Overall energy balance
OTC	Office of Transportation Cooperative
OTS	Office of Transportation Security
PDP	Philippine Development Plan
PETC	Private emission testing centre
PIDS	Philippine Institute for Development Studies
PIP	Public Investment Program
PKT	Passenger-kilometre travelled
PM	Particulate matter
PNR	Philippine National Railways
PPP	Public-private partnership
PRECIS	Providing Regional Climates for Impacts Studies
PSA	Philippine Statistics Authority
REECS	Resources, Environment and Economics Center for Studies
SIRPAFF	Survey on Inter-regional Passenger and Freight Flow
SO_2	Sulphur dioxide
SVPCF	Special Vehicle Pollution Control Fund
tCO_2eq	Ton of carbon dioxide equivalent
TDM	Travel demand management
TKT	Ton-kilometre travelled
TOE	Ton of oil equivalent
TRB	Toll Regulatory Board
TTPI	Transport and Traffic Planners, Inc.
UNCRD	United Nations Centre for Regional Development
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UP-NCTS	University of the Philippines–National Centre for Transportation Studies

USAID	The United States Agency for International Development
UVVRP	Unified Vehicular Volume Reduction Program
VKT	Vehicle-kilometre travelled
VOC	Volatile organic compound

Executive Summary

A sustainable and efficient transportation system is important in ensuring sustained economic growth, social progress and environmental protection. This report reviews existing data, institutions and policies in the area of sustainable transport in the Philippines in order to provide policy-makers, researchers, international organisations and other stakeholders a reference document for sustainable transport in the context of energy-efficiency and climate change.

Transport and Climate Change Data

With 76 vehicles per one thousand capita, the Philippines is at a relatively low rate of motorisation compared to other ASEAN countries such as Thailand, Indonesia and Vietnam. The vehicle fleet is however growing quickly, at about 6% annually, especially motorcycles and tricycles that comprise more than 50% of the total fleet. Cars and SUVs, utility vehicles (including jeepneys) and trucks comprise approximately 44% (11%, 23% and 5% respectively) of the registered vehicles,[1] but are estimated to contribute to more than 85% of the road transport CO_2 emissions.[2] Road transportation dominates both passenger and freight movements based on existing studies[3]. Maritime transport is also a significant mode for freight movement, while rail transport's significance has been limited to Metro Manila.

In 2010, the transport sector emitted 25.3 million $MtCO_2e$, or 35% of the total energy-related emissions in the Philippines. There appears to be substantial uncertainty in fuel consumption and emission estimates for the transport sector, with official statistics indicating that energy use and emissions have remained relatively flat within the period 2000–2010 (0.03% annual growth rate), despite the robustness in the vehicle population growth (6% per year in the same period). Per capita transport CO_2 emission is about 0.25 t per year,[4] which is lower than most ASEAN countries.

This report provides an overview of the available data parameters and the data gaps related to monitoring transport-related climate, energy and sustainability indicators based on the ASIF approach[5]. There is much room for improvement in terms of generating, managing, utilising and sharing transport data in the country. Issues include the following: uncertainty in top-down fuel sales estimates, difficulty in determining the number of vehicles that are actually in-use, the use of different classifications by different agencies that handle data, lack of mechanisms for disaggregating the vehicle fleet into relevant sub-segments (e.g. vehicle technology, emission standards), lack of monitoring mechanisms for vehicle activity data, absence of institutionalised transport surveys (passenger and freight) and the lack of reliable fuel economy information and emission factors.

[1]Based on 2013 LTO registration values.
[2]Based on studies that have done bottom-up estimation of CO2 emissions in the Philippine transport sector (ITPI, 2010 and Regidor & Javier, 2014).
[3]Based on the following transport-related studies: JICA 1992, 2007, Clean Air Asia, 2012, Gota, 2014 and ITPS 2014
[4]These figure is based on top-down energy consumption estimates, as reflected in the official energy statistics. As later explained, there are inherent leakages that are associated with such an approach.
[5]The ASIF (activity-structure-intensity-factor of emissions) parameters discussed in this report are not only relevant for emission analysis, but can be used for assessing the state and trends of the transport sector vis-a-vis other government priorities and communication to the public.

Institutions, Policies and Measures

The Philippines has instituted a multi-organisational approach in tackling sustainability in the transportation sector. While such an approach is necessary for ensuring that different elements are taken into account, it requires strong coordination so that polices and plans are aligned and that clarity is achieved in terms of roles and responsibilities.

The Department of Transportation (DOTr) is the primary policymaking and planning body for transport. It coordinates with several other Departments and Local Government Units (LGU) to develop, plan and **implement** transport policies that generally fall within the "avoid," "shift" and "improve" framework. It has been strengthening its capacity in relation to aligning sustainability and climate change into the transport sector through the formation of supporting units such as the Environmentally Sustainable Initiatives Transport Unit (ESITU), which is now the focal point in assisting in the planning, implementing and monitoring the progress of activities and measures towards mainstreaming sustainability in the land transport sector. To assist the government in determining long-term needs and in institutionalising relevant climate change mitigation measures, a sector technical working group (S-TWG) for transport was formed by the DOTr.

Strengthening the coordination between relevant institutions is necessary for building the momentum towards sustainable transport, as several dimensions need to be considered. Tackling sustainability in the transport sector requires the involvement of agencies such as the Deparment of Energy (DOE), the Department of Environment and Natural Resources (DENR), the Department of Trade and Industry (DTI), the Department of Public Works and Highways (DPWH), the Department of Science and Technology (DOST), among others. The Climate Change Commission (CCC), on the other hand, is the main government body tasked to coordinate plans, actions and programs related to climate change mitigation. Climate change mitigation strategies in the transport sector, for example, have to be aligned with national developmental goals and need to consider various targets in related fields such as energy and environmental performance.

Major policies, supporting strategies and plans that address sustainability in the transport sector are already in place. This report establishes the importance of incorporating significant policy drivers in sustainable transport strategies such as air quality, travel speed, accessibility, reduction of imported oil consumption, equity, and liveability. Climate change mitigation provides an additional driver towards sustainable transport policies.

The overall sustainable transport framework centres on several major policies and plans. The Philippine Development Plan includes targets related to transportation asset preservation, infrastructure provision, vehicle speed improvements, increasing bus load factors, reduction of traffic accidents and improving energy self-sufficiency. The NCCAP embodies the strategic direction of the country in relation to climate change mitigation and adaptation as guided by the Climate Change Act of 2009. The Philippine Clean Air Act (CAA) is also an important policy in relation to transportation as it sets out measures relating to the control of vehicular pollution. Reducing energy consumption in the transport sector has been taken up as a target by the DOE in the Philippine Energy Plan and through the Energy Efficiency and Conservation Roadmap. There are also existing supporting strategies and plans such as the NESTS as well as the NIP for Environment Improvement in the Transport Sector, which is now being updated by the DOTr. While these policies are in place, the country is still lacking an overarching national transport policy (NTP) that would set overall transport vision that embodies sustainability, as well as the structure and approaches that will clarify the roles and responsibilities of different government agencies as well as identifying specific gaps in

transportation planning (e.g. creation of integrated transport master plans), project implementation and monitoring.

Policies and measures are also assessed using the "avoid-shift-improve" framework.[6] It is noted that the country has instituted policies and initiated programs that are geared towards "improving" the vehicles and fuels that are used in the transportation system. Vehicle emission standards are in place and have been upgraded recently. There have been a recent initiative by the government to update the motor vehicle inspection system (MVIS) through a public-private partnership (PPP) project, but is still pending final approval. The use of biofuels and alternative fuels in transport have been supported by national laws and programs such as the biofuels act and the auto-LPG and natural gas vehicle program for public transport (NGVPPT) and the e-trike project. There are also notable bills in the Congress and Senate that can strengthen the country's goal to improve the environmental and energy performance of the sector.

"Shift" measures are currently gaining momentum due to the recent developments in instituting modern mass transport modes in cities. The Philippine government is also tapping into the private sector through PPPs in supporting several railway projects (among other transport related projects). Comprehensive policies and measures that aim to "avoid" the need to travel are generally not prioritized, but are gaining attention. Freight transport generally receives less–however increasing–policy attention.

Notable financing mechanisms that can be tapped for funding projects and programs related to improving the environmental performance of transportation in the country (including climate change mitigation) are discussed in this report as well. Available financial resources within the purview of the government (such as the Special Vehicle Pollution Control Fund) are currently far from being maximised and can be used for projects that can contribute towards instituting transformative change towards sustainability in the sector. International climate funds can also provide significant resources, but usually require strong measuring-reporting-verification (MRV) components, thus strengthening the case for improving transportation data. Foreign support in the form of technical assistance, loans and grants through an official development assistance appears to be prominent feature of financing or accelerating infrastructure development, feasibility analyses, demonstration projects to introduce new energy-efficient technologies and capacity building.

This report presents a review of data and policies including gaps relating to sustainable transport. In mainstreaming EST, the attention can be summed up by looking at the capacity-building measures noting the relevant transport, climate, energy and sustainability indicators needed by the sector as well as establishment and strengthening of the legal frameworks including having an overarching NTP in order to set the long-term vision for the Philippine transportation system and to institutionalize the needed structures and approaches that can clarify implementation and monitoring strategies to address transportation demands in a sustainable manner. Since climate change and transport involves a number of stakeholders, linkages among organizations, entities/agencies to promote, advocate and implement EST initiatives at national and local level are important. Alliances to avoid fragmented action, and instead promote cooperation among stakeholders must be highlighted.

[6]Avoiding the need to travel, shifting travel to more efficient modes, and improving the performance of the transport systems.

Introduction

The member countries of the Association of Southeast Asian Nations (ASEAN) are experiencing robust economic growth in the recent years. This growth has resulted in a rapid increase in the demand for motorized transportation and in its impacts such as greenhouse gas (GHG) emissions. In fact, with the 2nd largest vehicle fleet in Asia just after China, the ASEAN region already faces serious problems including congestion, fossil fuel consumption, air pollution and road safety. However, vehicle registrations are still increasing by over 10% annually in many countries, while shares of sustainable modes such as public transport and rail/water freight transport are often decreasing. With transport consuming approximately 25% of final energy consumption (IEA, 2013) it is also a significant and growing emitter of CO_2 and black carbon. The Philippines and other ASEAN countries are now facing significant challenges in providing sustainable, adequate and timely transport solutions that can keep up with the demand while minimizing the impacts.

These challenges are recognised at the regional level in the ASEAN Strategic Transport Action Plan (ASEAN, 2011) which calls for establishing 'a sustainable, energy efficient and environmentally-friendly transport system and in the Philippines in its national strategies', as can be seen in the current report. Even though energy-efficiency measures in transport often benefit the economy, consumers and the environment, realising sustainable, low-carbon transport system is a daunting task and requires strong policy action as well as shifts in vehicle production patterns and consumer preferences.

The project "Energy Efficiency and Climate Change Mitigation in the Land Transport Sector in the ASEAN Region," otherwise known as "Transport and Climate Change,[7]"aims to contribute to the development, implementation and monitoring of strategies and action plans towards the improvement of energy efficiency and the reduction of GHG emissions. At the regional level this includes development of an ASEAN policy or strategy as well as guidelines and templates for national policies and action plans for Member States. At the national level it aims at development of action plans and measures in five countries, and implementation of these according to national plans in at least three ASEAN Member States, as well as improvement of the measurement, reporting and verification (MRV) system in five countries: Indonesia, Malaysia, the Philippines, Thailand and Vietnam.

Scope and Objectives

This report aims to provide an up-to-date picture of data and policies related to transport and climate change mitigation in the Philippines, as well as identify gaps, needs and potential areas for improvement. It covers the land transport sector, including passenger and freight, and discusses existing data utilising the Activity-Structure-Intensity-Emission Factor (ASIF) approach (Chapter 2), strategies, policies and monitoring system for sustainable transport and climate change mitigation measures (Chapter 3), barriers towards sustainable transport (Chapter 4) and finally recommendations for further action (Chapter 5). The report is based on existing literature and policy documents, interviews with policymakers, experts and international organisations.

[7]www.TransportAndClimateChange.org

Country Information

The Philippines is an archipelagic country with 7,107 islands. It has three major island groups, namely, Luzon, Visayas and Mindanao, and a total land area of 299,764 km^2. The primary political and economic center of the Philippines, Metro Manila, or the national capital region (NCR), consists of the cities of Caloocan, Las Piñas, Makati, Malabon, Mandaluyong, Manila, Marikina, Muntinlupa, Navotas, Parañaque, Pasay, Pasig, Quezon, San Juan, Taguig, Valenzuela, and Pateros. In 2010, the average national population density was 308 persons/km^2, yet Metro Manila alone had an average of 19,137 persons/km^2, 62 times higher than the national value (PSA, 2012).

The Philippines lies in a tropical climate zone. Every year, about 20 typhoons enter the Philippine Area of Responsibility and about 9 make a landfall. Among the strongest tropical cyclones recorded, Yolanda (international name: Haiyan) hit the country in 2013 and resulted to a damage and loss of about PHP 571.1 billion (about USD 12.7 billion). Rehabilitation is said to cost PHP 360.8 billion (about USD 8 billion) and still on-going (NEDA, 2013). Aside from lying along the typhoon belt, the Philippines also lies within the Pacific Ring of Fire, making it vulnerable to volcanic eruptions and earthquakes. This location and the local conditions make the country susceptible to tsunamis, storm surges, flash floods and landslides.

In 2010, the country's gross domestic product (GDP) per capita was at PHP 148,645 (about USD 3,300), slightly higher than 2009 figures (NSCB, 2013). By end of 2012, the country's GDP had an annual real growth rate of 6.6%, much higher compared to the previous year (3.2%). The service sector, at 7.4%, had the highest GDP growth, followed by the industry sector at 6.5% and by the agriculture, fishery and forestry sector at 2.7%. By end of 2013, GDP real growth rate reached 7.2%, which was mostly attributed to service and industry sectors as well, at 7.1% and 9.5%, respectively (Cerda, 2014; PIDS, n.d.).[8]

Transport and Climate Data

Designing interventions and monitoring their impacts require sound information. This chapter gives an overview of the key trends of transportation parameters, focusing on those which are central to the analysis of the state and impacts of the sector, particularly those related to climate change and energy efficiency. These parameters are also important in monitoring progress of the sector against other goals–including national ones–that are related to economic and social development. It follows the activity-structure-intensity-fuel approach proposed by Schipper et al. (2000), see also Annex 1.

[8] Growth rates at constant 2000 prices.

GHG Emissions from the Transport Sector

The GHG emission inventories contained in the official Philippine National Communications to the United Nations Framework Convention on Climate Change (UNFCCC) are good starting points in looking at the country's transportation GHG emissions. While such reporting used to be voluntary and dependent on resource availability, biennial update reports containing updates of national GHG inventories, including a national inventory report and information on mitigation actions, needs and support received is required from 2014 as agreed upon at the 16th session of the Conference of the Parties in Cancún, Mexico in 2010[9].

The Philippines has conducted two official GHG inventories, one in 1994 and one in 2000. In both cases, the emission inventories for the transportation sector mainly relied on the Overall Energy Balance (OEB) sheets of the DOE, which contains sectoral energy consumption estimates[10] based on information submitted by relevant entities such as the fuel companies.

The 1994 national GHG inventory shows that Philippines released a total of 100.9 $MtCO_2e$, out of which 50.0 $MtCO_2e$ from the energy sector. Of this figure, 32% came from transportation, 31% from power generation, and 19% from industries. In 2000, GHG emissions reached 126.9 $MtCO_2e$ (DENR & MO, 2010). The energy sector was also found to be the main source of GHG emissions, accounting for 55% of the national emissions (with transportation contributing 37% of the emissions). This represents an increase by 39% from 50.0 $MtCO_2e$ to 69.7 $MtCO_2e$, or an average annual increase of 6% from 1994 to 2000. A significant amount of the emissions within the energy sector are due to transport (Figure 1). For both 1994 and 2000 GHG inventories, transport emissions accounted for more than a third of the total energy related emissions, increasing by 63% from 15.9 $MtCO_2e$ to 26.0 $MtCO_2e$ (annual average growth rate of 8.5%).

[9]Among ASEAN countries, as of July 2015, Vietnam and Singapore have submitted their first Biennial Update Reports. http://unfccc.int/national_reports/non-annex_i_natcom/reporting_on_climate_change/items/8722.php

[10] In kilotons of oil equivalent (ktoe)

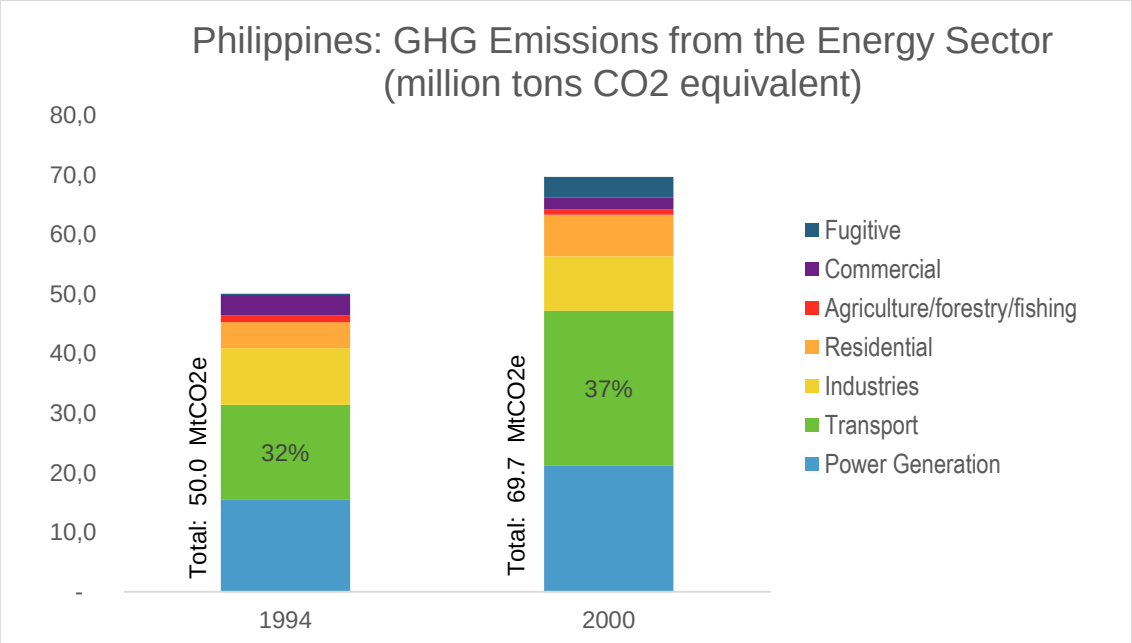


Figure 1: Philippine GHG emissions (MtCO2-req) from the energy sector for 1994 and 2000 (Source: Department of Environment and Natural Resources and Manila Observatory, 2010)

In the same manner, DOE conducts GHG inventories to track emissions from energy use. According to the DOE, GHG emissions from the transport sector in 1990 were 10.6 $MtCO_2e$. In 2000, its record estimates that emissions reached 25.7 $MtCO_2e$, and increased only up to 25.9 $MtCO_2e$ in 2010. It is important to note that the 2000-2010 data of DOE shows that the growth of emissions from the transportation sector remained relatively flat.

The official GHG inventories contained in the Second Philippine National Communications and the estimates of the DOE both utilise a top-down approach, which is useful when analysing total emissions and trends. However, a bottom-up approach based on sub-sector specific data (e.g. transportation activity rather than just fuel consumption) is also needed to provide deeper insights on the sources of emissions and the options for mitigation.

Several studies have attempted dissecting the emissions from the transportation sector using a bottom-up approach, such as the assessment study of low carbon interventions in the transport and power sectors done for the World Bank in 2010. The study estimates that the transport sector GHG emissions in 2007 were 24.6 $MtCO_2e$ (TTPI, 2010)[11]. Utility vehicles, which carries either passengers or goods[12], and trucks combined contributed 70.3% to the total road transport emissions, while buses, cars/SUVs, and motorcycles and tricycles contributed 29.7% (Figure 2).

[11]Based on the study Asia Least-Cost Greenhouse Gas Abatement Strategy (ALGAS) of ADB on average distance traveled by vehicle type, among others.

[12] The Land Transportation Office defines a utility vehicle (UV) as a vehicle with gross vehicle weight that does not exceed 4.5 tons and has passenger capacity less than eighteen. This includes the *jeepneys*, one the most common modes of public transportation in the Philippines.

The study estimates that in a business-as-usual scenario, the road transport emissions will be at 87 MtCO2e by 2030.

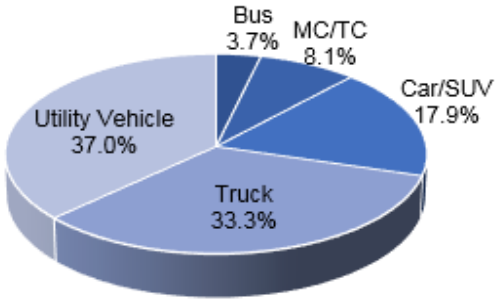


Figure 2: GHG emissions from road transport by vehicle type, 2007) (Source: TTPI, 2010)

*MC/TC refers to motorcycle/tricycle or two- and three-wheelers. Utility vehicle includes public utility jeepneys. Car/SUV include taxis.

A study conducted by Clean Air Asia (2012) estimated the CO_2 contribution of the different vehicle types from the road transport sector using the ASIF framework (activity–structure–intensity–emission factor).[13] The calculation framework takes into consideration the number of vehicles on the road, the estimates in terms of vehicle activity per vehicle type, the composition of the vehicle types in terms of fuel used, fuel efficiencies of different vehicle-fuel segments and the amount of CO_2 per amount of fuel.

The estimates of the study are higher than the top-down estimates, i.e. 2010 emissions are estimated at 46 $MtCO_2e$ as compared to the DOE's estimate of 25.9 $MtCO_2e$. The high estimates are due to the rapid increase in the vehicle numbers in the country within the study period (6% average annual increase). The analysis shows that the major contributors to the GHG emissions for the sector (2010) are the trucks (Heavy duty: 33%; Light-duty: 25%) and the multi-utility vehicles, including the jeepneys (23%).

Regidor and Javier (2014), in collaboration with the Institution for Transport Policy Studies and Clean Air Asia, also implemented a similar calculation methodology utilising the ASIF parameters and projected the CO_2 emissions from the transport sector[14] of the Philippines up to 2050. The study reveals that under a business-as-usual scenario, the emissions from the transport sector (land, air, water) could grow annually by 4.6% from 2005-2050 (206 million tons by 2050) with 96% of the 2050 emissions coming from road vehicles.

[13] More information about the ASIF Framework can be found in Annex 1.
[14] The study includes estimates for the land, air, water transport sub-sectors.

Figure 3 below shows the summary of GHG emissions estimates from the relevant studies mentioned earlier.[15]

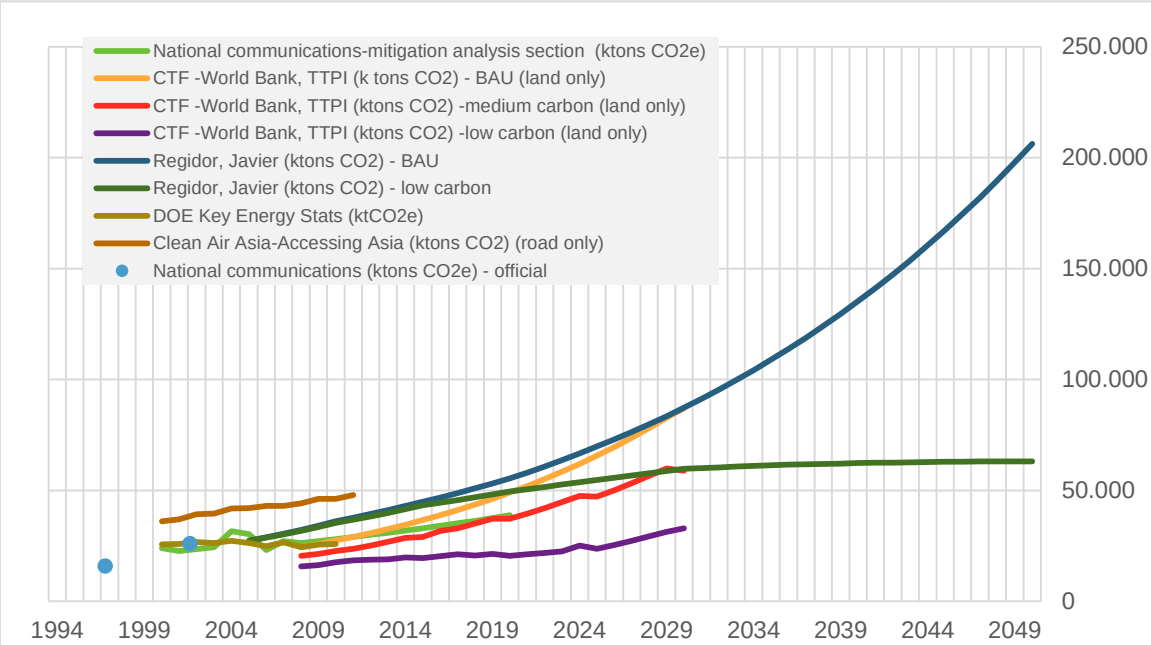


Figure 3: Summary of estimates for GHG emissions in the transport sector, in ktCO2e

Transport Activity

The conduct of transportation activity requires the expenditure of energy and often results in impacts such as emissions. Generally, it is important to monitor relevant units of transport activity such as passenger-km travelled (PKT) for passenger transport, and ton-km travelled (TKT) for freight transport. However, the movement of people and goods depends on many factors including demographics, income, economy and its composition, and urban form (Zegras, 2007) and thus, taking a look at these related parameters is also important in having a better understanding of activities relating to transportation.

In the Philippines, the aforementioned transport activity indicators (PKT and TKT) are not part of official statistics that are regularly reported by the government. Available data are thus obtained from independent studies or from feasibility studies commissioned by the government in cooperation with aid organisations and lending institutions to support planned projects. These studies, being need-based, mean infrequent and sporadic collection of data whose coverage is also often limited.

Passenger-kilometre travelled (PKT)

Travel surveys, e.g. trip diaries, and person trip surveys are good approaches for estimating total PKT and will also give useful insights into the complex travel patterns of people. The person-trip survey used in Metro Manila Urban Transportation and Integration Study' (MMUTIS), for instance, provide household profile since the process directly interviewed each of the household members for their trip information such as characteristics of trips made by residents of the area, including origin and destination, trip purpose, travel mode. However, compared with most developed nations, this

[15] This is limited to the studies that have been discussed in the earlier section. A summary of the studies can be found in http://transportandclimatechange.org/news-events/emission-studies-for-philippines-transport-sector/

approach is not regularly done as part of the national transport planning system. It is only being done when there it is initiated by development organisation or multi-lateral aid agency to support a particular transport infrastructure and/or services e.g. LRT expansion.

Interestingly, the MMUTIS Update and Capacity Enhancement Project (MUCEP) is an on-going initiative that builds on the MMUTIS project and aims to improve the capacity of DOTr to a) manage the Metro Manila transportation database; b) plan the public transportation network of Metro Manila; c) coordinate and formulate policies on public transportation network development in Metro Manila.

Other studies focus on motorised PKT which are often estimated by multiplying vehicle numbers, estimates of average vehicle-kms per year and average vehicle occupancies. This approach does not normally capture non-motorized PKT, and is limited by the lack of data on in-use vehicles,[16] vehicle activity estimates per vehicle segment[17] and occupancy levels.

For the Survey on Inter-regional Passenger and Freight Flow (SIRPAFF), a person-trip origin-destination survey was conducted in 2004 to determine the passenger movement between modes. According to the study, a total of 1.58 billion annual person trips were made across the regions, 98.31% of which was made by road. About 97.52% of all passenger travel were done by road. Rail transport recorded relatively small values, which could be due to limitations in rail infrastructure outside Metro Manila.

Table 1 shows the share of person trips by different transportation modes.

Table 1: Share of annual person trips by mode

Mode	Number of Trips (Thousand)	Share	Passenger-km Travelled (Million)	Share
Road	1,551,894	98.31%	325,235	97.52%
Rail	4,132	0.26%	227	0.07%
Water	16,370	1.04%	4,307	1.29%
Air	6,224	0.39%	3,748	1.12%
TOTAL	**1,578,620**		**333,517**	

(Source: SIRPAFF, 2005)

Unlike rail-based transport activity that can be measured through ticket sales, road-based activity is less tractable and is derived from different parameters such as those listed in Table 2. Road-based transport daily ridership in 2006 is 18,985,000, which is an order-of-magnitude higher than that of the rail-based transport. According to Mega Manila Public Transport Study (MMPTS) (2007), LRT

[16]Vehicle registration data is often used as a proxy.
[17] Odometer readings are not officially collected and therefore, estimates for vehicle activity are also uncertain.

Line 1 serves about 290,000 passengers per day up to 480,000 at peak traffic, while LRT Line 2 serves about 116,000 passengers daily. MRT Line 3 serves 356,000 per day, with peak day traffic of about 460,000 passengers. The PNR Commuter Line sees a decline in passenger ridership with only about 9,000 passengers per day. These railways are served by feeder systems such as jeepneys. MRT Line 3 runs along Epifanio de los Santos Avenue (EDSA), the major thoroughfare of Metro Manila, and there are buses plying along EDSA. Walking is the predominant feeder mode to the boarding points–and distribution mode from alighting points–of EDSA buses, PNR Commuter Line, and LRT and MRT lines, but data on the distances of these walking trips are not available. It is followed by jeepneys as feeder mode and buses as distribution mode.

The SIRPAFF study shows that Luzon Island generates the highest transport activity (as compared to Visayas and Mindanao) due to concentration of government institutions, financial and economic centers. Luzon ranks highest in annual total person trips by road with 275 billion PKT, while rail transport only recorded 2.3 million PKT. The study observed that most private inter-regional road trips "may be attributed Luzon Island where many provinces are interconnected by an established road network"(UP-NCTS, 2005).

Table 2: Ridership and PKT estimates for road-based transport in Mega Manila

Parameter	PUJ				AUV/FX				Non-EDSA bus EDSA bus		Total
End to end route length	Short (<5km)	Medium (5km - 10km)	Long (10km - 20km)	Extra Long (20km+)	Short (<10km)	Medium (10km - 20km)	Long (20km -50km)	Extra Long (50km+)	Non-EDSA	EDSA bus	Total
Average pax per one way trip	14.5	20.7	27.6	31	8.2	7.8	10	13	60.5	104.5	-
Average pax distance per trip (km)	1.72	3.49	5.77	11	2.4	5.32	9	19.9	10.6	10.2	-
Average speed (km/h)	11	12.9	15.5	25	14.94	20.77	19	29.45	16.9	19.5	-
Average number of vehicles operating route	92	158	171	170	29	52	52	52	-	-	-
Number of operational routes	150	148	231	41	90	127	119	11	17	40	-
Total number of vehicles	13,748	23,376	39,386	6,954	2,592	6,626	6,208	574	1,000	3,000	-
Average round trips per vehicle per day	9.6	6.4	4.4	3.3	4.7	3.2	3.0	1.5	3.9	3.0	-
Average number of 'work' days per vehicle week	5.4	5.5	5.3	5.3	5.3	5.3	5.3	5.3	6.2	6.2	-
Average number of passengers on a weekday (1,000)	2,975	4,863	7,296	1,060	151	250	288	17	418	1,666	18,985
Total passenger km travelled (1,000km)	5,117	16,973	42,100	11,637	363	1,332	2,566	337	4,430	16,993	101,850

(Source: Mega Manila Public Transport Study, 2007)

Ton-kilometre travelled (TKT)

The SIRPAFF study estimated that a total weight of 206.4 million metric tons of commodities was moved annually, of which 178.8 million tons (86.61%) were transported via road. All freight activities totalled 34.7 billion TKT, 99.97% of which was transported via road. Rail transport recorded insignificant values, which could be due to limitations in rail transport outside Metro Manila. For freight movement through rail, it is only limited to NCR and Southern Luzon since the coverage of the rail networks is also limited to those areas. Table 3 shows the share of freight by transportation modes in terms of weight and ton-km (which is a product of the weight of the goods and the total vehicle distance travelled). The ton-km metric further shows the importance of road trucks in terms of freight movement and the analysis by the study reflects that more vehicle-kms are needed to move a certain amount of goods on the road as compared to other modes due to the relatively small load capacities of road trucks versus the other modes.

Table 3: Mode share of annual commodity movement, 2005

Mode	Weight (Thousand metric tons)	Share	Ton-km travelled (Million)	Share
Road	178,797.89	86.61%	34,643,567.46	99.97%
Rail	2.14	0.00%	0.30	0.00%
Water	27,581.68	13.36%	11,455.26	0.03%
Air	48.68	0.02%	33.04	0.00%
TOTAL	206,430.38		34,655,056.06	

(Source: SIRPAFF, 2005)

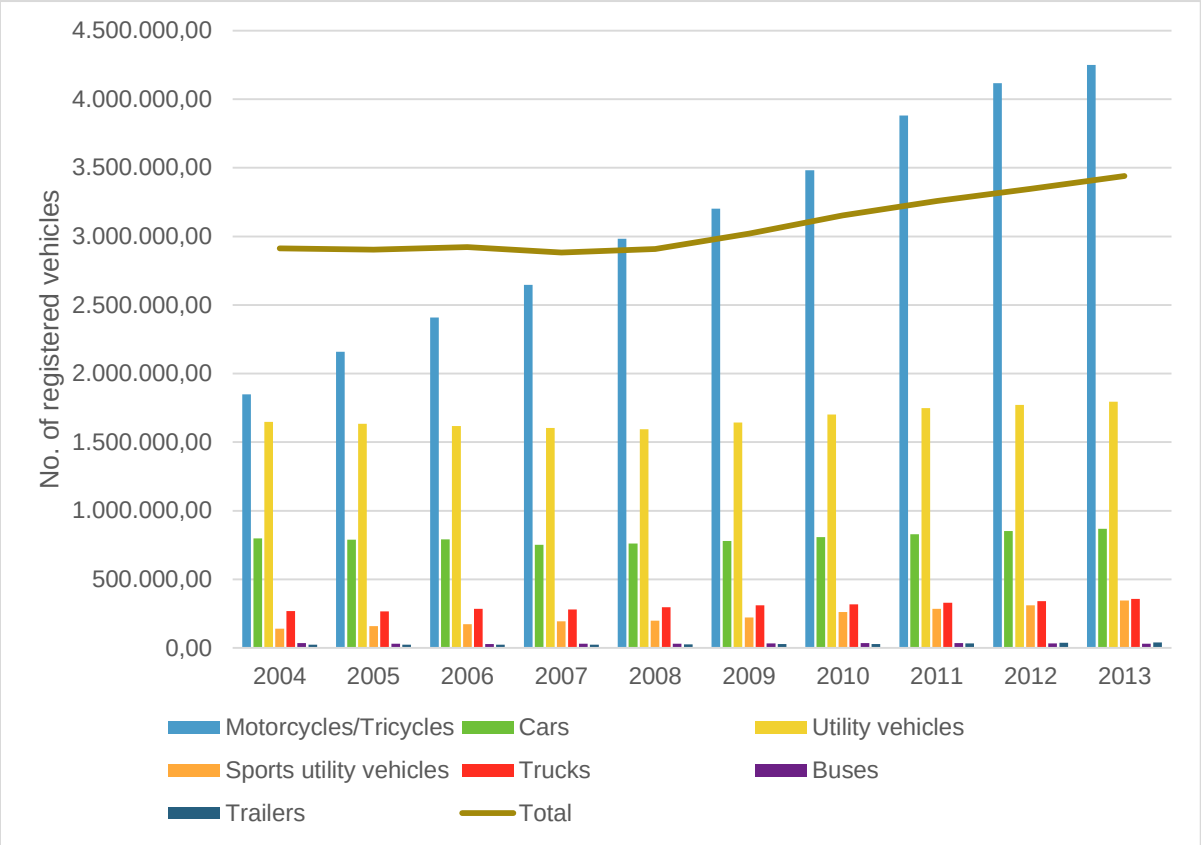
Number of vehicles

It is difficult to determine the number of vehicles that are actually in-use. Hence, the number of registered vehicles (which is required by LTO every year) is often used as a proxy. In 2005, 5.1 million motor vehicles were registered, 31.2% of which were registered in Metro Manila. LTO reports that total motor vehicle registration grew to 7.46 million in 2012, although registration in Metro Manila decreased to 27.2%. In 2013, total registration reached 7.69 million. The average growth rate between 2004 and 2013 is 5.5%. The growth rate for sedans is 3% on average, but sports utility vehicles (SUVs) have been growing at 10% annually, while motorcycles and tricycles are growing at 7%. Trucks are growing at 4%, while trailers have been growing at 11%.[18]

Shown in Figure 4 is the vehicle registration trend from 2004 to 2013, covering vehicles that are newly registered and vehicles with renewed registration. Private vehicles, particularly motorcycles and cars, comprise the majority share of the vehicle population. Motorcycle population is particularly noteworthy, growing approximately thrice the average growth rate of the entire vehicle fleet. Its

[18]Based on the analysis of the 2010-2013 registration data of LTO.

population was close to that of utility vehicles in 2004, but gradually increased from 39% of the total share of vehicles in 2004 to 55% in 2013. Of the total motor vehicles registered, 4.7% or 358,445



were trucks.

Figure 4: Number of motor vehicles registered* from 2004 to 2014, by type (Source: Land Transportation Office Annual Reports)

Vehicle occupancy

Loading (passenger occupancy and payload) is an important parameter in estimating transportation activity and will ultimately impact the energy intensity of the vehicles (i.e. energy consumed per unit of activity performed). For average passenger occupancy, table 4 below shows the results of the limited sampling[19] conducted by Metropolitan Manila Development Authority (MMDA). MMDA notes that the figure for car occupancy is likely overestimated as there were many observations of cars without passengers. SIRPAFF used secondary data for the average occupancies in 15 survey stations of the Luzon Island Strategic Road Network Development.

[19]Count of northbound traffic on footbridge north of the Aurora underpass in Cubao at 5:30 pm on 6 April 2011

Table 4: Average occupancy per vehicle type in Metro Manila) (Source: MMDA, 2011)

Vehicle type	Number of passenger (excludes drivers)
Motorcycle	1.5
Car	3
Van	3
Taxi	1
AUV/FX*	8
Bus	45
MRT	1200

* AUV/FX refers to Asian Utility Vehicles used to transport passengers in the Philippines along a fixed route with a seating capacity of ten. The vehicle originally used was Toyota Tamaraw FX Revo, hence the commuter term "FX."

An axle load survey was likewise conducted in 2004 in various regions of the country. It focused on loaded trucks, whereas the roadside interview and origin-destination surveys conducted for SIRPAFF had a different vehicle selection scheme (only 1.5% of weighed trucks were empty). An axle load survey determines the axle load distribution of the heavy vehicles using the road by weighing a sample of vehicles at the roadside using portable weigh pads (Pacific Consultants International Phils., Inc & TTPI, 2005). With 3,696 trucks weighed for the study, it found that the incidence of overloading was rampant for 3-axle rigid trucks or 10-wheelers, although some 4-axle and 5-axle truck-semi-trailers were also overloaded. SIRPAFF, on the other hand, found that 4-axle vehicles have the highest payload while pickups and vans carry the least payload.

Modal Share

The modal share can be defined as the distribution of transport activity by mode. It is an important indicator of the general picture of the transport system and it efficiency and is integral to sustainable transport planning, as the choice of vehicle and overall modal structure is influenced by the availability, costs and reliability of different transport modes, and reflects the impacts of supporting legislative and fiscal policies. For example, a jeepney would have lower fuel efficiencies (vehicle-km/litre of fuel) than a private car, but can have higher efficiencies in terms of passenger-km/litre of fuel due to the higher occupancy levels.

Mode shares are not estimated on a regular basis and consistent method in the Philippines. The collection of data on modal shares is usually done as part of major studies for particular transport infrastructure development like LRT, through the inclusion of person-trip surveys,

such as the MMUTIS in 1999 and the JUMSUT[20] in 1980 and has historically focused on Metro Manila. In general, such studies are only done for metropolitan cities such as Metro Manila, Cebu and Davao.

For cargo traffic, the mode share for annual freight commodity movement is significantly dominated by road freight transport, as illustrated at Table 3. For passenger traffic, determining whether the relative shares of road, water, and air have changed over the years is difficult to ascertain given the absence of historical data.

From the limited data, it can be inferred that in Metro Manila, road transport comprises the majority of passenger and cargo traffic, which accounts for 98% and 58% of the total share, respectively. Public utility jeepneys, in particular, account for 80% of the land-based trips taken according to MMPTS. Even during the time when MMUTIS was being conducted in late 1990, the number of transfers between jeepneys and tricycles, jeepney to jeepney, and jeepney and buses were high. Tricycles serve as a feeder mode to jeepneys in suburban areas, and the main feeder mode to the LRT was the jeepney. However, mode share data do not usually consider non-motorized modes (e.g. walking, cycle rickshaws known as *pedicab*) and tricycles.

Energy Intensity

Energy or fuel intensity (I) is the consumption of fuel per amount of work done, i.e. passengers or goods moved. It is affected by e.g. vehicle technology, age, engine type, and driving cycles and driving conditions (Schipper et al., 2007).

Fuel economy of vehicles

Fuel economy refers to the amount of fuel consumed relative to distance travelled (Fulton, 2014). Different countries use different metrics for fuel economy, i.e. litre/100 km, km/l and gCO_2/VKT. In developed countries such as U.S., Japan and Korea and European countries, fuel economy data of new vehicles is obtained through laboratory testing of emissions and fuel consumption as part of the type approval process. Various approaches for developing standards exist, e.g. the Corporate Average Fuel Economy (CAFÉ) that is used by the U.S: the CAFÉ provides the fleet-wide average fuel economy that, depending on policy design, can serve as the minimum performance standard. Currently, the Philippines has no officially adopted methodology for estimating fleet-wide average fuel economy, and no standards are in place.

Fuel economy–both for in-use and new vehicles–values are not part of the national statistics and are not collected regularly. The lack of any authorised testing facility limits the capacity to collect and store fuel economy data. While the option is to use rated fuel economy from manufacturers, there is no law that requires manufacturing and sales companies to report the fuel economy rating of each vehicle. The DOE conducts fuel economy runs for some vehicles, but this approach is usually limited to highway driving and would not reflect efficiencies in real life conditions. Moreover, the vehicles included in the run do not represent the whole vehicle population, thus it does not provide sufficient information to estimate the fuel economy of different vehicle segments.

Available data on fuel economy is generated from studies conducted to support government projects and from those that are conducted by the academe. Table 5 shows sample values on estimates of the fuel efficiencies of different vehicle types. The data were compiled from a various set of studies, and

[20] JICA Update on Metro Manila Study on Urban Transport

the fuel economies compiled by both studies vary slightly. In this regard, the variations of tricycles and motorcycles are most notable because of the threefold difference in the fuel economies cited by the two studies. These differences can be attributed to numerous factors, among which are vehicle technologies, age, and driving conditions. However, both studies are in agreement that, in terms of fuel economy, lighter vehicles such as motorcycles and tricycles have higher fuel economies (in km/liter) relative to their bulkier counterparts like buses and utility vehicles.

Table 5: Fuel economy according to vehicle type and fuel used

Vehicle type	Fuel Type	Fuel Economy (km/liter)	
		Vergel and Tiglao, 2013[a]	WB-TTPI, 2010[b]
Private Car, SUV	Diesel	9.79	8.98
	Gas	7.50	4.77
	LPG		4.80
Taxi, Car Rental	Diesel	7.50	8.98
	Gas	6.94	4.77
	LPG		4.80
Private UV	Diesel	5.69	6.90
	Gas	7.50	4.17
	LPG		4.20
PUJ, AUX	Diesel	5.69	6.90
	Diesel (B2) (AUV)	5.77	4.17
	LPG	3.36	4.20
Private Bus	Diesel		2.61
	Gas		1.83
	CNG		2.99
PUB, SB	Diesel (B2)	2.67	2.61
	LPG	1.58	1.83
	CNG	3.07	2.99
Motorcycle	Gas	29.29	9.08

	LPG		9.10
Tricycle	Gas	24.41 (two-stroke) 29.29 (four-stroke)	9.08
	LPG		9.10

[a]Compiled from DOE, n.d.; MMUTIS,1999; DOTr-MMPTS,2007; UPD-COE, 2009; and Biona et al., 2007. Results of DOE Fuel Economy runs can be viewed at https://www.doe.gov.ph/energy-efficiency/fuel-economy-run-results

[b]Derived from ADB ALGAS, 1998; ADB Vehicle Emission Control Planning in Metro Manila, 1992; JICA SIRPAFF, 2005; and AusAID Truck Overloading Study, 2009

Road condition

Road conditions affect the fuel economy of vehicles on the road(Schipper, Cordeiro, & Ng, 2007). Travelling in flat and smooth roads, for example, consumes less fuel than travelling in steep and rough roads. As of 2012, the Philippines have 203,000 km of roads which translates to a road density of 0.69 km of road per km^2 of land area. While the road density may seem high, its quality is problematic as most of them are unpaved. In the Global Competitiveness Report 2012-2013 conducted by the World Economic Forum, the Philippines ranked 87 out of 144 countries in terms of road quality several rungs below Indonesia, Malaysia, and Thailand. 26.42 percent of national roads are in poor to bad condition (DPWH, 2014) and are thus in need of maintenance and rehabilitation. Poor road condition affects driving efficiency, causing vehicles to stop-and-go more frequently. Also, poor road condition causes slower speed which increases travel time and consequently fuel consumption.

Vehicle Segmentation

Factors such as vehicle technology employed and fuel type are also important parameters to take into consideration when looking at energy use and emissions in the transport sector. Vehicle emission standards applied are quite important in the control of criteria air pollutants. Readily accessible data on the segmentation of the vehicle fleet with regards to these parameters is not available. The official statistics, for example, are only limited to disaggregating vehicle types into diesel and gasoline (as the database only has fields for these fuels). Data generated by private research groups are usually utilised in studies that require vehicle segmentation data. For example, data from a private firm called Segment Y shows that most of the vehicle fleet in the Philippines in 2008 use older technologies (Pre-Euro I and Euro I)[21] as shown in Annex 2.

Vehicle age

The age of vehicles also affects fuel economy and energy intensity. In general, the combustion efficiency of vehicles decreases as it gets older which consequently increases its fuel consumption. Data on this parameter is also limited, and information on vehicle age is not easily accessible. As mentioned earlier, there are commercially available estimates for vehicle segmentation data, but accessibility is a concern since it can only be made available for a fee. Except for buses, most vehicles are 0 to 5 years old. Moreover, a substantial proportion of buses, cars and jeepneys have been on the road for more than 10 years. This cross section of vehicle age by vehicle type in 2008 is shown in Annex 3.

[21] Segment Y Automotive Intelligence Pvt. Ltd. is a Dutch owned and managed company based in India that focuses on automotive markets in Asia. Besides India, Segment Y has data collectors and researchers in all Asian countries.

Vehicle speed

Speed variation has direct impact on the overall fuel consumption of a vehicle. Fuel consumption follows a non-linear curve over speed, which indicates that fuel consumption is optimised at certain speed levels. According to MMUTIS, the average travel speed of jeepneys within Metro Manila was 9 km/hr, while that of buses was 12 km/hr. Jeepneys, as well as buses, have unsystematic loading and unloading system. Along the EDSA thoroughfare, private vehicles ran at 10 km/hr on average at the time of study. For the runs conducted for MMPTS, the average speed of jeepneys was 13.2 km/hour, which is low. The Philippine Development Plan quotes average Metro Manila travel speeds of 27.79 km per hour. Thus, data variations could also be attributed to the time of sampling. Moreover, vehicle speed data is only available for major thoroughfares. Details are found in Annex 4.

Energy consumed

The DOE estimates that the total energy consumed grew from 23.5 million tons of oil-equivalent (TOE) in 2000 up to 24.5 million TOE in 2010 (Figure 5). In terms of fuel type, diesel use exceeds that of gasoline, and consumption of both fuels has been increasing since the 1970s (Figure 6). Historically, the road transport sector has always predominated fuel consumption and, according to the projections of the DOE, this trend is likely to continue to 2030 (Figure 7).

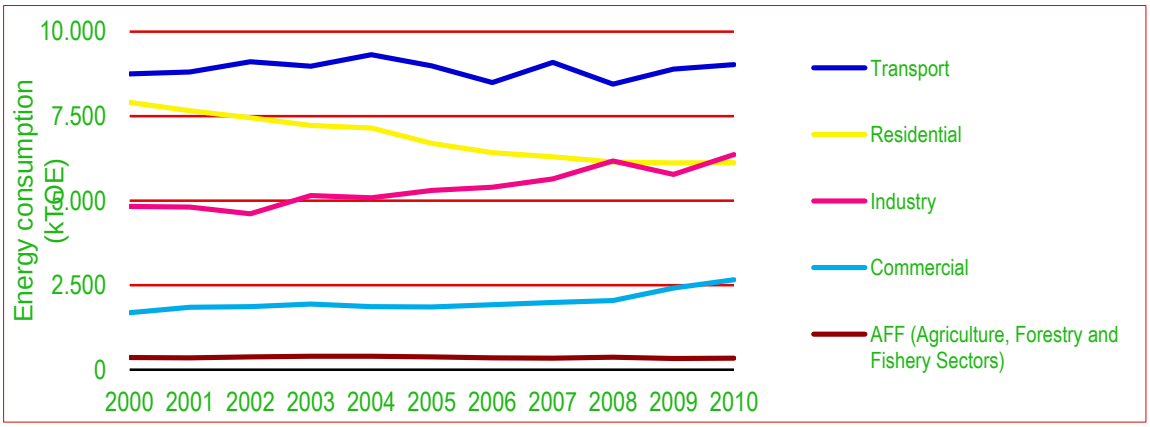
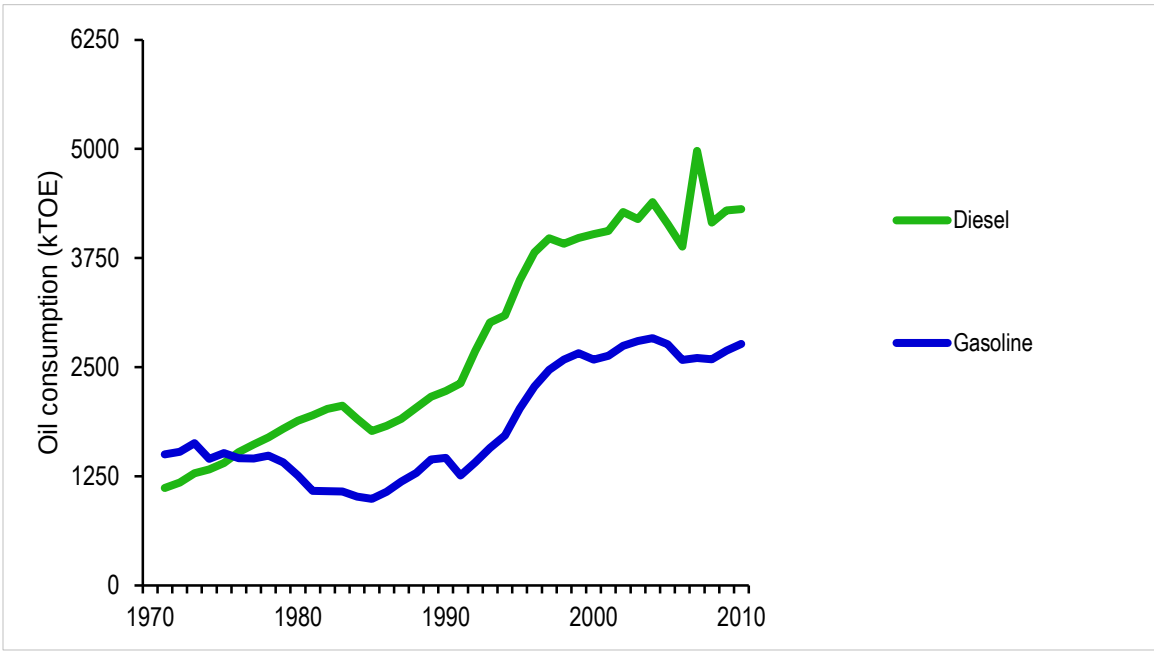


Figure 5: Energy consumption by sector, 2000-2010 (Source: Department of Energy, 2010)



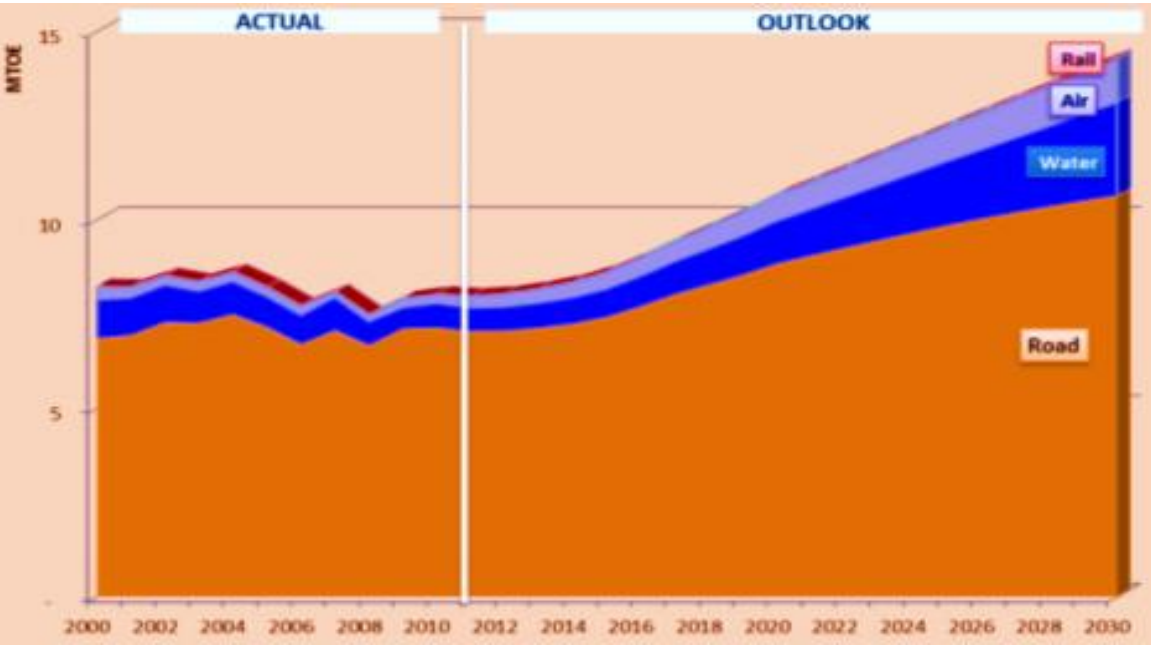


Figure 6: Fuel consumption due to road transport, by fuel type, 1970 to 2010 (Source: World Bank, 2013)

Figure 7: Historical and projected energy consumption for road, water, air and rail transport (Source: Department of Energy, 2012)

The energy consumption estimates of DOE are derived using fuel sales data. Schipper, Cordeiro, & Ng (2007) cautions that this method may not be accurate because of tax evasion, fuel smuggling, and fuel adulteration. In the Philippines, there have been reported cases of fuel smuggling and fuel

adulteration (Gamboa, 2003; Meruenas, 2013; Esplanada and Yamsuan, 2013). If these activities are accounted for, actual fuel consumption may be higher than the estimates of the DOE. Gota (2014) also considers two possible reasons for the low growth of fuel consumption: the high increase in fuel prices and the impact of sustainable transport policies in reducing travel demand, however both reasons cannot explain the low growth. On the other hand, positive developments such as higher fuel efficiencies of newer vehicles that have entered the fleet, coupled with the impacts of programs aimed at energy efficiency in the transport sector, may have also played a role in limiting the increase in total energy consumption in the sector.

Fuel pricing

Fuel pricing can influence the demand for motorised travel. Fiscal mechanisms such as fuel subsidies or taxation hold a key role in climate change mitigation and energy efficiency strategies. Fuel prices may influence annual distance driven by car drivers, vehicle ownership and choice to purchase fuel-efficient car models as well as the choices of the public in terms of which modes to take in performing certain trips. This shift in demand causes vehicle manufacturers and distributors to implement and promote more efficient vehicle technologies and models.

In the Philippines, the oil industry is deregulated pursuant to Republic Act No. 8479, or the Downstream Oil Industry Deregulation Law, enacted in 1998. The liberalisation and privatisation of the oil industry means that the government does not control fuel prices. The DOE monitors international crude oil prices and domestic retail pump prices, and liquefied petroleum gas (LPG) and auto-LPG prices, among others, and are notified by oil companies of price adjustments[22]. GIZ likewise collects data on fuel prices through the International Fuel Prices project[23].

Prices of gasoline and diesel in the Philippines have experienced an overall increase since 2002 (Figure 8), notably due to the rise in global prices. As of November 2012, the gasoline was USD 1.25/litre while diesel was USD 1.01/litre. However, according to DOE, the decreasing world oil prices in 2014 brought the domestic prices of gasoline and diesel to about PHP 43.75/litre (about USD 0.97) and PHP 32.95/litre (about USD 0.73) in December 2014, respectively, reflecting a total year-to-date net decrease of gasoline and diesel prices to PHP 10.74/litre (about USD 0.24) and PHP 12.13/litre (about USD 0.27), respectively[24].

[22] For more information, visit https://www.doe.gov.ph/price-adjustments/price-adjustments-fuels
[23] Publication database can be accessed at http://www.giz.de/fuelprices.
[24] As of 7 December 2014 in Metro Manila.

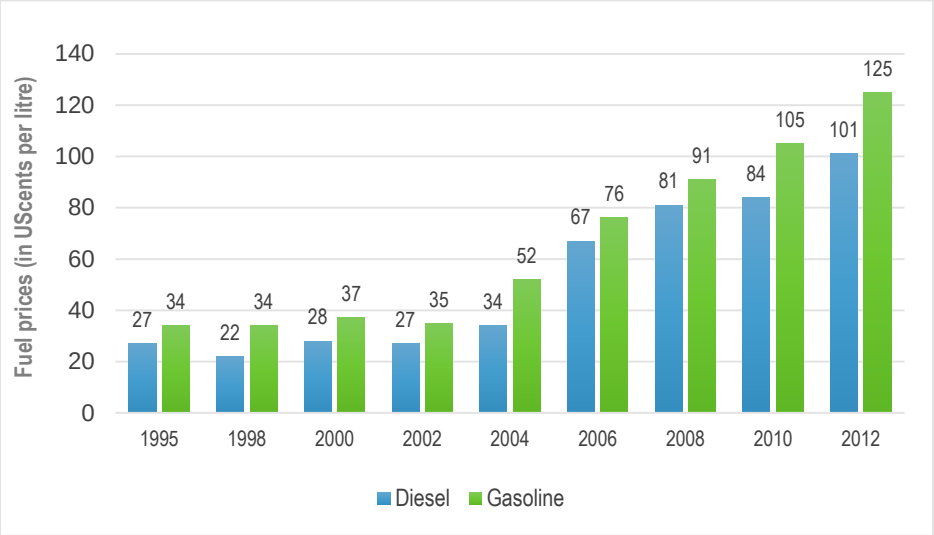


Figure 8: Fuel price in the Philippines,1991-2012 (Source: GIZ 2013, International Fuel Price Database)

Fuel Emission Factors

Motor vehicles emit different types of pollutants (e.g. CO_2, CO, HC, NOx, PM) and the type and quality of fuel would have different impacts in terms of energy consumption and emissions. For example, natural gas, diesel and gasoline have differing GHG emissions per unit of fuel ('F' in ASIF) consumed due to the differences in carbon contents of the fuels. The indirect emissions of electric vehicles depend on the characteristic of the source electricity grid: fuel sources, combustion technologies, and transmission and distribution losses.

Emission factors are particularly important parameters in estimating pollutant and GHG emissions. Multiplying the emission factor to the activity (VKT, PKT or TKT) results in the estimated emissions. Emission factors can be expressed as g/km, g/liter, or g/MJ. CO_2 emissions are considered a representative indicator of GHG emissions in the transport sector, though methane (CH_4) emissions are also significant for natural gas fuelled vehicles. According to the Intergovernmental Panel on Climate Change (IPCC, 2007), the CO_2-equivalent emission is obtained by multiplying the emission of a GHG by its Global Warming Potential (GWP) for the given time horizon[25].

The Philippines has limited data on emission factors for transport. Available information on local emission factors per vehicle and fuel type only comes from the ADB study in 1992 on Vehicle Emission Control Planning in Metro Manila, which may no longer represent current conditions and it is likely that fuel and vehicle characteristics have changed over the past two decades. If, however, the data is used to infer trends in fuel emission factors, the following insights can be drawn: (1) within the same vehicle type, gasoline engines release more CO_2 relative to other engine fuel types, and (2) among the different types of fossil fuels, combustion of CNG and LPG are the least CO_2-intensive. Proposals to develop new emission factors are underway. Annex 5 provides emission factors for each of the criteria pollutants.

[25] The 100 year GWP of relevant GHGs are: methane = 21; Nitrous Oxide = 310.

Monitoring and data collection by policy category

The government has instituted mechanisms to monitor relevant data and indicators that are related to transport, climate change and energy efficiency, but the scope of these data and indicators are limited at the present. For example, there are no official and regular transport activity (PKT and TKT) estimates, as well as updated mode shares and vehicle fleet composition details and emission factors.

Several government agencies collect data according to their mandates and needs, further elaborated in Table 6. The private sector also collects transport related data. While private companies have traditionally held on data they have collected or generated, they are presently becoming more receptive to sharing information especially for collaborative work.

Table 6: Current status monitoring system by policy cluster in the Philippines

	Current approach
Energy efficiency (passenger and freight)	The Department of Energy and the Philippine Institute of Petroleum gather fuel consumption by volume and by type of fuel and emission control standards. Fleet characteristics are usually from the automobile and trucking companies or associations. Physical characteristics of the road network are monitored by the local and national government. Comprehensive vehicle classifications by fuel type and by technology type have limited availability, but may be monitored using statistics from oil companies, market data such as Segment Y, and technical studies.
Urban transport including public transport, NMT, land use policies, etc.	Metropolitan Manila Development Authority monitors the traffic statistics in Metro Manila. The Department of Transportation monitors the motor vehicle registration and the licenses issued by the Land Transportation Office. Land Transportation and Franchising Regulatory Board monitors the number of public transport franchises granted. Most of the travel activity in urban transport system can be found in technical studies such as Metro Manila Urban Transportation Integrated Study (MMUTIS).Data on tricycles and in some cases bicycle use are gathered by local government units.
Modal shift in non-urban transport	The Philippine National Railways(PNR) connects Metro Manila to the surrounding provinces and monitors the movement of passengers, but activity data are usually found in technical reports and feasibility studies, and are dependent on projects. Travel activities are not part of national household surveys conducted by National Statistics Office. Local government units are responsible for regulating the three-wheelers, but it is often difficult to find statistics on such.
Modal shift in freight	Freight and logistics data is monitored by DTI but not necessarily the mode use. The Philippine National Railways, which also serve the transport of goods, monitors the length of railways and usage.
Fiscal policies, e.g. fuel/vehicle taxes	The DTI, through the Bureau of Customs, collects data regarding the volume of trade and the vehicle imports. The NEDA studied the economic growth and infrastructure growth and the investments entering the Philippines.

Policies and Institutions

The transport sector is confronted with the challenge of meeting the demand for increased mobility and better accessibility on one hand, while minimising transport-related externalities particularly GHG emissions, air pollution, and energy insecurity on the other. Owing to the sectoral nature of development planning in the Philippines, meeting the challenge of the transport sector necessitates the cooperation and coordination of different institutions. This section identifies the relevant institutions and their roles in transport sector development. It also examines how the instituted policies and action plans figure into and contribute to the development of a sustainable transport system.

Institutional Structure

The Climate Change Commission (CCC) is the sole policy-making body of the government tasked to coordinate, monitor and evaluate the programs and action plans of the government relating to climate change. Acting as an autonomous body under the Office of the President, CCC was established pursuant to Republic Act 9729, also known as the Climate Change Act of 2009, and has the same status as that of a national government agency. The agency is mandated to formulate a national framework strategy and programme (hence the formulation of National Framework Strategy on Climate Change for 2011 to 2028), mainstream climate risk reduction into national, sector and local development plans and programmes, recommend policies and key development investments in climate-sensitive sectors, and assess of vulnerability and facilitation of capacity building. The agency likewise formulated the National Climate Change Action Plan (NCCAP) and guidelines for Local Climate Change Action Plan (LCCAP).

To assist the government in determining long-term needs and in institutionalising relevant climate change mitigation measures, a sector technical working group (S-TWG) for transport was established. The group serves as sector experts for integrating climate change mitigation to the target sector, identifies capacity needs for the transport sector on climate change mitigation, reviews the technical soundness of these initiatives, develops a coherent overarching framework for climate change mitigation consistent with the national development priorities of the country; and promote synergies among stakeholders through regular dialogues. It is chaired by the DOTr, while the current members represent civil society and academic institutions organisations such as the University of the Philippines–National Center for Transportation Studies (NCTS), Clean Air Asia, and Partnership for Clean Air.

The DOTr is the primary administrative, regulatory, and planning body of the government covering road, rail, air and water transport. DOTr is tasked to develop a comprehensive and integrated transport system for land, air, and water, and is responsible for coordinating with other agencies for transport-related concerns and in implementing and monitoring the National Environmentally Sustainable Transport (EST) Strategy and the National Implementation Plan 2011-2016 (NIP) in the Transport Sector (see Section 3.2.2).

Among the agencies under DOTr are the Land Transportation Office (LTO) and the Land Transportation Franchising and Regulatory Board (LTFRB). LTO monitors private and public motor vehicles, mainly registration and licensing, while LFTRB promulgates, administers and monitors compliance of policies, laws and regulations of public land transportation services (including the issuance of franchises and fare regulation of public transport). LTO and LTFRB also issued a Joint Memorandum Order No. 2014-01 authorising the traffic enforcement arms of Local Government Units to apprehend illegally operating or unlicensed motor vehicles (including public

utility vehicles, bus operators, truck and van operators, motorcycles) and other franchise-related violations.

Other attached agencies under DOTr include Toll Regulatory Board (TRB), which regulates the construction, operation and maintenance of toll facilities, and the collection of toll fees, and Office of Transportation Cooperatives (OTC), which promotes the transport cooperatives program in the public transport and transit system. Three agencies cover rail transport, namely, the Philippine National Railways (PNR), Light Rail Transit Authority (LRTA), and North Luzon Railways Corporation (NLRC/North rail). PNR is mandated to provide a nationwide railway transportation system; LRTA is mandated to manage LRT systems in Metro Manila, while NLRC is mandated to enhance railway system in Central and Northern Luzon. The Office of Transportation Security (OTS) ensures national transport security programs, plans, rules and regulations to secure the transportation system of the country.

Meanwhile, the DOE prepares and supervises programs and other government activities on energy exploration, development, utilisation, distribution and conservation. DOE monitors fuel quality and fuel consumption, as well as the promotion of renewable energy, biofuels, and other alternative fuels. DOE also leads in establishing technical fuel quality standards for biofuels and biofuel-blended gasoline and diesel. For biofuels, DOE is assisted by the DOST and Department of Agriculture (DA) in developing viable feedstock for the production of biofuels.

On fuels and fuel quality, DOE and the Department of Environment and Natural Resources (DENR), in consultation with DOST and DTI-BPS as well as the representatives of the fuel and automotive industries, academe and the consumers, set specifications for fuel and fuel-related products to improve fuel composition for increased efficiency and reduced emissions. DOE is mandated to specify the allowable content of additives in all types of fuels and fuel-related products, limit the content or begin that phase-out of additives therein, and, in coordination with BPS, regulate the use of any fuel or fuel additive

The DENR reviews and revises the National Ambient Air Quality Guideline Values sets the standards for monitoring pollutant levels and also issues a certificate of conformity (COC) to a vehicle manufacturer/assembler or importer certifying that a particular new vehicle or vehicle type meets the requirements provided in the Philippine CAA. The DTI promulgates the necessary regulations prescribing the useful life of vehicles and engines including devices.

The DTI, DENR and DOTr are tasked to formulate and implement a national motor vehicle inspection and maintenance program under the CAA. The DTI also certifies training institutions, instructors and facilities and issues licenses to qualified private service centres and their technicians to perform the testing, servicing, repair and the required adjustment to the vehicle emission system. The DOTr through LTO or DOTr-designated enforcement unit(s) deputises qualified government employees, LGUs, government agencies and private entities to conduct roadside inspection and to apprehend vehicles which do not comply with the in-use standards. The deputised agents, often called the Anti-Smoke Belching Units (ASBU), shall undergo a mandatory training on emission standards and regulations, as well as maintenance and calibration of smoke testing equipment. In summary, the DOTr enforces compliance among motor vehicles using the emission standards set by the DENR, as well as authorises private emission testing centre (PETC) duly accredited by DTI to conduct emission tests on vehicles apprehended by ASBU.

Meanwhile, the DPWH is responsible for planning of infrastructure, such as national roads and bridges[26], flood control, water resources projects and other public works, as well as the design,

[26] Roads in the Philippines are classified according to its functionality to the national road network. National roads are classified into primary arterial and secondary arterial and further categorized into North-South Backbone (the main

construction and maintenance of national roads and bridges, and major flood control systems. DPWH also ensures that these infrastructures are disaster-resilient. The development of infrastructure projects and the formulation of transport policies, plans and programs are also reviewed by the National Economic and Development Authority (NEDA) through its Committee on Infrastructure[27]. The functions of NEDA reside in the NEDA Board which is composed of Secretaries from various national government agencies, including DOTr.

The DOST engages in research and development initiatives in relation to transportation such as the development of customized local road vehicle standards (CLRV), pilot projects on new transportation vehicle options such as the automated guideway transit (AGT)[28] and the recently launched road train.

To ensure adequate funds, the Road Board is mandated to ensure that all monies collected from the Motor Vehicle User's Charge (MVUC) on owners of all types of motor vehicles, are earmarked for national and provincial road maintenance, improvement of road drainage, installation of adequate traffic light and road safety devices and air pollution control. The Road Board is chaired by the DPWH and the members include the DOTr, and private sector representatives.

The governance in the Philippines is decentralised and recognizes the importance of local government units (LGUs). The Department of the Interior and Local Government (DILG) assists the President in the exercise of general supervision over all of the LGUs, and in strengthening their administrative, technical and fiscal capabilities. These LGUs are envisioned by the Philippine CAA to be responsible for the full administration of the air quality management and regulation within their territorial jurisdiction. With this, DENR and its regional and city offices[29] urge the creation of ASBUs in various LGUs throughout the country.

Moreover, LGUs perform traffic management functions within their territorial jurisdiction, regulate the operation of tricycles and grant franchises for the operation thereof, and regulate the use of parking areas pursuant to the Local Government Code of 1991. Each LGU is mandated to formulate a comprehensive multi-sectoral development plan. However, the MMDA manages transport and traffic transcending the local political boundaries of the 17 LGUs of Metro Manila. MMDA is tasked to install and administer a single ticketing system, and fix, impose and collect fines and penalties for all kinds of violations of traffic rules and regulations, and also confiscate and suspend or revoke driver's licenses. Figure 9shows an overview of the primary government agencies involved in certain transport measures. A host of other organisations are currently also involved in planning and implementing projects that contribute to land transport development in the Philippines, such as non-governmental organisations or civil society, academic and research institutions, including the private sector and international development agencies.

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trunkline from northernmost Luzon down to Southern Mindanao interconnecting major islands), East-West Lateral (roads traversing backbone and across the islands), Other Roads of Strategic Importance (direct access to important centers and areas vital for regional development and emergencies) and National Secondary Roads (other roads which complement national arterial roads to provide access to other main population and production centers).

[27] The NEDA Board is assisted by seven cabinet-level inter-agency committees: Development Budget Coordination Committee, Investment Coordination Committee, Social Development Committee, Committee on Tariff and Related Matters, Regional Development Committee, National Land Use Committee, and Infrastructure Committee.

[28]Joint project with the University of the Philippines.

[29] The functions of the national government like DENR are devolved to the LGUs. DENR exercises supervision over the 16 administrative regions of the country. The regional offices of DENR oversee the provincial, municipal, or city environment natural resources offices that may be established within their region. The Local Government Code also stipulates that, in each municipality/city, the mayor may appoint an environment and natural resources officer (as well as a planning and development coordinator, among others).

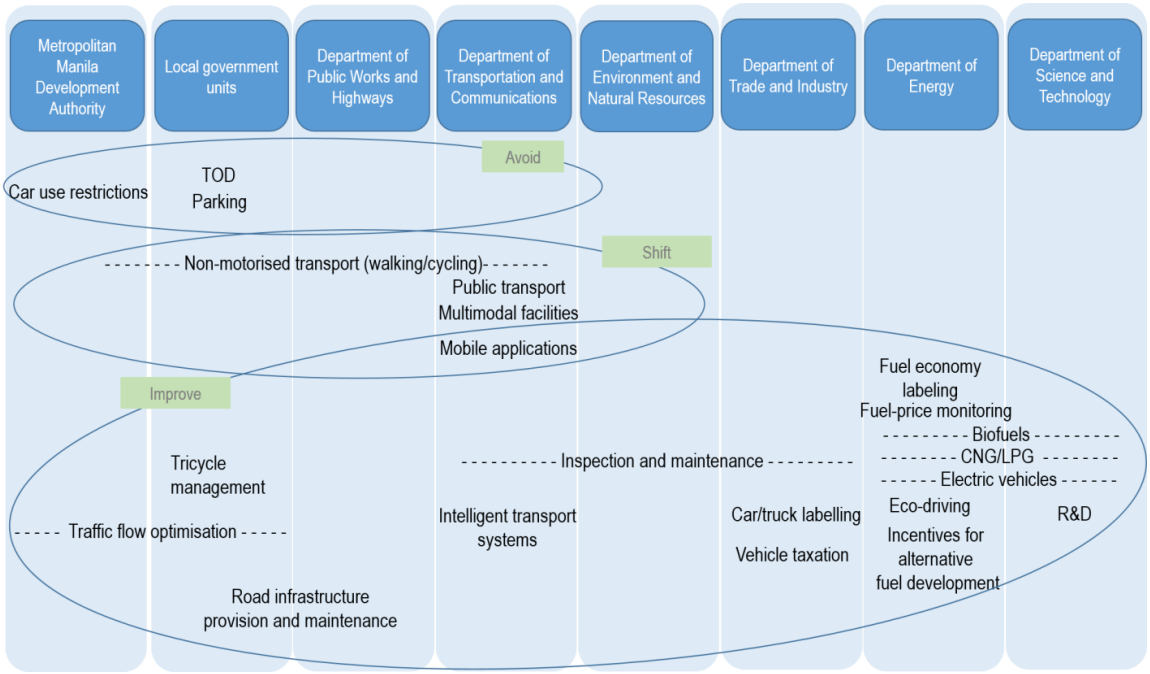

Figure 9: Overview of responsibilities for transport policy-making (Source: Authors)

Regulatory Framework and Initiatives

This section covers the relevant policies and initiatives that have been promulgated in the Philippines related to climate change mitigation, energy efficiency and sustainability of the transportation sector. Figure 10 illustrates the relationship of the frameworks covered in this section

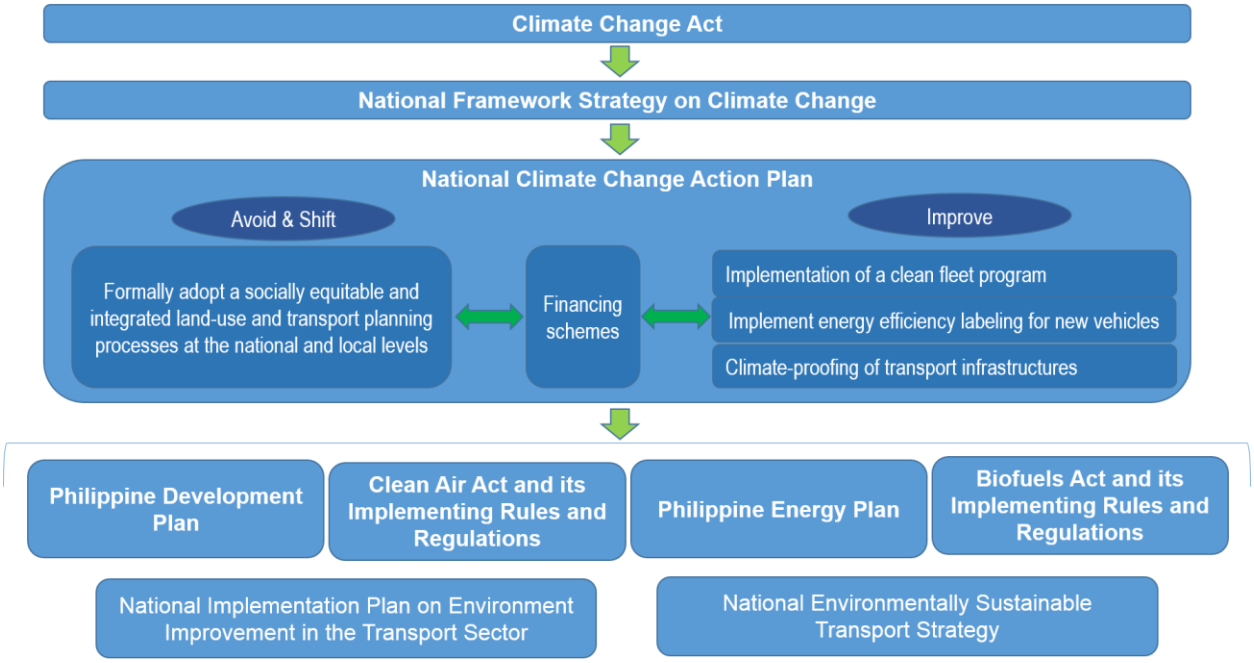

Figure 10: Overview of climate change and sustainable transport initiatives (Source: Authors)

The Philippines' Response to Climate Change Mitigation and Adaptation

The Philippines signed the United Nations Framework Convention on Climate Change (UNFCCC) in June 1992. As the Philippines is among the Non-Annex I parties to the Convention, it has no binding obligations to reduce GHG emissions. However, recent global discussions are leading towards increased participation of developing countries in curbing GHG emission trajectories. During the 19th Session of the Conference of Parties (COP 19) to the UNFCCC held in Warsaw (2013), Parties agreed to initiate or intensify the preparation of their intended nationally-determined contributions (INDC) that can help limit average global temperature increase to below 2˚C relative to pre- industrial levels–a limit that is critical in preventing dangerous climate change. The INDCs are expected to be given by the Parties before the COP 21 to be held in December 2015 in Paris. These INDCs should include the type and ambition of its mitigation commitments.

An overview of the climate change policy and sustainable transport framework is shown in Figure 11. The role of climate change policy and its strategies that are drivers for sustainable transport and its clean energy components are highlighted.

Climate Change Act of 2009 (Republic Act No. 9729)

In 2009, the Climate Change Act of 2009 (Republic Act No. 9729) was enacted as a response to global climate change. Apart from the creation of the CCC, the Climate Change Act calls on the CCC to formulate the NFSCC and the NCCAP, to "ensure the mainstreaming of climate change, in synergy with disaster risk reduction[30], into the national, sectoral and local development plans and

[30] The Philippine Climate Change Act defines "disaster risk reduction" as referring to the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

programs," and "coordinate and establish a close partnership with the National Disaster Coordinating Council in order to increase efficiency and effectiveness in reducing the people's vulnerability to climate-related disasters." Furthermore, it requires LGUs to implement Local Climate Change Action Plans

In 2012, Republic Act No. 10174 was approved to amend the Climate Change Act to establish the People's Survival Fund to provide long-term finance streams to enable the government to finance the adaptation programs based on the NFSCC 2010-2022. The fund is a special fund in the National Treasury with PHP 1 billion (about USD 45 million) that will be appropriated annually under the General Appropriations Act (GAA), which may be increased as the need arises. The amendment provides funds to LGUs and civil society groups for preventive measures, planning, preparedness and management of impacts relating to climate change. It mandated the creation of People's Survival Fund Board which is lodged under CCC.

National Framework Strategy on Climate Change 2010-2022

As mandated by the Climate Change Act, the CCC, together with a select group from government and non-government agencies and the academe, crafted the NFSCC. NFSCC is the country's roadmap in creating a climate risk-resilient Philippines. The general goals are to build the country's adaptive capacity, to increase the resilience of natural ecosystems to climate change, and to optimise mitigation opportunities.

Recognising the need for the synergy of adaptation and mitigation, NFSCC provides a basis for the national program on climate change and identifies key result areas to be pursued in climate-sensitive sectors for climate change mitigation and adaptation, as outlined in Table 7. One particular mitigation pillar is environmentally sustainable transport (EST), with the strategic priority of promoting models to improve the transport sector's efficiency and modal shifts as CNG and LPG become the primary fuel of the public transport, convert public utility vehicles to LPG and renewable energy sources, and the expansion of and shift to more efficient transport systems, support the expansion of and the shift to more efficient mass transport systems, and to integrate climate change to formulation of energy and transport policies.

Table 7: Climate change adaptation and mitigation in NFSCC 2010-2022

Adaptation	**Mitigation**
• Enhanced vulnerability and adaptation assessments • Integrated ecosystem-based management • Climate-responsive agriculture • Water governance and management • Climate-responsive health sector • Disaster risk reduction • Climate-proofing of infrastructure	• Energy efficiency and conservation • Sustainable infrastructure • Renewable energy • Environmentally sustainable transport • National REDD+ Strategy (Reducing Emissions from Deforestation and Degradation, Conservation, Sustainable Management of Forests and Enhancement of forest carbon Stocks) • Waste Management

National Climate Change Action Plan 2011-2028

The National Climate Change Action Plan 2011-2028 (NCCAP) sets the country's strategic direction for 2011 up to 2028. The said plan prioritises food security, water sufficiency, ecological and environmental stability, human security, climate-smart industries and services, sustainable energy and knowledge and capacity development. Guided by the NFSCC, NCCAP translates the framework into concrete programs.

In the area of sustainable energy, NCCAP prioritises the expansion of energy efficiency and conservation, the development of sustainable and renewable energy, EST, and climate-proofing and rehabilitation of energy systems infrastructures, putting emphasis on the integration of EST strategies and fuel conservation. The "promotion and adoption of environmentally sustainable transportation" is one of the priority areas of action as stated in the NCCAP. Activities in relation to transport identified in the NCCAP are as follows:

1. Climate proofing, rehabilitation and improvement in the country's energy systems and transport infrastructure ;
2. Implementation of clean fleet programs ;
3. Formally adopt a socially equitable and integrated land-use and transport planning processes at the national and local levels (e.g. Implementation of mixed use, medium to high density integrated land-transport plan in developing new urban areas or in expanding existing ones ; development of guidelines on integrated land use-transport plan) ;
4. Implement energy efficiency labeling for new vehicles ; and
5. Study potential financing schemes to encourage EST.

The Philippines' Response to Environmentally Sustainable Transport

The Philippines signed the Manila Statement of 2004 at the inter-governmental Manila Policy Dialogue on Environment and Transport in the Asian Region in January 2004, which indicates that the country welcomes the initiatives of the UNCRD in extending assistance in preparing national strategies and action plans in promoting EST. The Philippines thereafter signed the 2005 Aichi Statement[31] which recognises the need for national and local governments to develop and adopt integrated policies and programs towards sustainable transport in the following thematic areas: 1) public health; 2) strengthening roadside air quality monitoring and management; 3) traffic noise management; 4) vehicle emission control, standards, and inspection and maintenance; 5) cleaner fuels; 6) public transport planning and travel demand management; 7) non-motorized transport; 8) environment and people friendly infrastructure development; 9) social equity and gender perspectives; 10) road safety and maintenance; 11) knowledge base, awareness and public participation; and 12) land use planning.

National Environmentally Sustainable Transport Strategy 2010-2020

The DOTr was mandated by Administrative Order No. 254 in 2009 to lead the formulation of a National Environmentally Sustainable Transport (EST) Strategy together with DENR, as well as to guide the LGUs "to transform the locomotion and transportation system to favour parties who have no motorized vehicles, and facilitate the mainstreaming of the National EST Strategy." The National

[31] Adopted at the Regional Environmentally Sustainable Transport (EST) Forum, 1-2 August 2005, in Nagoya, Japan

EST Strategy recommends measures to promote EST in the Philippines, mostly covering land transport in urban areas. This framework was completed by DOTr along with the DENR in 2011 with support from UNCRD, Clean Air Asia, and Institute for Global Environmental Studies, and in collaboration with University of the Philippines–National Center for Transportation Studies (UP-NCTS). The National EST Strategy formulates strategies and action plans for the 12 thematic areas abovementioned, 6 of which are outlined in Annex 6.

National Implementation Plan on Environmental Improvement in the Transport Sector 2011-2016[32]

The NIP on Environmental Improvement in the Transport Sector 2011-2016 is a compendium of activities for low carbon and low emission transport systems, and for promotion of non-motorised transport systems, and describes the plan of action. Its scope includes land, water and air transport sectors. Annex 7 presents the outline of the key action plan of NIP. The DOTr drafted the NIP as a result of its commitment to develop such a plan under the ASEAN-Japan Action Plan on Environment Improvement in the Transport Sector (AJ-APEIT). The NIP has the following goals related to the transport and environment:

1. 30% PM10 reduction in 2011;
2. PM10 reduction around 12 to 16 tons per day due to MVIS and operation of 4-stroke tricycles;
3. PM10 reduction by 11 tons per day due to urban rail expansion;
4. 10% reduction of CO2 by public transport rationalisation by 2015;
5. 30% reduction of CO2 through demand management measures and public transport improvement by 2015;
6. 20% reduction of CO2 through better freight and logistics management by 2015;
7. Rationalisation of power utilisation at air and marine terminals; and
8. Issuance of DENR Administrative Order mandating enforcement of updated standards and regulations on noise pollution

The NIP suggests that DOTr will be the one to conduct yearly monitoring of transport-related issues, while DENR will monitor pollution emissions and DOE will monitor fuel quality. DOTr is tasked to perform the function of monitoring and evaluating the progress of the NIP (Figure 11).

[32]The NIP is being reviewed and updated in 2015

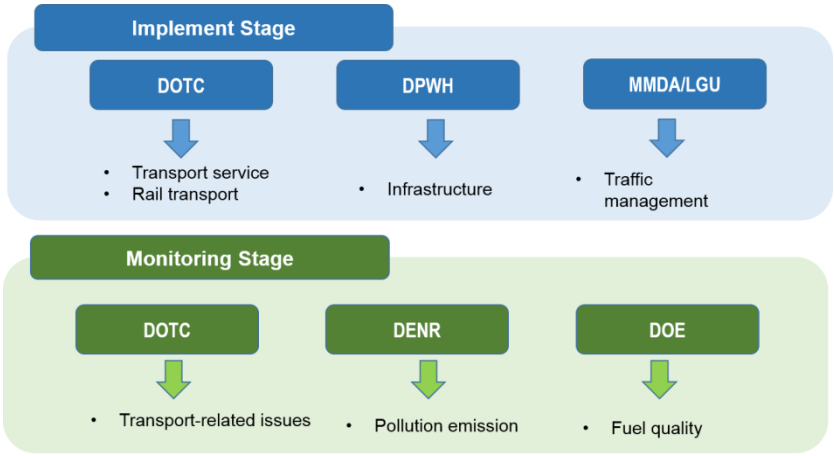

Figure 11: Role of different institutions implementing and monitoring the NIP (Source: Department of Transportation, 2011)

Philippine Development Plan 2011-2016

The Philippine Development Plan (PDP) 2011-2016 serves as a blueprint for defining strategies and programs to "achieve inclusive growth, create employment opportunities and reduce poverty." It contains targets for the five major guide posts or priorities that cover the 16-Point Agenda under the President's Social Contract with the Filipino People[33]. The five are anti-corruption, poverty reduction and empowerment of the poor and vulnerable, rapid, inclusive and sustained economic growth, a just and lasting peace and the rule of law and, most notably, integrity of the environment and climate change mitigation and adaptation. Among the indicators that PDP sets for land transport sector to accelerate infrastructure development as well as for energy efficiency (NEDA, 2011) are outlined in the results matrix below. The matrix provides indicators, baseline information, end-of-plan target and responsible agencies.

[33] More information is available at http://www.gov.ph/about/gov/exec/bsaiii/platform-of-government

Table 8: Philippine Development Plan 2011-2016 result matrix

Indicators/Unit	Baseline		End-of-plan target	Implementing agency
	Year	Value		
Land transport				
Increase road density, road length/land area	2010	81.91	To be determined	DPWH
Increase in total length of arterial roads with Roughness Index of 3.0 (in km)	To be supplied	To be supplied	6,600 km (80%) of total arterial roads	DPWH
Increase percentage of paved road length	2010	77% (out of the total 31,242 km)	93%	DPWH
Increase percentage of length of permanent bridges along national arterial roads	2010	94% (out of the total 330,089 km)	100%	DPWH
Decrease travel time in Metro Manila (minute/km)	2010	2.17	1.57	MMDA
Increase travel speed in Metro Manila (km/hour)	2010	27.79	38.2	MMDA
Decrease number of locations in Metro Manila with pedestrian-vehicle conflict	2010	302	10	MMDA
Increase occupancy due to reduction of Metro Manila City buses				
- Air conditioned bus, passenger/bus	2010	40	65	MMDA
- Non-air conditioned bus, passenger/bus	2010	37	45	MMDA

Rail transport				
Increase in annual ridership (in million)	2010	219.27	270.1	LRTA
Ratio of capacity to ridership				
Increase ratio of revenue to operation and maintenance cost(farebox ratio)	2010	1.05	1.15	LRTA
Energy self-sufficiency				
Self-sufficiency level	2010	59.61%	60.30%	DOE
Energy efficiency and conservation				
Increase savings from electricity and fuel consumption reduction	2010	2,652 KTOE	2654 KTOE	DOE

Philippine Clean Air Act of 1999 (Republic Act No. 8749)

The Philippine Clean Air Act of 1999 (Republic Act No. 8749) is a significant legislation containing air pollution policy to manage nationwide air quality. It sets out the emission control of in-use vehicles and new motor vehicles, establishment of National Motor Vehicle Inspection and Maintenance Program, roadside inspection of vehicles, fuels, additives, substances and pollutants, and regulation of fuels and additives.

The CAA puts in place an integrated system to manage the main sources of air pollution such as stationary, mobile, and other sources. It also mandates the DENR, DTI, and DOTr to establish the procedures for the inspection of motor vehicles and the testing of their emissions.

The CAA is supported by DENR Administrative Order No. 2000-81, otherwise known as the Implementing Rules and Regulations for the Philippine CAA. These Rules set the National Ambient Air Quality Guideline Values, the National Emission Standards for Source

Specific Air Pollutants, as well as the framework for the development of an Ambient Air Monitoring Network, the need for the inventory of emissions, the establishment of an air quality database, the administration of Air Quality Management Fund (which will be discussed further in Section 3.3).

It likewise has provisions on mobile source emissions, setting guidelines on new, in-use, and second-hand motor vehicle emissions covering passenger vehicles, light duty vehicles (LDV), and heavy duty vehicles (HDV), and test procedures to determine exhaust emissions. The type approval emission limits and exhaust emission standards for passenger vehicles, light and heavy duty vehicles, motorcycles and mopeds are outlined in Annex 8 and 9.

The Philippines' Response to Energy Efficiency and Conservation

Philippine Energy Plan 2012-2030

Currently, the Philippine Energy Plan (PEP) 2012-2030 is the blueprint that governs the policies to be implemented to ensure energy security in the country. The PEP specifies plans and programs for the power generation sector, rural electrification, indigenous energy development, renewable energy, downstream oil industry, downstream natural gas, alternative fuels, and energy efficiency and conservation. The relevant targets and plans for transport include: 10% energy savings on total annual energy demand of all economic sectors by 2030; 30% of all public utility vehicles running on alternative fuels nationwide by 2030; natural gas as a major alternative fuel for public transport by; and addition of CNG refilling stations and LNG hub terminals.

National Energy Efficiency and Conservation Program

Efforts have been taken to reduce the country's dependence on imported oil to attain self-sufficiency, not necessarily to ensure energy efficiency. In the transport sector, emphasis is placed on the use of alternative fuels and natural gas. The National Energy Efficiency and Conservation Program (NEECP) was launched in 2004 to promote efficient utilization of all forms of energy. For the transport sector, NEECP encompasses standard and labelling program as well as fuel economy runs. The fuel economy run is a program that employs energy efficiency measures and driving techniques tested on national roads and/or main thoroughfares in order to obtain accurate data on fuel economy rating in a safe and normal condition. The goal of this program is to achieve an

average annual energy savings of 23 million barrels of fuel-oil-equivalent (MMBFOE) for the period 2005 to 2014. This also translates to an avoidance of 50.9 $MtCO_2e$ emissions for the whole period.

Two more efforts within the context of energy efficiency and conservation are being pursued: 1) The Philippine Energy Efficiency Roadmap, and; 2) The Energy Efficiency and Conservation Bill. The said roadmap includes a number of strategies to reduce energy consumption in the transport and industry sectors, and residential and commercial buildings, as well as supplementary cross-sectoral components such as the passage of the aforementioned bill, awareness-raising, and establishment of energy efficiency database and monitoring and evaluation framework.

Among the plans set by the government for the Energy Efficiency and Conservation Roadmap is the passage of related bills into law. Both the Senate and the House of Representatives have filed their respective bills pertaining to energy efficiency and conservation. In the third quarter of 2014, House Bill No. 5053, which was to be known as the "Energy Efficiency and Conservation Act of 2014," was submitted for approval. This bill seeks to mandate a minimum energy performance standard (MEPS) for manufacturers and importers of road transport vehicles, as well as a display of energy consumption label on transport vehicles set by the DOE. The bill also seeks to mandate compliance to fuel economy performance labelling requirements set by the DOE. Earlier that year, House Bill No. 4393, otherwise known as "Sustainable Energy Efficiency and Conservation Act of 2014" was submitted for approval. Parallel bills were filed by the Senate of the Philippines in 2013: Senate Bill No. 1085 and Senate Bill No. 167, or the "Energy Efficiency and Conservation Act of 2013." These bills also seek to mandate compliance to MEPS and energy label requirements on vehicles.

Biofuels Act of 2006 (Republic Act No. 9367)

The Biofuels Act of 2006 (Republic Act No. 9367) was enacted to reduce dependence on imported fuels by incentivising the production, distribution and use of locally-produced biofuels. The Act also stipulates that, within two years from its effectivity, at least 5% bioethanol be comprised in the annual total volume of gasoline fuel sold and distributed by each and every oil company in the country. For diesel, the Act mandates that, within three months from its effectivity, a minimum of 1% biodiesel by volume shall be blended into all diesel engine fuels sold in the country, increasing if feasible. Within two years from its effectivity, National Biofuels Board created from the passage of the Act is also empowered to recommend to DOE to mandate a minimum of 2%biodieselblendby volume. In 2009, through Department Circular No. 2009-02-0002, the mandatory 1% biodiesel blend was increased to 2%. Specifically, coconut methyl ester (CME) or coco-biodiesel, derived from coconut oil, is the type of biodiesel being promoted (Xinhua, 2013).

Renewable Energy Act of 2008 (Republic Act No. 9513)

The Act establishes the framework for accelerated development and advancement of renewable energy sources, and the development of strategic program to increase its utilization. In an assertive move to promote RE development and use, the DOE has determined long-term goals such as (1) increase renewable energy-based capacity by 100%by 2013; and (20 increase non-power contribution of renewable energy to the energy mix by 10 MMBFOE in the next ten year. In support of these general goals, the government aims to be (1) the number one geothermal energy produce in the world; (2) the number one wind energy producer in Southeast Asia; (3) double hydro capacity by 2013; and (4) expand contribution of biomass, solar, and ocean by about 131 MW. These goals serve as concrete measures for government to advance its vision of sustainable energy system with RE being mainstreamed in the system.

Natural Gas Vehicle Program for Public Transport and Auto-LPG Program

The NGVPPT, issued through Executive Order No. 290 in 2004, promotes the use of CNG and repowered CNG-fed buses, and requires natural gas to be supplied through the use of indigenous gas resource and the importation of liquefied natural gas (LNG) from gas producers worldwide to supplement existing indigenous gas supply. It also mandates that CNG refuelling stations and related facilities be established. The Autogas Program, on the other hand, promotes the use of LPG as another alternative fuel.

Existing Policies on Transport

Table 9 and Table 10 provide an overview of the key polices and measures in passenger transport and freight and their status as of the end of 2014. These tables are extracted from the comprehensive policy table in 0, which also includes the information sources. Status is assessed according to these categories:

- *Implemented*: the policy is implemented and enforced, or the transport plan (e.g. metro) is completed and functioning. However, it does not imply there can be no further implementation, e.g. if a certain fuel economy standard is implemented, a future, more stringent, standard can still be developed, or new standards be developed for other types of vehicles.
- *Partially implemented*: some parts of the policy or transport plan are (being) implemented
- *Implementation ongoing*: implementation has started but not yet completed
- *Pilot*: may refer to a policy that is being implemented, but not (yet) at a large scale
- *Planned:* clear policy signals, particularly published official documents, that a policy will start implementation in a certain year in the future
- *Intended*: evidence of policy discussions have been found (public information or personal communication)
- *Not in discussion*: no information on policy discussion has been found

The policies have been categorised according to avoid, shift, improve or general policies: "Avoid" policies refer to those that reduce the need to travel or reduce the length of travel; "Shift" policies refer to those that encourage a shift to more efficient modes of transport or those that promote a high share of such modes, and; "Improve" policies refer to those that increase energy and carbon efficiency of vehicles, their operation and fuels used in the different modes.

Table 9.Passenger transport policies and measures: current status (end 2014)

	Policies/Measures	Implementation Status	Remarks
Avoid	TOD / land-use planning	Planned	A national land use policy is being sought. At local level land-use planning done through Comprehensive Land Use Plans. A national transport plan highlighting mass public transport eg LRTs, PNR can be basis of real estate and commercial development plans.
	Road pricing	Implementation ongoing	Tolled roads are limited to expressways and bridges.
	Restrictions on car use	Implementation ongoing	Metro Manila has number-coding scheme, prohibiting operation of vehicles 7am-7pm some days of week depending on last digit of license plate.
Shift – incentives / regulation/ information	PT management reform	Planned	High quality bus service piloted in Manila; and jeepney reform in NAMA
	Subsidy for PT options	Implemented	The government subsidizes the MRT Line 3, LRT Line 1 and LRT Line 2 in Metro Manila
	Cycling campaigns	Implementation ongoing	Embodied in plans and policies, bike-to-work campaigns, critical mass rides, among others.
	Integrated ticketing for PT	Implementation ongoing	The trial run of LRT-MRT unified ticketing system began in July 2015.
	Real-time public transport info	Implementation ongoing	DOTr launched "Transit App Challenge," which led to the development of transit apps aimed at providing information to the commuting public to improve public transport trip planning. The DOTr partner applications are available in the DOTr website. MMDA already has a media partner for their traffic app: Traffic Navi

Shift – infrastructure	Improvement of intra-urban rail	Implementation ongoing	Plans of expansion for MRT and LRT lines are underway. PNR extended its train service up to south of Manila.
	BRT	Pilot	Cebu BRT approved. DOTr is studying possible BRT in Metro Manila. BRT was announced as a new public transport category through the DOTr Department Order No. 2015-11 "Further Amending Department Order No. 97-1097"to Promote Mobility.
	Sidewalks	Pilot / planned	Pasig City and Ortigas CBD Greenways; Transport Policy Act (pending) includes design guidelines
	Cycling lanes	Implementation ongoing	Cycling lanes in Metro Manila and many other cities are either being initiated or increased.
	Bike-sharing	Pilot/planned	*Tutubi* bike-sharing program in Pasig City and MMDA program in EDSA and other areas; more stations planned in Metro Manila.
	Park-and-ride	Partially implemented	DOE encourages park-and-ride program to eliminate congestion and promote fuel conservation but infrastructures are inadequate.
Improve – efficiency	Incentives for efficient vehicles	Policies being discussed	Tax incentives for production of EVs, e-trikes and e-jeepneys. Import duty reductions for hybrid and CNG vehicles. Discussions on scrappage scheme for 2-stroke tricycles
	CO_2-based taxation for new vehicles	Not in discussion	
	Car labelling	Planned	Fuel efficiency labelling is a target milestone in EE&C Roadmap. DOE is now working on an action plan
	Fuel efficiency standards	Planned	Among the targets in EE&C Roadmap.
Improve –	ITS	Implementation	There are mobile applications like Waze, and traffic signalization systems, traffic monitoring systems are on some major thoroughfares, and CCTV as

operation		ongoing	well as wifi connections in MRT stations.
	Speed limits	Implementation ongoing	Speed limits for cars 2W, trucks and buses are set. Pending bills seek installation of speed limiters in PUVs.
	Inspection and maintenance	Implementation ongoing	Roadside inspections by ASBUs for compliance with the in-use emission standards. In early 2015, a PHP 19 billion MVIS PPP project for national networks linked to LTO is near final approval.
Improve – fuel	Incentives for low-carbon fuels	Implementation ongoing	No tax on local or imported biofuels component; VAT exemption for sale sale of raw material used in the production of biofuels
	CNG/LPG for taxis and buses	Implementation ongoing	DOE's NGV Program for Public Transport promotes use of CNG and repowered CNG-fed buses, while Auto-LPG program targets the taxis.
	EV incentives (2W/3W/car)	Pilot / planned	DOE to procure e-tricycles for LGUs; Pending bill seeks incentives for production and purchase of EVs
General	Fuel price reform	Implemented	Subsidies phased out in 90s. "Pantawid Pasada" Program assists jeepney and tricycle drivers and operators.

Table 10: Freight transport policies and measures: current status

	Policies/Measures	**Implementation Status**	**Remarks**
Avoid	Empty hauling reduction	Not in discussion	
	Improve logistic centres and their location	Not in discussion	
Shift – regulation	Lorry restrictions	Implementation ongoing	Lorry restrictions are only meant to reduce congestion during daytime to benefit motorists

			and commuters, not to encourage shift to other modes such as rail or make movement more efficient. For instance, trucks are particularly prohibited from entire stretch of EDSA on certain rush hours of the day.
Shift - infrastructure	Master planning for rail and water	Planned	A National Logistics Master Plan, including the development of the Strong Republic Nautical Highway and road-roll-on/roll-off (RORO) terminal system linking the entire country, is among the priorities in the Philippine Development Plan 2011-2016.
	Multimodal facilities/dry ports	Planned	The Philippines adopted the Intergovernmental Agreement on Dry Ports, ensuring the development of certain dry ports in Luzon and Mindanao.
Improve – efficiency	Tax incentives for efficient vehicles	Not in discussion	
	Import restriction for inefficient vehicles	Implementation ongoing	Executive Order No. 156 prohibits importation of used/surplus vehicles. This includes vehicle kinds include truck and bus.
	Fuel economy/CO_2 emission standard	Some discussions were initiated on this	
Improve – operation	Vehicle scrapping/fleet replacement	Not in discussion	Vehicle scrapping is intended for passenger vehicles.
	Speed limits	Implemented	The Land Transportation and Traffic Code sets maximum allowable speed limit of 50 kph for trucks.

	Eco driving	Being discussed	While the government collaboration efforts with the private sector on promoting fuel efficient driving is concentrated on passenger vehicles, recent discussions on promoting eco-driving for professional drivers (including freight truck drivers) have been initiated (during the Transport Sector Workshop on INDCs in Tagaytay, June 2015) and was mentioned as a potential measure that can be considered in the future..
	Tyre standards	Not in discussion	
	Aerodynamic standards	Not in discussion	While aerodynamic standards are not mandated nationally, the private sector launches truck fleets with improved aerodynamic cab designs
Improve – fuel	Low carbon fuel (1st/2nd gen Biofuel, CNG, LPG) incentives	Being discussed	
General	Fuel subsidy reduction	Not applicable	Fuel subsidies were phased out in late 1990s

Looking at the existing policies from an "avoid-shift-improve" lens, the country currently has several policies that look at "improving" the vehicles (and operation thereof) and fuels that are used in the transportation system. In particular, car labelling and fuel efficiency standards are planned (which are related to policy objectives such as PDP indicators energy self-sufficiency and energy savings). Taxation measures, which are important to stimulate buyers towards more efficient or lower-carbon vehicles, are not yet well developed. Several policies to make operation of vehicles are being implemented to piloted. Standards or labels for energy efficient tyres, e.g. for trucks, are not yet in discussion.

As for alternative fuels, there is significant attention to CNG and LPG, and initial interest to promote electric vehicles[34], with expectations that by the end of 2015 some 40,000 e-bikes, e-tricycles and e-jeepneys will be in use. Subsidies or other incentives to individual buyers of electric vehicles including 2-wheelers are not yet in place. The Electric, Hybrid and Other Alternative Fuel Vehicles Incentives Act includes incentives for producers and buyers of electric and hybrid vehicles, in particular, for electric tricycles and other public transport vehicles.

"Shift" measures are currently gaining momentum due to the recent developments in instituting modern mass transport modes in cities.[35] Optimisation of the current system of buses and jeepneys is being planned

There appears to be public momentum for improving NMT conditions. Policies and plans for high quality sidewalks and bicycle lanes are in an early stage, with pilots in several cities and provisions for NMT infrastructure being proposed in a pending bill (see below). For example, Marikina City was the first city with a bicycle network, while Pasig City initiated the first Car-less Sunday. Other cities within Metro Manila follow suit; recently, Quezon City announced that it would add bike lanes in its city development plan. Outside of Metro Manila, Vigan City, Iloilo City, Davao City and Cebu City have been among the forefront in promoting non-motorized transport by coming up with ordinances and related initiatives.

Land use and infrastructure planning is also implemented at the local level through their respective Comprehensive Land Use Plan and zoning ordinances. However, further "Avoid" measures, such as transport and land-use planning to shorten trips or have NMT alternatives for short distance trips, parking and road pricing, which can have substantial impacts in reducing the overall energy consumption and emissions from the transport system have not been given focus in the existing policies and measures. Encouraging real estate and commercial developers to come up with its own incentives in reducing private vehicle trips such as car-pooling are also options to consider. As is the case in many countries, freight transport receives less policy attention than passenger transport.

[34]http://climate-journal.asia/philippines-push-for-electric-vehicles/

[35]Project preparation and/or planning activities for bus rapid transit projects are now being conducted in major cities such as Cebu and Metro Manila.

Pending bills and circulars[36]

Filed in 2013 (16th Congress), Senate Bill No. 26 or the "Sustainable Transportation Act of 2013" seeks to mandate DOTr in coordination with NEDA to draft a Sustainable Transport Action Plan with strategies relating to parking, public transport, cycling, walking and transport infrastructure. It also seeks to mandate installation of walkways (e.g. 3-meter sidewalks for primary and secondary roads, or elevated footbridge in case there is no space), implementation of public transportation initiatives, commission of a BRT, establishment of water ferry system, drafting of guidelines on travel demand management (TDM) to reduce cars on the road (e.g. car-sharing, congestion pricing measures, telecommuting, flexible work schedule), and designation of bike lanes and provision of bike parking spaces and bike racks.

A "Transportation Policy Act" which aims to set the direction of and parameters for the development of the Philippine transportation system has also been drafted and has been filed under the House of Representatives in 2013 as House Bill No. 315. The Act aims to establish the structure and methodology for national transport planning. As per the official records of the House of Representatives, the action is pending from the Committee on Transportation since July 2013. The draft of the Act was an output under the initiative "Formulating a National Transport Plan"– supported by the Philippines-Australia Partnership for Economic Governance–which also produced a draft national transport plan and a NTP framework.

To further promote non-motorized transport, a Joint Memorandum Circular is being drafted[37] seeking to institutionalise the "Bayanihan sa Daan" Awards (Cooperative Heroism) to recognize pioneering local governments, individuals, civil society groups and organisations from across the country that are actively promoting walkable-bikable communities and road-sharing movement.

Several bills have also been submitted by both the Senate and the House of Representatives of the Philippines on incentivizing alternative fuel vehicles, e.g. House Bill No. 387, House Bill No. 483, House Bill No. 2316, Senate Bill No. 164 and Senate Bill No. 2151.

House Bill No. 387[38] (Electric, Hybrid and Other Alternative Fuel Vehicles Incentives Act of 2013) seeks to provide incentives for the manufacture, assembly, and importation of electric, hybrid and other alternative fuel vehicles (and does not cover vehicles powered by biodiesel and bioethanol). This would subject manufacture or assembly to 0% excise taxes and duties, and importation and sale of raw materials and spare parts for such purpose to 0% value-added tax (VAT), for 9 years from effectivity of the Act. Meanwhile, importers of these vehicles would be exempt from excise taxes and duties for 4 years. House Bill No. 483 (Alternative Fuel Vehicles Act of 2013) seeks to grant the same exemptions, as well as exemption of motorists converting their old vehicle to hybrid or alternative fuel vehicle from MVUC. The bill also seeks to exempt these vehicles from toll fees at expressways, and to grant them 50% discount on parking fees in all establishments. Such vehicles used for public conveyances are sought to be exempt from income tax as well. This bill seeks to create an Alternative Fuel Vehicle Program Trust Fund to finance the promotion of hybrid or alternative fuel vehicles.

[36] Bills are pending laws. They become laws when they are approved by both House of Representatives and the Senate, and the President of the Philippines. More information on the Philippine legislation process can be found at http://www.gov.ph/about/gov/the-legislative-branch.

[37] As of May 2015.

[38] According to the document, the bill was initially introduced as House Bill No. 5161 during the 15th Congress and was approved on 3rd reading in March 2013. It was transmitted to the Senate in January 2013 where it was also approved. However, lack of time prevented the bill from being subject to Bicameral Conference Committee.

House Bill No. 2316 (Electric, Hybrid and Other Alternative Fuel Vehicles Incentives Act of 2013) was later proposed to combine several elements from the previous bills, namely, the incentives to manufacturers or assemblers, to importers, and exemption from payment of MVUC. This also adds non-fiscal incentives to PUV operators utilising electric, hybrid or other alternative fuel vehicles, granting them priority in franchise application and its renewal for 9 years.

Similarly, Senate Bill No. 164 (Electric, Hybrid and Other Alternative Fuel Vehicles Incentives Act of 2013), filed in 2013, seeks to grant the incentives to manufacturers or assemblers, to importers, and exemption from payment of MVUC. Moreover, this bill seeks to exempt these vehicles from Unified Vehicular Volume Reduction Program (UVVRP) or Number-Coding Scheme[39] . The bill does not seek for discount on parking fees, but rather seeks for free parking spaces to be exclusively designated for electric, hybrid and other alternative fuel vehicles, for 9 years. In 2014, Senate Bill No. 2151 (Electric, Hybrid and Other Alternative Fuel Vehicles Incentives Act of 2014) was filed to mainstream the use of the said vehicles through similar incentives to manufacturers or assemblers and to importers, and exemption from MVUC. This also includes non-fiscal incentives, namely, priority in registration and issuance of plate number, priority in franchise application, exemption from the Number-Coding Scheme, and provision for free parking spaces in new establishments. This also seeks to create Coordinating Council for Promotion of Electric, Hybrid and Other Alternative Fuel Vehicles to formulate incentives, develop standards and specifications, review and recommend policy for allowing the entry of and promoting such vehicle fleet operations, among others.

Financial Structure

The national budget is disbursed to all government units for their operations, maintenance and projects. The government drafted the 2011-2016 Public Investment Program (PIP) to guide the public sector resource allocation, among others. A Revalidated PIP, published by NEDA (2014), puts "infrastructure development[40]" high on the agenda with the largest share of investment target (53.3%) among all key areas[41] for the period 2013-2016. The national government, including official development assistance (ODA) loans and grants, is proposed to cover 80.18% of investment targets for all key areas for the said period, amounting to PHP 2,760,253.56 million (about USD 61.27 million).

The national government annually prepares GAA[42] which presents the budgetary programs and projects for each agency of the government. Funds from the government can be sourced from special taxes, fines, and user's charge such as the MVUC. All monies collected from MVUC are distributed among four special trust accounts in the National Treasury: Special Road Support Fund (80%); Special Local Road Fund (5%); Special Road Safety Fund (7.5%); SVPCF (7.5%). The first three funds are managed by DPWH while the Special Vehicle Pollution Control Fund (SVPCF) is under DOTr. SVPCF, which is a special trust account set up to reduce air pollution from mobile sources, covers the following categories: vehicle standards and regulations; vehicle pollution control research, education, training, and public information; vehicle pollution control management, and; alternative vehicle pollution control and technology (DOTr, 2014b).

[39] This scheme took effect in June 1996 pursuant to MMDA Regulation No. 96-005. It was implemented to reduce the number of vehicles on major roads by prohibiting operation of motor vehicles during corresponding days of the week, depending on the last digit of their license plates.
[40] Infrastructure covers transport infrastructure, information and communications technology (ICT) and water supply projects.
[41] Apart from infrastructure development, this includes macroeconomic policy, industry and services, agriculture and fisheries, financial system, social development, governance, peace and security, environment and natural resources.
[42] For 2014, the Republic Act No. 10633, or the 2014 GAA, serves as the primary fund release document.

Both the national government and the LGUs can access this fund, while private academic institutions and NGOs can collaborate with government agencies or public universities in drafting proposals and research, provided that these government institutions will take the lead. As of September 2014, the available balance in the fund is PHP 5.6 billion (about USD 124.3 million) (DOTr, 2014b).

Another example is the Air Quality Management Fund (AQMF) that was set up as a special account in the National Treasury, and is managed by DENR-EMB. One third of the fund is reserved for national purpose while remaining two-thirds is distributed among the airsheds. It finances the purchase of equipment related to air quality monitoring and the research on air-related issues, among others, and is sourced from air emission charges from industrial facilities and from motor vehicles, and grants from both private sector and donor organisations.

Local government units

The Local Government Code of 1991 grants to LGUs the power to enact ordinances that would benefit their community and people; environmental management is considered one of the basic services that LGUs should provide to its inhabitants. Development planning is conducted by the LGUs Local Development Council (LDC) which is the body mandated by law to assist their respective *Sanggunian* or Council in setting the direction of economic and social development, and coordinating development efforts within their respective territorial jurisdictions. There are LDCs at the barangay, city or municipality, and provincial levels. Each LGU shall have a comprehensive multi-sectoral development plan to be initiated by its development council and approved by its City or Municipal Council. The local development plans approved by their respective Councils may be integrated with the development plans of the next higher level of local development council. The approved development plans of the LGUs shall be submitted to the regional development council, which shall be integrated into the regional development plan for submission to NEDA.

In terms of the direct powers of LGUs relating to specific transport modes, LGUs (particularly cities and municipalities) have the authority to regulate tricycles. Section 458 of the Local Government Code Book 3 states that city/municipal governments can grant franchises, enact ordinances authorising the issuance of permits or licenses, or enact ordinances levying taxes, fees and charges upon such conditions and for such purposes intended to promote the general welfare of the inhabitants of the municipality, and pursuant to this legislative authority shall regulate the operation of and grant franchises to tricycle operations subject to the guidelines of DOTr.

For the efficient implementation the said local development plans, each LGU has the authority to create its own sources of revenues and to levy taxes, and to get a share of national taxes through the Internal Revenue Allotment (IRA) in which provinces, municipalities, barangays, among others, each receive a corresponding allotment. LGUs are also granted financial assistance through various forms. In line with the Performance-Based Incentive Policy approved in 2009, DILG initiated the Performance Challenge Fund for LGUs to put premium on performance to avail of financial support. Among its objectives is to "encourage alignment of local development investments program with national development goals and priorities to achieve the Millennium Development Goals (MDGs), boost local economic development and comply with Philippine Disaster Risk Reduction and Management Act of 2010 and Climate Change Adaptation Act of 2009"(DILG, 2011).

In 2011, the DILG launched the Seal of Good Housekeeping to further the transparency, accountability and participation among LGUs. To qualify for the grant, the LGU must comply with criteria on planning, budgeting, revenue mobilization, financial management and budget execution, procurement, and resource mobilization. DILG annually selects LGUs to confer the Seal upon, and

these LGU awardees are entitled to financial assistance through the Local Government Support Fund (LGSF). In 2011, 1,325 (69 provinces, 111 cities, and 1,145municipalities) were conferred with the Seal of Good Housekeeping, 351 of which received a Performance Challenge Fund. This provides a subsidy of PHP 1 million (about USD 22,200) to each municipality, PHP 3 million (about USD 66,600) to each city, and PHP 7 million (about USD 155,000) to each province (DILG, 2012). In January 2014, the DILG launched the Seal of Good Local Governance, an improved version of the former seal. This not only measures "good housekeeping" but also encourage disaster preparedness and social protection (Official Gazette, 2014).

Private sector participation

The government encourages public-private partnership (PPP) to improve the infrastructure in the country. This is prescribed under the Philippine Build-Operate-Transfer (BOT) Law (Republic Act No. 6957) issued in 1990 which recognises the private sector as the main engine for national growth and development, and authorises all government infrastructure agencies, including government-owned and controlled corporations and LGUs to enter into contract with any duly prequalified private contractor for the financing, construction, operation and maintenance of any financially viable infrastructure facilities through the build-operate-and-transfer or build-and-transfer scheme.

The PPP Center was established to realise the PIP, which supports the PDP 2011-2016. This includes encouraging investments in expanding the rail network in Metro Manila, and the implementation of roadways and toll expressways in the country, among others. The PPP Center is the main agency responsible for PPP project facilitation, coordination, and monitoring mandate. Among its current projects is the MVIS, which involves setting up of Motor Vehicle Inspection Centers to test HDVs, LDVs and two-wheeler vehicles across the Philippines. Big ticket PPP railway projects were also recently announced. The private partner will develop, operate, and maintain a network of centers that will perform the inspections.

International funding sources and donors

The Philippines coordinates with ADB and the World Bank Group (International Bank for Reconstruction and Development, International Finance Corporation) in tapping USD 250 million from the Clean Technology Fund (CTF). CTF is among the largest multilateral funding source promoting the transfer of low carbon technologies with significant potential for long-term GHG emissions savings, among which is transport sector. In 2009, USD 125 million was allocated from the CTF loan to the deployment of low carbon energy technologies as well as energy efficiency measures for industry, commercial buildings, and municipalities. The amount was divided to USD 24 million for energy efficiency and USD 101 million for the deployment of e-tricycles. ADB will provide an additional USD 300 million for the e-tricycle program.[43]

On the other hand, the Global Environment Facility (GEF) has been designed to assist developing countries to deal with five major environmental problems, including global warming, i.e. mitigation and adaptation to climate change. It is the largest public funder that covers incremental or additional costs associated with global environmental benefits.

Financial support also comes from international financial institutions and foreign bilateral aid agencies in the form of technical assistance, and loans and grants through an ODA. In general, the infrastructure sector receives a larger fraction of ODA loans than other sectors, among which the

[43]Lopez, 2012. "Filipinos may pay for new ADB loan without having a say on how it's spent". Retrieved from: http://www.sunstar.com.ph/manila/local-news/2012/01/24/filipinos-may-pay-new-adb-loan-without-having-say-how-its-spent-202318

transport sector has the highest share (Navarro & Llanto, 2014). Major donor activities in the Philippines are enumerated in Table 11.

Table 11: Example of donor activities on sustainable transport projects and related EST policy

Strategy	Passenger Transport	Freight Transport
Transport Demand Management	• JICA conducted the feasibility study for Central Luzon Link Expressway Project to expand industrial activities to Central Luzon, and provided technical assistance to Metro Manila Region Highway Network Intelligent Transport Systems Integration Project. JICA also funded Metro Manila Urban Transportation Integrated Study (MMUTIS) in 1999 and supported in 2011 the Metro Manila Update and Capacity Enhancement Project	
Modal shift	• ADB: Davao Sustainable Urban Transport Project, including development of a comprehensive public transport plan • World Bank, AFD: The Cebu BRT • GIZ, ADB, Swedish International Development Cooperation Agency (Sida): Cities Development Initiative for Asia. Construction of BRT route in Cebu (in addition to that of World Bank) • JICA Capacity Enhancement of Mass Transit Systems in Metro Manila Project (Extend the south end of LRT1 and the east end of LRT2)	• Japan Bank for International Cooperation (JBIC) granted an ODA loan to construct Subic Container Port of 600,000 twenty-equivalent unit (TEU) capacity.
Energy efficiency	• GIZ, KfW are finding opportunities to improve the sustainable transport policy: The project "Energy Efficiency and Climate Change Mitigation in the Land Transport Sector in the ASEAN Region" aims to support the development, implementation and monitoring of strategies and action plans towards the improvement of energy efficiency and the reduction of GHG emissions in the land transport sector, and development of action plans and measures in five countries, and implementation according to national plans in at least three ASEAN Member States, among others. • ADB provided technical assistance for Mitigation of Climate Change through Increased Energy Efficiency and Use of Clean Energy, and provided loan for Market Transformation through Introduction of Energy-Efficient Vehicles Project to reduce transport sector's fuel consumption. The primary output is to transform the tricycle industry and distribute thousands of electric tricycles.	

General	• The Japanese government through the Cities Alliance, World Bank's East Asia Eco2 Cities program and Australian Agency for International Development (AusAID) trust fund support the Metro Manila Greenprint 2030. • JICA conducted a roadmap study for transport infrastructure for Metro Manila and its surrounding areas (Bulacan, Rizal, Cavite and Laguna) as requested by NEDA in order to formulate a transport master plan towards 2030. • JICA's Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines (also called Metro Manila Urban Transportation Study Update and Capacity Enhancement Project or MUCEP). This includes the development of a comprehensive transport database and a decision support system based on geographical information • Canadian International Development Agency (CIDA) and AusAID gave additional grant contribution to the Project Development and Monitoring Facility (PDMF) of the PPP Center. Among the projects covered by PPP is MVIS • AusAID funded the 2009 NTP and Planning Study • GIZ TCC is providing assistance in updating the NIP finalizing the SVPCF Operating Guidelines and assistance in establishing DOTr-ESITU, tasked to mainstream EST projects funded by SPVCF as co-benefit of pollution reduction initiatives in mobile sources.	• JICA's Logistics Infrastructure Development Project is to finance medium to long-term capital for logistics infrastructure (e.g. construction of roads and facilities for cargo and storage)

Sustainable Transport Barriers

The review on current transport policies addressing sustainable transport and climate change reveals several points of consideration:

- Owing to the cross-sectoral nature of sustainable transport and the archipelagic setting of the Philippines, strengthening the coordination across geographically dispersed and different sectoral transport institutions and integration among different modes of transport are important.
- The constant change in personnel at the administrative level often coincides with the changes in the political landscape, which also hinders the capacity of institutions for long-term planning and impedes the continuity of policies and projects undertaken.
- The existing NESTS that comprehensively highlights the avoid-improve-shift framework encourages a defined policy framework and direction geared towards sustainable transport. However, the NESTS should be supported by specific policies, such as the NIP on Environment Improvement in the Transport Sector or a NTP that will guide the development of strategies and plans and enable implementation. Implementation plans and policies moreover, need to be supported by a MRV system to monitor and enhance transparency of achieved impacts.
- Financing is one of the major obstacles to sustainable transport. ADB (2012) found that the level of investment required for transport infrastructure development in the Philippines exceeds its national budget allocation. While efforts such as PPP have been undertaken to address the funding gap, the participation of international private entities in transport infrastructure financing is constrained, as government bidding only allows proponent entities that are predominantly Filipino-owned. Moreover, the prioritisation and approval criteria of projects are mainly determined by the economic costs and benefits. The environmental sustainability component of transport infrastructure projects needs to be included as an additional criterion in project appraisal stages.
- Other local sources (SVPCF and AQMF) and international sources (CTF and GEF) of funds are available but access to such funds remains limited. The SVPCF, for example, obtains approximately USD 10 million per year (about PHP 800 million) that can be tapped to implement EST projects that are aligned with the goals of the Philippine Clean Air Act. Much of the funds, however, remain undisbursed due to the lack of clarity in terms of the projects that can actually apply for funding. In addition, fiscal and administrative delays in government processing, and duplicate and lack of clarity in inter-agency requirements also contribute to the delayed disbursement of government funds.[44]
- Increasing the awareness of the public on the issues related to sustainable transport is also an essential need. A "car-centric" culture is still evident in the country and this hinders the implementation of sustainable transport policies.

The review of transport data using the ASIF framework reveals that available data in the Philippines is very limited. Collection of data at a level that is useful for planning is only conducted occasionally and is thus often outdated. It is also often limited to major urban centers like Metro Manila. For the reason that information on transport activity and trends are important in designing policies and in monitoring their impacts, limited data availability reveals limited institutional capacity for planning and monitoring. The lack of sustained, quality and consistent data will also pose challenges later on in terms of accessing available international climate finance for transportation projects as good MRV elements are expected to be pre-requisites for accessing such funds. Table 12 enumerates several challenges in data collection in the Philippines. These challenges in collecting transport-related data are present across Asia, as observed by Fabian and Patdu (2011) in 0.

Table 12: Challenges in availability, reliability, and quality of data that are relevant for emissions estimation in the Philippines

Activity	• Transport activity data is not regularly collected. Some activity data can be found in reports of technical assistance projects funded by development organisations, transportation planning studies (DOTr), fleet records, and local studies. Most efforts in upgrading available data are ad hoc and project-dependent. Because data collection is dependent on projects, activity data is only available for certain years and not in time-series. • Important information is with the local governments who are also involved in transport planning and traffic management within their jurisdictions, but there is no mechanism to standardise and collate these data from the local government units. • Information on mobility is not included in regular national household surveys conducted. • Odometer readings are not being recorded as part of the annual vehicle inspections scheme. Having an accurate estimate of the vehicle activity for each sub-segment of the vehicle fleet is quite an important factor in relation to energy efficiency and climate change.
Structure	• There is no official in-use vehicle population statistics in the Philippines. Estimates can be derived using the following sources: general vehicle registration statistics which can be easily accessed from LTO, and; traffic statistics from the National Road Traffic Survey Program (NRTSP) of DPWH. A limitation of the NRTSP, however, is that it does not include metropolitan areas like Metro Manila, Baguio, Cebu, and Davao. For Metro Manila, this is already within the scope of MMDA, but only for main thoroughfares. • While in-use vehicle population data is not readily available, vehicle registration renewal in the Philippines is required annually (except for newly registered cars, wherein annual renewal of registration is required on the third year). The yearly nature of vehicle registration in the Philippines eliminate some of the issues other developing countries have (like Cambodia, Indonesia, India) in terms of the accuracy of registration data as a proxy for in use vehicle data. As owners are required to register their vehicles annually, this means that the registration data is somewhat a good approximation of the active vehicles on the road. However, there are still uncertainties as there are vehicles that are not registered yearly (non-compliance). Vehicle sales, imports, and production data, and, in

	some cases, models, can be used to refine vehicle population estimates further, but these are not readily available. • A challenge in collating data with regards to vehicle population is that the vehicles are managed by different agencies. Data for number of public utility vehicles (PUVs) including *jeepneys* and AUVs, can be taken from LTFRB. Two-wheelers and three-wheelers are not disaggregated in the vehicle registration statistics of LTO. It is necessary to approach the different LGUs to be able to acquire a reasonable estimate for three-wheelers, which is important to account for since three-wheelers are often used for public passenger transport. • Another limitation in consolidating vehicle population statistics is that the agencies use varying terminologies in their reporting. For example, in the LTO vehicle registration statistics, these are the vehicle categories used: cars, utility vehicles, sports utility vehicles, trucks, buses, motorcycles and trailers. This is different from categories used in the DPWH Atlas: motor-tricycle, passenger car, passenger utility, goods utility, small bus, large bus, rigid truck (2 axles), rigid truck (3+ axles), truck semi-trailer (3&4 axles), truck semi-trailer (5+ axles), truck trailers (4 axles), truck trailers (5+ axles). • Comprehensive vehicle classifications by fuel type (especially for vehicles running on alternative fuels and on electricity) and by technology type (which is important for air pollutant emissions estimations) have limited availability. This can be estimated using sales statistics from oil companies, market research data (e.g. Segment Y Automotive Intelligence Pvt. Ltd.), and local studies. Official statistics do not reflect the true fuel split of the vehicle segments, as the LTO database only has fields for gasoline and diesel (i.e. CNG, LPG are not reflected as part of the official statistics)
Intensity	• Information on fuel efficiencies of the in-use vehicles is limited. Some information is available in reports of technical assistance projects funded by development organisations, transportation planning studies commissioned by the government, vehicle manufacturer's statistics, transport company records, fleet operators' surveys, and local studies. • The fuel economy of new vehicles entering the fleet can be calculated using segmented sales data (and pairing the sales data with published fuel economy values), but there is no requirement for the car companies to release such data to the government currently.
Fuel	• Availability of locally derived emission factors is limited and outdated as emission factors used by the Philippines are from 1992. However, the University of the Philippines–National Center for Transportation Studies has prepared and submitted a proposal to DOTr for SPVCF to develop local emission factors for different sub-segments of the vehicle fleet. The proposal encompasses vehicle fleet characterisation and derivation of local drive cycles for different vehicle fuel types

Recommendations

This report has provided an overview of the available data parameters and the data gaps related to monitoring transport-related climate, energy and sustainability indicators based on the ASIF approach[44]. Issues include the following: uncertainty in top-down fuel sales estimates,[45] difficulty in determining the number of vehicles that are actually in-use, the use of different classifications by different agencies that handle data, lack of mechanisms for disaggregating the vehicle fleet into relevant sub-segments (e.g. vehicle technology, emission standards, among others), lack of monitoring mechanisms for vehicle activity data, absence of institutionalised transport surveys (passenger and freight) and the lack of reliable fuel economy information and emission factors.

ASEAN context

These recommendations are regarded as being appropriate in the ASEAN regional context as it maintains coherence with the ASEAN Strategy Transport Plan 2011-2015, which has been approved by the DOTr and calls for more significant focus on sustainable transport policies, capacity building, data systems, and MRV. We observe a momentum within many of the ASEAN Member States as well, with regards to initiatives addressing sustainability, climate change mitigation and energy efficiency especially in the land transport sector e.g. for fuel economy standards and incentives, green freight, and public and non-motorised transport.

Plans, Policies and Programs

The Department of Transportation already has an Environmentally Sustainable Transport (EST) framework and strategies published in a 2011 document. It embodies the Avoid-Shift-Improve pillars to achieve a truly sustainable and climate-friendly transport system. The challenge is translating these pillars into policies that will guide the planning and implementing mechanisms including MRV.

Enactment of National Transportation Policy and Operationalisation of the NIP

Major policies, supporting strategies and plans that address sustainability in the transport sector are already in place. The review establishes the importance of incorporating significant policy drivers in sustainable transport strategies such as measures to meet air quality standards, reduction in imported oil, accessibility, equity, and liveability. Climate change mitigation provides an additional driver towards sustainable transport policies. While relevant overarching strategies are in place, an overarching NTP that would set overall transport vision that embodies sustainability, as well as the structure and approaches to clarify the roles and responsibilities of different government agencies and to identify specific gaps in transportation planning (e.g. creation of integrated transport master plans), project implementation and monitoring is needed.

[44] The ASIF (activity-structure-intensity-factor of emissions) parameters that were discussed in this report, are not only relevant for emissions analysis, but can be used for assessing the state and trends of the transport sector vis-a-vis other government priorities and communication to the public

[45] There appears to be substantial uncertainty in fuel consumption and emissions estimates for the transport sector, with official statistics indicating that energy use and emissions have remained relatively flat in the period within 2000 – 2010 (.03% annual growth rate), considering the robustness in the vehicle population growth (6% per year in the same period).

It is noted the country has instituted a number policies and initiated programs that are geared towards "improving" the vehicles and fuels that are used in the transportation system. "Shift" measures are currently gaining momentum due to the recent developments in instituting modern mass transport modes in cities while "avoid" the need to travel need policy attention. In general, freight transport receives less, however increasing, policy attention.

The enactment of a NTP is important in laying down a long-term vision for the Philippine transportation system and institutionalising a responsive planning process that can address transportation demands in a sustainable manner.

"Avoid" measures, such as land-use planning to shorten trips, parking and road pricing have not been given focus in the existing policies and measures. Developing such policies together with the above mentioned "shift" policies would result in a more comprehensive, push and pull strategy. Encouraging real estate and commercial developers to come up with its own incentives in reducing private vehicle trips such as car-pooling should also be done.

Develop national guidelines for NMT infrastructure design and operation integrated into the transport planning process

Shifting trips towards more efficient modes within the Philippine context would require close attention in improving the overall quality, safety and inter-connectedness of the different modes. This points towards the need for better inter-modal transport planning. National guidelines on NMT that incorporates NMT infrastructure design and operations need to be developed and mainstreamed into the transport planning process.

Ensuring convenient and safe access by non-motorised (NMT) transport to public transport stations (first/last mile connectivity) and other destinations is key toward realising the full benefits of the planned mass transport projects. It shall require comprehensive and consistent planning, including provisions and standards for safe NMT infrastructure such as separate bike lanes and sidewalks, safe crossings without detours, direct routes, bike parking and reduction of conflicts with motorists, complemented by information and branding campaigns and potentially e-bike incentives. Such interventions can build on the ongoing public momentum there is for improving NMT conditions.

Introduce and promote fiscal and non-fiscal measures on alternative fuels and vehicles

Given the potential benefits of alternative fuels and vehicles, policy support for fiscal - such as incentives for fuel efficient vehicles and CO2 based vehicle taxation - and non-fiscal measures - fuel economy labelling and/or standards for vehicles and vehicle components (such as tires) – can be considered.

Revise project appraisal criteria for transportation projects to include environmental sustainability components

Prioritisation and approval criteria of projects are mainly determined by the economic costs and benefits. The environmental sustainability of the project is treated as an externality, which consequently excludes environmental benefits in appraising the overall returns of the project. The

environmental sustainability component of transport infrastructure projects needs to be included as an additional criterion in project appraisal stages.

Developing a national green freight program integrated into the transport planning framework

Freight transportation planning must be given more attention and ultimately must be integrated into the general transport planning framework. Potential policies and measures includes efficient vehicle and tire standards or incentives and eco-driving, all of which could reduce logistics costs and CO_2 emissions. Multimodal planning and optimising freight movement through logistic centres can also be considered. Developing a national green freight program that includes a labelling/recognition component as well as financial incentives can motivate shippers and carriers towards adopting green technologies and practices is also a potentially transformative program.

Knowledge Management and Database System

There is much room for improvement in terms of generating, managing, utilising and sharing transport data in the country. Developing and maximising the capacity of data management units in order to develop data, provide clear and guided frameworks and procedures for other agencies and LGUs to collect and report data. Efforts to also maximise and organise assistance from development partners could support gaps in data development and management.

Develop and institutionalize a robust national transport data and monitoring database

The data needed for establishing energy and climate change indicators for transport are mostly data that are needed for transport system monitoring – data that should be collected to support transport planning and decision-making in general. An actual detailed mapping, collation and data-tagging of the existing data and identifying the other potential uses of these data may be a useful exercise for heightening the appreciation and emphasizing the significance of such data. Improved lateral and vertical cooperation within the government agencies, as well as with other institutions is needed in sustaining a knowledgebase on sustainable transport. A central repository of studies and accompanying data/ databases can be put up in order to enable sustained knowledgebase development. These studies can be housed in a "compendium of studies" database system, which can be managed by a unit within DOTr. There is also a need to institutionalise the generation of additional data that would help in understanding the movements of people and goods in the country. A national transport survey, for example, can be developed and can be integrated into an existing government data collection initiative such as the national census or the household energy consumption survey

Establish procedures for data collection and reporting

Standardised formats for tagging the essential elements of and data contained in the studies can be formulated in order to facilitate the easy transfer of knowledge in the future. In the longer-term, the government can look into expanding the aforementioned "compendium of studies" to include harvested data points from the different studies. Ultimately, the goal is to have a database - accompanying processes - that can be used for monitoring the state and trends of relevant transport indicators, including climate-related ones.

Implementation of the motor vehicle inspection system

The upgrading and expansion of MVIS in the country is a key measure that is essential in ensuring that the negative impacts of road transportation are alleviated.[46] It also provides an opportunity to generate data for the Philippine government that are essential in a holistic characterization of the vehicle fleet and generating robust vehicle activity data.

Capacity Development and Information, Education and Communication

Insights on potential capacity building and awareness raising activities are suggested based on the results of this stocktaking exercise. Rationalised and targeted training programs for relevant government officials can be beneficial in mainstreaming sustainability in the transport sector. Existing courses on sustainable transport can be tapped and tailor-fitted in order for these to address the specific needs of relevant stakeholders, particularly those in the government who are involved in planning and policy development.

Conduct a training needs assessment for key government agencies

A training needs assessment among relevant government staff can be done in order to pinpoint specific demands for certain topics such as: environment, social and economic benefits of sustainable transport, integrated policy planning and development for sustainable transport, MRV of sustainable transport actions and policies and its importance in accessing climate finance opportunities. The formation and implementation of additional training programs must also be contextualized within the current volume of training programs. In order to maximise the benefits from such trainings, internal procedures for maximising the usage and the scope of reach of the learnings can be considered by government agencies, such as requirements and guidance for re-echoing and documentation.

Develop a communication strategy

A communication strategy beyond climate change related issues may be helpful to inform the public about the progress towards sustainability. This can have a substantial impact in raising the public's awareness on the issues related to transport and an appreciation of how moving towards sustainability in the transport sector will have direct impacts on their lives.

Developing financing mechanisms for programming EST initiatives

Notable financing mechanisms that can be tapped for funding projects and programs related to improving the environmental performance of transportation in the country (including climate change mitigation) have been discussed in this report as well. The development of reliable and robust data and monitoring systems are needed in encouraging international climate change funds to support sustainable transport initiatives. To further support the approval of EST projects, efforts to highlight and integrate the environmental sustainability of projects in the project prioritisation and approval process need to be undertaken.

[46] A centralised vehicle inspection system with strong government oversight is a model that can be considered by the Philippine government.

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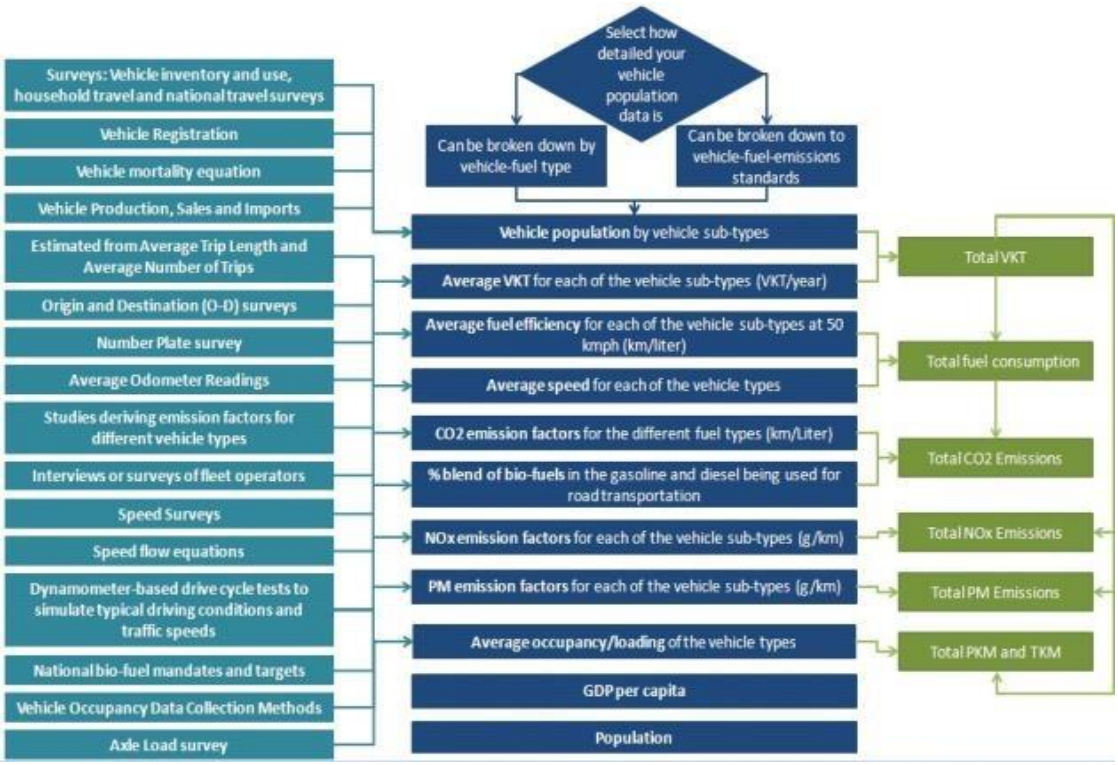
Annexes

Annex 1. Factors under the ASIF component)

Emissions	=	**A. Activities** (pkm=trips x km) *Determinants* • Population • Demographics • Income • Economy • Urban form…	x	**S. Mode Share** (% pkm) *Determinants* • Income • Motorisation rate • Infrastructure • Service provision • Relative costs • Urban form…	x	**I. Fuel Intensity** (quantity per pkm) *Determinants* • Engine type • Vehicle load • Vehicle age • Congestion levels • Capacity mix • Urban form…	x	**F. Fuel Choice** (emission per quantity) *Determinants* • Fuel type • Engine type • Vehicle tech • Vehicle age • Temperature • Altitude…

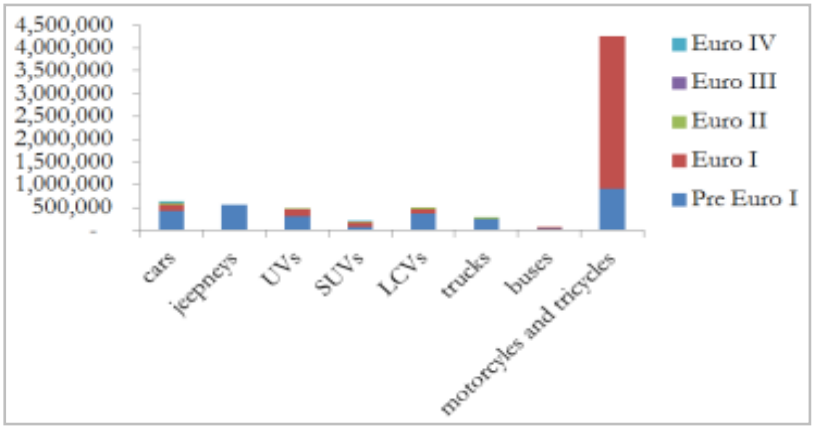
Source: (Clean Air Asia, 2012. Accessing Asia: Air Pollution and Greenhouse Gas Emissions from Road Transport and Electricity)

Clean Air Asia (2012)published a set of guidelines to identify air pollution and GHG emission indicators for road transport and electricity sectors. Based on the ASIF framework, data availability of input parameters for each country can be identified using various indicators. The figure below illustrates the calculation flowchart to estimate emissions.



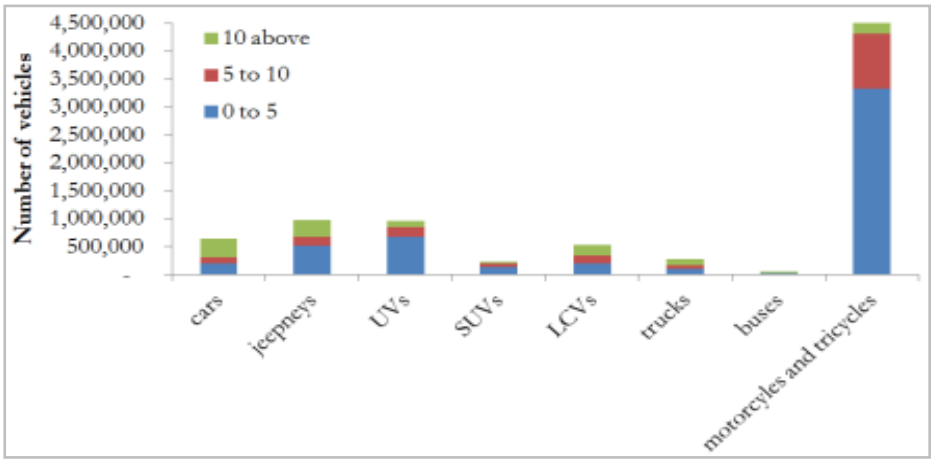
Flowchart to estimate emission from road transport

Source: Clean Air Asia, 2012. Accessing Asia: Air Pollution and Greenhouse Gas Emissions from Road Transport and Electricity



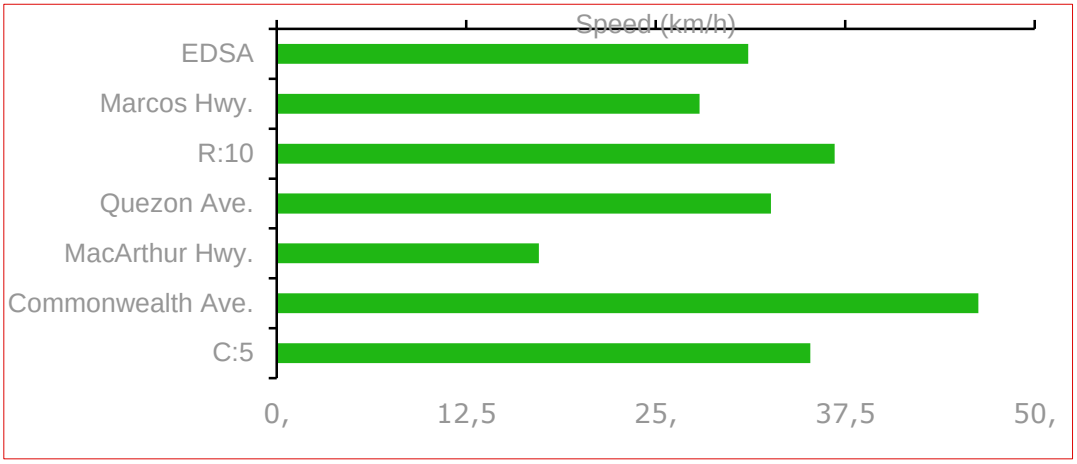
Annex 2. Vehicle population by vehicle technologies, 2008)

(Source: Data obtained from segment Y Automotive Intelligence Pvt. Ltd.)



Annex 3. Vehicle age by vehicle type, 2008

(Source: Data obtained from segment Y Automotive Intelligence Pvt. Ltd.)



Annex 4. Vehicle speed at major thoroughfares in Metro Manila in 2010

(Source: MMDA, 2010)

Annex 5. Vehicle speed at major thoroughfares in Metro Manila in 2010

Vehicle Type	Fuel Type	Pollutant emission factors (g/veh-km)				
		PM	CO	HC	SO_x	NO_x
Car	Gasoline	0.1	49.5	6.0	0.011	2.7
Utility Vehicle	Gasoline	0.12	60.0	8.0	0.014	3.0
	Diesel	0.9	2.5	0.7	0.115	1.4
Motorcycle	Gasoline	2.0	26.0	18.6	0.004	0.2
Taxi	Diesel	0.6	1.9	0.65	0.081	2.0
Jeepney	Diesel	0.9	2.5	0.7	0.121	1.4
Truck	Diesel	1.5	12.4	3.7	0.374	12.5

(Source: Reprinted from National Implementation Plan, Department of Energy, 2011)

Annex 6. Strategies and action plans embodied in the National EST Strategy

Thematic Area	Strategies	Key Result Activities in National EST Strategy
Vehicle emission control, standards, and I/M	a) Establish motor vehicle standards on fuel economy and roadworthiness (in-use)	a) Develop fuel efficiency standards for PT vehicles/fuel efficiency ratings for private modes (for PT, to aid in LTFRB fare setting) b) Develop vehicle scrappage program
	b) Strengthen road side apprehension on (smoke-belchers and) polluting and non-roadworthy vehicles including organisation of ASBUs under CENRO office	a) Encourage enactment of local ordinances to impose fees and set aside collection as a local clean air fund; b) Encourage creation of LGU ASBUs with training; facilitate deputation of LGU personnel by LTO
	c) Mandatory vehicle inspection of public utility vehicles [2x a year]	Issuance of policy directive requiring of mandatory twice a year inspection of PUVs;
Cleaner fuels	a) Increase use of cleaner fuels for all vehicles (reduction of use of conventional fuels; improvement of specs)	a) Provide of fiscal and non-fiscal incentives for producers and users of cleaner fuels; b) Provide incentives for assemblers of cleaner fuel vehicles; incentives for clean fuel conversion/retrofit companies); c) Develop standards for LPG conversion of tricycles; d) Negotiate for sources of natural gas supply (e.g. Malampaya or imported);
	b) Adoption of harmonized fuel quality standards (Euro regulations)	a) Harmonization of biofuel blends with Euro 4 standards; b) Study on appropriate fuels for motorcycles/ tricycles (e.g. conversion of 2-stroke to LPG); c) Suitability of E10 to carbureted vehicles
	c) Improve distribution system of CNG	Conduct of FS for additional CNG refueling stations; encourage investors for LNG terminals and pipeline distribution system
Public transport planning and travel demand management	a) Integrate public transport system network (including efficient public transport)	a) Integrate EST in NTPP2; b) DOTr to endorse NTPP2 to NEDA; b) Develop of HLURB policy guidelines to integrate PT plan to LGU plan - mandatory to HUCs; c) Develop policy guidelines
	b) Develop and enhance appropriate freight transport policies	Push studies for rationalised truck routes
	c) Develop and implement appropriate TSM/TDM measures (e.g. synchronization of traffic lights, road widening and paving, alternate routes)	a) Conduct studies to assess travel speeds along critical corridors/sections; b) Assess truck routes in Metro Manila and other Highly Urbanized Cities (HUCs

	d) Develop mass transit systems especially BRT	a) Assess existing public transport system; b) Push studies for mass transport including BRT and rail
	e) Rationalise public transport systems and services according to public transport and road network hierarchies	a) Assess existing public transport system; b) Push studies for mass transport including BRT and rail
Non-motorized transport	a) Assess existing public transport system b) Push studies for mass transport including BRT and rail b) Provide non-motorized transport (NMT) facilities	a) Develop local indices; b) Push for bicycle and walkway plans implementation by 2012
Environment and people-friendly infrastructure development	a) Incorporate green architecture principles in the design of transportation infrastructure (number/length of pedestrian walkways, etc.)	a) Develop local indices; b) Prepare plans by 2011, implementation by 2013
	b) Incorporate "inclusive transport" principles in transportation infrastructure and vehicle design	Strict implementation of provisions for PWD, senior citizens, pregnant women, etc. as stipulate in Philippine laws and design codes
	c) Provide seamless and secure transport systems (e.g. seamless transfers)	a) Develop indices; b) Prepare inter-modal terminal plans; c) Conduct diagnostic assessment
Land use planning	a) Capability building on integration of land use and transport policies	a) Detailed case study on the Marikina Bikeways in 2009 and search for EST leading practices of HUCs; b) Development of EST training program and modules; c) Develop and conduct advocacy activities for LGUs; d) Develop and implement recognition mechanics
	b) Promote mixed use development (compact, shorter trip distances)	a) Conduct transport surveys; b) Advocate diversification of land use by responsible agencies especially HLURB; c) Recognize local best practices in compact, mixed use development

Note: This list only covers six of the twelve thematic areas. Not covered herein are Public Health, Strengthening Road Side Air Quality Monitoring and Assessment, Traffic Noise Management, Social Equity and Gender Perspective, Road Safety and Maintenance, and Knowledge Base, Awareness and Public Participation

Annex 7. Actions embodied in the National Implementation Plan

Outline of Actions	Outline of Actions	Details of the Actions
Emission control, Standards, I/M	- Establishment of MVIS - Improvement of vehicle inspection and maintenance system - Regulation of secondhand vehicle - Introduction of Jeepney standard - Introduction of new or revised emission standards e.g. Euro4, fuel economy, noise	Development of National Motor Vehicle Inspection and Maintenance Program (DOTr/LTO) Motor Vehicle Type Approval System Test covering emission test proposed in 2012 (DOTr) Philippines Harmonization of Vehicle Standard and Classification for submission to ASEAN (DOTr) Philippines version of the ASEAN Agreement on Mutual Recognition of the Vehicle Type Approval System Arrangement for submission to ASEAN (DOTr) Intensify advocacy for conduct of Preventive Maintenance of vehicles Allow fleet operators, bus corporations and transport cooperatives self-emission test upon presentation of acceptable maintenance plan/actions; Submission of annual maintenance activities to support application for extension of validity of franchise (authority); Issue Guidelines Requiring Commercial Vehicles (Public transport) to submit Maintenance program to support franchise (authority) applications Improve PETC operation by introducing ICT in test result transmission Empower local government units in anti-smoke belching campaigns Develop fuel efficiency standards for PT vehicles/fuel efficiency ratings for private modes (for PT to aid in LTFRB fare setting) Develop vehicle scrap page program Encourage enactment of local ordinances to impose fees and set aside collection as a local clean air fund Encourage creation of LGU ASBUs with training
Vehicle Technology	- Operation of fuel efficient vehicles - Operation of vehicles using alternative fuel - Conversion of tricycles to electric tricycles - Operation of CNG, electric and hybrid buses	Promotion of fuel efficient passenger cars and light commercial vehicles Development of Standards of Customize Local Road Vehicle Development of Standards of Customize Local Road Vehicle Urban Transport Program for Highly Urbanized Cities: Bus Rapid Transit System (DOTr) Metro Manila BRT system feasibility study will start 2012 Revisit Organized Bus Route System Along EDSA Operation of CNG, electric vehicle and alternative fuelled public transport services

Cleaner fuel	- Alternative fuel introduction (CNG, LPG, etc.) in the national development plan	Provision of fiscal and non-fiscal incentives for producers and users of cleaner fuels (National: DOE) Incentives for assemblers of cleaner fuel vehicle; incentives for clean fuel conversion/retrofit companies) (National: DOE, BOI, DOF) Negotiate for sources of natural gas supply (e.g. Malampaya or imported)(National: DOE, BOI, DOF) Develop standards for LPG conversion of tricycles (National: DOE, BOI, DOF) Conduct of FS for additional CNG refueling stations (National: DOE, DOTr) Encourage investors for LNG terminals and pipeline distribution system (National: DOE, DOTr) Promote operation of vehicles using alternative fuels Study feasibility of Fuel Tax Study on appropriate fuels for motorcycle/tricycles (e.g. conversion of 2-stroke to LPG) (National: DOE, DOTr)
Public Transportation	- Operation of BRT - Promotion of MRT, LRT, BRT - Enhance ferry services - Multi modal service in nautical highways - Development of PNR commuter and inter-regional services	Urban Transport Program for Highly Urbanized Cities: Bus Rapid Transit System (DOTr) Metro Manila BRT system feasibility study will start 2012 Revisit Organized Bus Route System Along EDSA Operation of CNG, electric vehicle and alternative fuelled public transport services
Travel demand management	- Truck Ban on certain periods of the day - Introduction of pedestrian only streets - Promotion of staggered work and school hours - Development of sub-urban cities - Vehicle ownership policy	Implement Unified Vehicle Volume Reduction Program Introduction of bike lanes Introduction of more toll roads Increase utilization of electronic payment system (EPS)
Non-motorized transport	- Promotion of Bikeway and installation of bike lanes - Promotion of vehicle traffic utilization reduction campaign e.g. car free day, mobility week	Introduction of bikeways Restoration of pedestrian Sidewalks Introduction of pedestrian haven and covered walkways
Freight and logistics	- Improvement of freight transportation complex, truck terminals and physical distribution centers	Rationalisation of logistics providers/operation

Biofuel	- Alternative fuel introduction (Biofuel, etc.) in the national development plan	Harmonization of biofuel blends with Euro 4 standards (National: DOE, DOTr), Suitability of E10 to carbureted vehicles (National: DOE, DOTr)
Behavioral changes	- Promotion of ecosafe-driving	Promotion of Ecosafe-driving Promotion to stop idling at intersections Full implementation of People Survival Fund (PSF)
Environmental monitoring	- Introduction of environmental monitoring systems e.g. noise, PM	Purchase of noise level meters (National: DOTr/LTO. Local: LGU ASBU) Installation of additional Ambient Air Quality Monitoring Network and modernization of test equipment (National: EMB. Local: LGUs of HUCs) Dissemination of template of ordinance (samples, ex. QC) (National: EMB, HLURB, DOTr. Local: LGU)
Inventory	- Development of local data in estimating emissions, e.g. vehicle emission factors, registrations	Establish baseline data for other criteria pollutants; determine contribution of transport to emissions (inventory)—emission factor development and AAQ modeling; source apportionment/ speciation (EMB)
Infrastructures	- Expansion/completion of missing road network (ring road, bypass) and bridges - Restoration of signalized (vehicle actuated traffic signal system) intersections in Metro Manila - Grade separation at main interchanges - Establishment of integrated and multi-modal terminals	
Institutional/Legislative measures	- Operationalisation of People Survival Fund (PSF) for climate change adaptation - Operationalisation of laws that legislate tax subsidies for electric vehicle development manufacturing and importation	

Annex 8. Type approval emission limits for new passenger vehicles, light and heavy duty vehicles, motorcycles and mopeds

Type approval emission limits for passenger vehicles (M) and LDVs (N1), (Euro 2)

Category / Class of Vehicle **		Limit Values					
		Reference Mass RW (kg)	Mass of CO L_1(g/km)		Combined Mass of HC and NO_xL_2 (g/km)		Mass of Particulates L_3 (g/km)
Category	Class		Petrol	Diesel	Petrol	Diesel(1)	Diesel(1)
M(2)	-	all	2.2	1.0	0.5	0.7	0.08
N_1(3)	I	RW ≤1,250	2.2	1.0	0.5	0.7	0.08
	II	1,250<RW ≤1,700	4.0	1.25	0.6	1.0	0.12
	III	1,700<RW	5.0	1.5	0.7	1.2	0.17

[a]Until 1 January 2011, for vehicles fitted with diesel engines of the direct injection type, the limit values L2 and L3 are the following:

	L_2	L_3
− category M(2) and N1(2) class I:	0.9	0.10
− category N1(3) class II:	1.3	0.14
− category N1(3) class III:	1.6	0.20

(2) Except:

- Vehicles designed to carry more than six occupants including the driver.
- Vehicles whose maximum mass exceed 2,500 kg.

(3) And those category M vehicles, which are specified in point (2).

** For purposes of this DAO, "vehicle category" refers to a classification of power-driven vehicles in accordance with PNS 1891

Type approval emission limits for heavy duty vehicle (Euro II)

Type of engine	Class of Vehicle	CO (g/kWh)	HC (g/kWh)	NOx (g/kWh)	PM (g/kWh)
Compression-ignition	Heavy-duty vehicles	4.0	1.10	7.0	0.15

Meanwhile, all new motorcycle and moped types to be introduced in the market two (2) years after the approval of DENR Administrative Order No. 2010-24 shall comply with emission limits indicated.

Emission limits for motorcycle (L3)[a] type approval and conformity of production
(Level 1 with effectivity two (2) years after the approval date of the Administrative Order)

Class (cc)	CO (g/kWh)	HC (g/kWh)	NOx (g/kWh)
<150	5.5	1.2	0.3
>150	5.5	1.0	0.3

[a]"Motorcycle (L3)"is a two-wheeled vehicle with an engine cylinder capacity in the case of a thermic engine exceeding 50 cubic centimeter or whatever the means of propulsion a maximum design speed exceeding 50 km/h.

Class (cc)	CO (g/kWh)	HC (g/kWh)	NOx (g/kWh)
All	7.0	1.5	0.4

[a]"Motorcycle (L4)"is a vehicle with three wheels asymmetrically arranged in relation to the longitudinal media plane with an engine cylinder capacity in the case of a thermic engine exceeding 50 cubic centimeter or whatever the means of propulsion a maximum design speed exceeding 50 krnh. (motorcycles with side cars or tricycles).

Emission limits for motorcycle (L3)
(Level 2 with effectivity three (3) years after effectivity of Level 1)

Class (cc)	CO (g/kWh)	HC (g/kWh)	NOx (g/kWh)
<150 (UDC cold)[a]	2.0	0.8	0.15
>150 (UDC+EUD cold)[b]	2.0	0.3	0.15

[a] Test cycle: ECE* R40 (emission measured for all six modes; sampling starts at T=0)
[b] Test cycle: ECE* R40+EUDC** (emissions measured from all modes; sampling starts at T=0, with the maximum speed of 120 km/h)
*Economic Commission for Europe
**Extra Urban Driving Cycle

Emission limits for moped (L1) type approval and conformity of production

Effectivity	CO (g/kWh)	HC + NOx (g/kWh)
Level 1 – Two (2) years after the approval of the Order	6[a]	3 [a]
Level 2 – Three (3) years after the implementation of Level 1	1[b]	1.2

[a] The limit values for the masses of CO and HC+NO_X are multiplied by a factor of 2 in the case of 3-wheel mopeds
[b] The limit values for the mass of CO must be 3.5 g/km in case of 3-wheel mopeds

Annex 9. Exhaust emission standards for in-use vehicles, motorcycles and mopeds

The ASBUs ensures that vehicles comply with the in-use emission standards set forth in DENR Administrative Order No. 2010-23 which stipulates emission standards for motor vehicles equipped with compression-ignition and spark-ignition engines and DENR Administrative Order No. 2010-24, which sets emission limits/standards for motorcycles/tricycles and mopeds.

Emission standards for in-use motor vehicles differ depending on the date that the vehicle is registered for the first time. The tables below enumerate those for gasoline engines and for diesel engines, as well as the emission standards for rebuilt (i.e. locally assembled using new or old engine) and imported used motor vehicles or pre-registered vehicles retrofitted with used engines.

Emission standards for vehicles with spark-ignition engines (gasoline)[a]

Vehicle registration	CO (% by volume)	HC (ppm as Hexane)
Registered for the first time prior to 31 December 2002	4.5	800
Registered for the first time on or after 1 January 2003 but before 1 January 2008	3.5	600
Registered for the first time after 31 December 2007	0.5	250

[a] Except motorcycles

Emission standards for vehicles with compression-ignition engines (diesel)

Vehicle registration	Light absorption coefficient, m-1, k
Registered for the first time prior to 31 December 2002	2.5 3.5 (turbocharged) 4.5 (1,000-m increase in elevation)
Registered for the first time on or after 1 January 2003 but before 1 January 2008	2.5
Registered for the first time after 31 December 2007	2.5

*Emission standards for rebuilt and imported used vehicles**

Vehicle registration	CO (% by volume)	HC[a] (ppm as Hexane)	Light absorption coefficient, m-1, k (turbo charged)[b]
Registered for the first time after 31 December 2007	0.5	250	2.0

[a] For spark-ignition (gasoline) engines
[b] For compression-ignition (diesel) motor vehicles
[c] Applicable only to vehicles listed in Sec 3.1.1 - 3.1.5 of Executive Order 156

Emission standards for in-use motorcycle / tricycle and moped

Vehicle registration	CO (% by volume)	HC (ppm)	White smoke (% opacity)
Registered for the first time prior to 1 January 2003	6.0	6,500	30
Registered for the first time from 1 January 2003 up to 31 December 2011	4.5	6,500	30
Registered for the first time on or after 1 January 2012	3.5	4,500	30

Annex 10. Existing policies/measures on transport

Category			Policy / measure	Implementation period	Lead organisation(s)	Description	Status	Assessment / remarks
ASI (G) *	Passenger/ Freight	Type of policy instrument**						
G	F	I	Certification system for low-carbon companies	-	-	International certification standards on environmental management systems (ISO 14001) is adopted in Philippines as Philippine National Standards (PNS) 1701. Philippine Environment Partnership Program (PEPP), pursuant to DENR Administrative Order No. 2003-14, encourages establishments to adopt mandatory self-monitoring and compliance to environmental standards by awarding those with superior environmental performance with DENR Official Seal of Approval[i].	Implementation ongoing	Labelling schemes for companies with a low freight and logistics footprint (Green freight Labelling) are not included in this.
G	P/F	I	Emissions monitoring system	2000	DENR	DOE performs top-down energy and CO_2 estimates of the transport sector; bottom up approach is also used but suffers from lack of data	Partially implemented	Transport and energy indicators at the sectoral level are not regularly reported; for ex-post monitoring and evaluation of policies assessment is incomplete
G	P/F	E	CO_2-based fuel pricing / taxation systems	-	-	While tax mechanisms for petrol and diesel are in place, taxation for passenger cars and trucks are not based on CO_2 emissions[ii].	Not in discussion	
G	P/F	E	Fuel subsidy reduction	1998	DOE	Fuel subsidies were phased out in late 1990s through Republic Act. No. 8479 or the Downstream Oil Industry Deregulation Act of 1998[iii]. However, to mitigate the effects of oil price hikes, the government instituted through Executive Order No. 32 the PHP 450-million	Implementation ongoing	The subsidy excludes buses.

						Public Transport Assistance Program (PTAP) or "Pantawid Pasada" program in 2011 which subsidizes the average consumption of identified public transport groups (jeepneys and tricycles) [iv].		
A	P/F	E	Road pricing	-	-	Road pricing in the Philippines is generally a means of financing road infrastructure projects, not as congestion charging measure[v]. Road pricing is implemented in expressways such as North Luzon Expressway (NLEx), South Luzon Expressway (SLEx), Subic-Clark-Tarlac Expressway (SCTEx), Southern Tagalog Arterial Road (STAR Tollway), Manila-Cavite Expressway (CAVITEx), Tarlac-Pangasinan-La Union Expressway (TPLEx), and Metro Manila Skyway.	Implementation ongoing	Tolled roads are limited to expressways and bridges. The largest toll operator, Metro Pacific Tollways Corp., is planning for road projects in Visayas and Mindanao, particularly beginning with building a bridge to connect Cebu City and Mactan Island. Tolled roads are privately operated. Electronic road pricing is not being discussed
A	P/F	R	Integrated land-use planning	-	LGU	The Local Government Code or the Republic Act No. 7160[vi] confers upon the local governments the authority to determine land use in their respective jurisdictions. To integrate such plans and management of country's land at the national level, Senate Bill No. 3091 or National Land Use Act filed in 2011[vii], and House Bill No. 6545 or National Land Use and Management Act filed in 2010[viii] seek to institutionalise a national land use policy.	Not in discussion nationally	The Senate Bill is pending on third reading in the Senate, while House Bill passed third and final reading in the lower chamber in September 2012[ix]. A salient feature of the House Bill is the formulation of National Land Use Guidelines and Zoning Standards. Zoning ordinances are more common in the Philippines, wherein the division of a city/municipality is zoned according to use. The private sector usually takes the lead in developing mixed-use communities, especially in central business districts. For example, the Japan International Cooperation Agency (JICA) has hired consultants to draft urban master plans for 13 local government units in Cebu Province[x].

A	P	R/E	TOD/ compact development/mixed-use planning	-	LGU	An institutionalised national land use policy is being sought. Land-use planning is implemented at local level through their respective Comprehensive Land Use Plan[xi]. The private sector usually takes the lead in transit-oriented development, especially in central business districts.	Planned	Zoning ordinances are more common in the Philippines, wherein the division of a city/municipality is zoned according to use. Senate Bill No. 3091 filed in 2011, or National Land Use Act, and House Bill No. 6545 or National Land Use and Management Act filed in 2010 also seeks for the creation of National Land Use Commission, which shall draft the National Physical Framework Plan (NPFP) to prescribe the country's land use. The NPFP in 1992 was updated to National Framework for Physical Planning 2001-2030[xii], which also encourages physical planners to build mixed use developments to reduce advserse impacts from urbanization trends and vehicle emissions.
A	P	E/R	Parking pricing and management	-	LGU or private management	Managing on-street parking (including towing of illegal parking) is covered by local government units[xiii]. Private parking lots are managed by private management companies. On-street parking fee is imposed on cars and motorcycles but rates vary between cities and districts. Rates for cars and motorcycle varies too. Charging for parking is generally regarded as a means of generating revenues, not as a means of decongesting.	Implementation ongoing	The local government of the city of Manila installed the first parking meters in the Philippines in early 2013. This was aimed to decrease the cases of double parking[xiv].
A	P	R	Telecommunication promotion	-	-	-	Not in discussion	-
S	P	R/Infra	Bike-sharing	2012	LGU; MMDA (for those in EDSA)	ADB launched *Tutubi* bike-sharing scheme in 2012 in Pasig City with two stations: in ADB headquarters and in Pasig City Hall[xv]. A bike-sharing scheme along EDSA was also launched in 2013 albeit more manual[xvi]. There are plans to add more bike-sharing stations in Metro Manila in 2015	Pilot/planned	The 10 bikes in EDSA are placed on racks installed on the walls, and users register by logging on a notebook. These bikes can only be used along EDSA bike lanes. For Pasig City, more stations are planned in 2015.

S	P	Inv	Cycling infrastructure		MMDA, LGU	Cycling lanes in Metro Manila and many other cities are either being initiated or increased. At the local (city/provincial) level, bike lanes are usually supported by an ordinance. Several bills have been filed to improve bike infrastructure, such as Senate Bill No. 400 or the Bike-Friendly Communities Act[xvii] that seeks to require all public places, government offices, schools, major business establishments, including malls, banks, restaurants, hospitals, and the like, to provide bicycle racks for bicycle parking. The bill is still pending approval.	Implementation ongoing	
S	P	Inv	Walking infrastructure	2009	MMDA, LGU	MMDA Resolution No. 02-28 authorizes MMDA and LGUs to clear the sidewalks, alleys, among others, of all illegal structures and obstructions. The local governments are empowered to further such measures[xviii].	Varies in the locality. Implementation ongoing in many urban areas.	Makati City, for instance, prohibits the parking of motor vehicles and installation of business stalls on sidewalks of all streets in Makati pursuant to Municipal Ordinance 1993- 330. Makati City has also developed a network of elevated walkways.
S	P	R	NMT friendly building regulations	-	-	The National Building Code only has provisions for the protection or pedestrians during construction or demolition[xix]. Senate Bill No. 400 or the Bike-Friendly Communities Act seeks to require all public places, government offices, schools, major business establishments, including malls, banks, restaurants, hospitals, and the like, to provide bicycle racks for bicycle parking[xx]. The bill is pending approval. House Bill No. 572 also seeks to require a parking space in public and private buildings and other structures for public use, including commercial and public establishments[xxi]	Planned	The foundation of building structures are, in fact, permitted to encroach into public sidewalk to a width not exceeding 50 centimeters, provided that it does not obstruct any existing utility such as power or sewer lines.
S	P	R	Bus route optimisation and prioritisation	-	-	JICA-funded EDSA Bus Route Revalidation Survey was completed in 2006 by UP-NCTS and DOTr, which concludes there is an oversupply of buses[xxii]. The UP-NCTS also conducted a study "Development of Mega Manila Public	Studied	

						Transport Planning Support System" for DOTr[xxiii]. The study identified bus, jeepney, and UV Express routes for Metro Manila and its surrounding areas. In 2014, LTFRB rationalised bus routes, allowing buses to amend their routes based on passenger demand[xxiv].		
S	P/F	R	Low-emission zones	-	-	-	Not in discussion	-
S	P	R	Master planning for PT/NMT	-	-	No national master plan for public transport and non-motorized transport is in place as of writing, but CPCS Transcom Ltd. of Canada is completing the feasibility study of a railway master plan consisting of the proposed Integrated Luzon Railway Project and the North-South commuter rail link connecting Cagayan in the north to Bicol in the south of Luzon[xxv]. NCTS is also undertaking the "Development of Mega Manila Public Transportation Planning Support System (MMPTPSS)" for DOTr[xxvi].	Studied	
S	P	R	Integrated ticketing	2015	DOTr	The trial run of LRT-MRT unified ticketing system began in July 2015[xxvii].		
S	P	Inv	Non-urban rail improvements	Varies	DOTr	Plans of expansion for MRT and LRT lines are underway[xxviii]. PNR plans to extend its train service up to south of Manila[xxix].	Implementation ongoing; further proposals are planned and studied	To the south of Metro Manila, 8 new stations will be constructed after LRT Line 1-Baclaran station to serve Bacoor, Cavite. To the east, 2 stations will be built (in Cainta, Rizal, and in Antipolo City) as an extension of LRT Line 2. PNR continues to strengthen its services to serve the CALABARZON region and Bicol region. DOTr also plans to revive the oldest rail systems, particularly to turn the South Line of the North-South Railway into a dynamic commuter and long-haul service. The bidding for the PHP 171-billion railway project is the most expensive PPP project to date[xxx].

S	P	Inv	Urban PT infrastructure	Varies	DOTr	Cebu BRT has been approved by NEDA in May 2014 and has secured funding[xxxi]. BRT in Metro Manila is also being studied[xxxii]. DOTr is targeting to have the BRT in operation by 2018[xxxiii]. DOTr is studying possible BRT in Metro Manila. BRT was announced as a new public transport category through the DOTr Department Order No. 2015-11 "Further Amending Department Order No. 97-1097"to Promote Mobility[xxxiv]. In Mindanao, the PHP 71-million feasibility study of Mindanao Railway System was completed in 2009 but the project has yet to be included in the PPP program of the present administration.	Implementation ongoing	Cebu BRT will have 176 buses which can serve 330,000 passengers per day. It will be funded by French Development Agency and the World Bank's CTF. Metro Manila will have 300 buses running from Quezon City to Quirino Highway. In 2012, a bus segregation scheme was initiated by MMDA in which passenger buses along EDSA are tagged either as "A", "B" or "C" stickers on the driver's side of the windshield. Buses A and B have their respective stops, while those with C stickers are allowed to stop everywhere. Bus drivers in Metro Manila have the tendency to illegally alight and board passengers beyond the bus stops[xxxv].
S	P	E	Regulatory and physical restrictions on car use	1995	MMDA	Unified Vehicular Volume Reduction Program (UVVRP), or the number-coding scheme, prohibits the operation of all motor vehicles from 7am-7pm on some days of the week depending on the last digit of the vehicle license plate. There are "window hours" when these vehicles can travel within the day.	Implementation ongoing	The scheme applies in Metro Manila, but the cities of Marikina and Muntinlupa do not implement the scheme. It applies to all motor vehicles, both public and private, but exempts ambulance and fire trucks, school buses, media vehicles, government vehicles, as well as freight trucks (which are covered by another ordinance governing truck ban, i.e. refer to "Lorry Restrictions" for further information) and motorcycles.
S	P	R	Car-sharing	-	-	Car-sharing is popularized by mobile applications where users heading to the same destination or direction can share a ride in private vehicles. In 2015, app-based services offered by Transportation Network Companies are permitted to operated under the new category of public transport conveyances pursuant to DOTr Department Order No. 2015-11 "Further Amending Department Order No. 97-1097"to Promote Mobility[xxxvi]	Implementation by private individuals; not nationally agreed to yet.	
S	P	R	Three in one policy/high-occupancy	-	-	-	Not in discussion	-

			vehicle lanes					
S	P	I	Real-time public transport information	From 2013	DOTr, MMDA	DOTr/MMDA launched "Transit App Challenge," which led to the development of transit apps aimed at providing information to the commuting public to improve public transport trip planning. The DOTr partner applications are available in the DOTr website.	Implementation ongoing	
S	P	I	Campaigns	-	-	Information, education, and communication campaigns are usually embodied in various frameworks, plans, and policies. Individuals began a series of campaigns to promote biking, such as Firefly Brigade, a citizen's volunteer action group formed in 1999, which initiated bike-to-work campaigns, critical mass rides, and the Tour of the Fireflies. DOE's Fuel Economy Run as well as Road Transport Patrol disseminates information on fuel efficiency, vehicle maintenance and driving behavior[xxxvii].	Implementation ongoing by civic-led action groups	Campaigns to shift to a more sustainable form of transport like bus or NMT are not done massively and consistently. In some parts of MM, Iloilo and Davao there are regular campaigns for cycling and walking.
I	P/F	E	Tax incentives for efficient vehicles	2004	DOE, Bureau of Customs	Executive Order No. 396 of 2004 also reduces import duty reductions for hybrid and CNG vehicles[xxxviii]. Executive Order No. 397 of 2004 reduces the rates of import duty on completely-knocked-down parts and components for assembly of low engine displacement and hybrid vehicles[xxxix]. Tax incentives have been approved for Philippine Utility Vehicle Inc. in 2013 as new domestic producer of e-vehicles, e-trikes and e-jeepneys[xl]. Several bills have also been submitted by both the Senate and the House of Representatives of the Philippines on incentivizing alternative fuel vehicles, e.g. House Bill No. 387, House Bill No. 483, House Bill No. 2316, Senate Bill No. 164 and Senate Bill No. 2151.	Implementation ongoing; Planned	Executive Order No. 290 mandates the Board of Investments (BOI) to enhance existing incentive packages for land transportation using CNG, conversion shops, terminals with CNG refueling stations and the manufacture/assembly of NGVs and provide incentives to the other NGV industry related activities[xli].
I	P/F	E	Fuel economy/ Fuel efficiency standard	2016	DOE	Development of fuel efficiency standards is among the target milestones in the Philippine Energy Efficiency and	Planned	-

						Conservation Roadmap 2014-2030[xlii]. Moreover, House Bill No. 5053 of 2014[xliii] seeks to mandate a minimum energy performance standards for manufacturers and importers of road transport vehicles, as well as a display of energy consumption label on transport vehicles set by the DOE. The bill also seeks to mandate compliance to fuel economy performance labeling requirements set by the DOE.		
I	P/F	I/Inv	ITS	From 2011	Various	Various systems have been installed to aid commuters such as the CCTV in MRT stations, traffic signalization systems, and traffic monitoring systems on major thoroughfares. Refer to "Traffic Information"	Implementation ongoing	-
I	P/F	I	Traffic flow improvement and traffic information	From 2011	MMDA	MMDA also launched its Traffic Monitoring System in 2011 where online traffic data for the major thoroughfares in Metro Manila is available[xliv]. The traffic information can be viewed through the MMDA mobile application, social media accounts (Twitter) and the website (MMDA Traffic Mirror). In March 2014, MMDA inaugurated its Traffic Signalization System (TSS), called "Hermes," presently housed in the Common-and-Control Centre (Metrobase) building in MMDA headquarters[xlv].	Implementation ongoing	According to the news, the first phase of TSS is capable of managing 85 priority intersections and 25 traffic control/video surveillance locations in Metro Manila. The project will continue to upgrade to manage over 500 intersections. Traffic management is also conducted at the LGU level. For instance, in Davao City, the traffic signalization and surveillance project was implemented in 2006. It was suspended a few days after for modification, and re-run by end of January 2007. The Traffic Monitoring Center is housed in the Public Safety Command Center. As of July 2013, Davao City has 40 CCTV cameras installed and 130 more will be added. The city government has allocated PHP 100 million for the installation of the remaining130 cameras[xlvi].
I	P/F	R	Speed limits	From 1964	Varies	The Land Transportation and Traffic Code (Republic Act No. 4136) sets maximum allowable speed limits of 80 kph for cars and motorcycles, and 50	Implementation ongoing	The Republic Act prohibits authorities from other city/municipality to enforce any ordinance specifying a maximum

						kph for trucks and buses. It only covers major roads and excludes expressways[xlvii]. In 2014, various House Bills have been filed seeking the installation of speed limiters in public utility vehicles, such as House Bill Nos. 3151, 1762, 3624, 3798 and, in 2013, House Bill No. 3377. Some of these House Bills also seek to amend the speed limits.		allowable speed other than the Act. In March 2015, LTFRB will pilot-test an in-vehicle GPS device and communication system to closely monitor speed to reduce road mishaps[xlviii]. This initiative is the resulting recommendation of the "Study on Speed Control of Public Utility Buses" conducted by UP-NCTS in 2014. The government aims for all public utility buses nationwide to have the GPS devices installed by end-2015.
I	P/F	I	Eco driving	-	-	While there seems to be no Orders promoting or requiring the administration of an eco-driving program, the government collaborates with the private sector to raise awareness on fuel-efficient driving methods.	Not in discussion	One example is the 1'M Blue Eco-Safe Driving Movement which was launched in July 2012 with the aim of training 1 million Filipino drivers. In 2010, Honda Foundation launched Eco-Safe Driving and Clean Fleet Management Program in partnerships with the Philippine Business for the Environment, Clean Air Asia, and DOE using the Clean Fleet Management Toolkit developed by UNEP for the eco-driving lessons[xlix].
I	P/F	R	Inspection and maintenance	2001 onwards	DOTr-LTO	Roadside inspections are conducted by anti-smoke-belching units to ensure compliance with the in-use emission standards. In early 2015, a PHP 19.33-billion MVIS PPP project is near final approval. This aims to develop national network of motor vehicle inspection centers, using inspection methods that will be linked to the information system of LTO[l].	Implementation ongoing	Vehicles are required to comply to emission standards, the most updated of which are DENR Administrative Order No. 2010-23[li] and DENR Administrative Order No. 2010-24[lii] which sets the revised emission standards for motor vehicles, and for motorcycles/tricycles and mopeds, respectively. Moreover, the latter Order provides that starting January 01, 2016, all new passenger and LDVs to be introduced in the market shall comply with EURO 4 emission limits subject to EURO 4 fuel availability. The Implementing Rules and Regulations of the Philippine Clean Air Act requires DOTr-LTO to

								have MVIS fully operational in Metro Manila by January 2003[liii], but as of December 2013, only 4-5 MVIS sites have been established all over the country[liv].
I	P/F	E/ R	Vehicle scrapping/fleet replacement	-	DOTr	The National EST Strategy 2010-2020[lv] lists the development of vehicle scrappage program among its recommended action plans, and so did the NIP2011-2016[lvi]. There are now discussions on trying a replacement and scrappage scheme for two-stroke tricycles.	Intended	Executive Order No. 156 of 2002 prohibits importation of used/surplus vehicles. Vehicle kinds include truck, bus, special purpose vehicle, fire truck, crane lorry, ambulance, hearse, among others[lvii].
I	P/F	E	Incentives for low-carbon fuel (1st/2nd gen Biofuel, CNG, LPC)	2007	DOE	There is no tax on local or imported biofuels component, per liter of volume. The sale of raw material used in the production of biofuels shall also be exempt from the value-added tax.	Implementation ongoing	Pursuant to Republic Act No. 9367 or the Biofuels Act of 2006[lviii], the specific tax on local or imported biofuels component, per liter of volume is zero, and the sale of raw material used in the production of biofuels shall be exempt from the value-added tax (VAT). Water effluents from the production of biofuels are exempt from wastewater charges mandated by Republic Act No. 9275 or Clean Water Act[lix].
I	P	E	CNG/LPG for taxis and buses	2002	DOE	The NGVPPT, launched in 2002 and instituted by Executive Order No. 290, promotes the use of CNG and repowered CNG-fed buses. Auto-LPG Program promotes the use of LPG for the taxis, as well as jeepneys[lx].	Implementation ongoing	
A	F	R	Empty hauling reduction	-	-	-	Not in discussion	-
A	F	R	Improve logistics centres and their location	-	-	-	Not in discussion	-
S	F	E	Lorry restrictions	1994	MMDA	Truck bans are first enforced in Metro Manila pursuant to Metropolitan Manila Council (MMC) Ordinance No. 5 Series of 1994. Trucks are particularly prohibited from entire stretch of EDSA during rush hours stated in the ordinance every day except Sundays and holidays.	Implementation ongoing	Resolutions have been enacted thereafter to modify the implementation thereof such as during Christmas and during international forums[lxi]. The city of Manila also enacted its own regulation beginning February 2014

								and designated several truck routes from the ports to decongest streets in the city, but this has also been modified anyhow to decongest the port area, allowing trucks coming from the Port Area in Manila to use a designated lane in the 7.6-km stretch of Roxas Boulevard except on Fridays[lxii].
S	P/F	Inv	High-speed rail infrastructure	-	-	-	Not in discussion	
S	F	R	Master planning for rail and water / Logistic planning	-	-	A National Logistics Master Plan, including the development of the Strong Republic Nautical Highway (SRNH) and road-roll-on/roll-off (RORO) terminal system linking the entire country, is among the priorities in the Philippine Development Plan 2011-2016[lxiii].	Planned	-
S	F	E	Rail incentives	-	-	-	Not in discussion	-
S	F	E	NMT freight incentives	-	-	-	Not in discussion	
S	F	Inv	Cycling infrastructure	-	-	Bike couriers in the Philippines make use of the existing lanes (whether motor vehicle lanes or bike lanes). There is no dedicated infrastructure for non-motorized transport of goods.	Not in discussion	It is usually in the initiative of the bike couriers to provide incentives to those availing their services. Pedala Bike Messengers, Inc., a social enterprise servicing Metro Manila, uses bikes to deliver goods.
S	F	Inv	Multimodal facilities/dry ports	-	-	NEDA recognizes the need for a seamless inter-modal transport logistics network[lxiv]. The Philippines adopted the Intergovernmental Agreement on Dry Ports, ensuring the development of certain dry ports in Pampanga (Luzon), South Cotabato, Misamis Oriental, Zamboanga City, and Davao City (Mindanao) within the framework of the national programs[lxv].	Planned	Roll-on-roll-off (RoRo) bridges connect the national highways but not yet from island to island.
S	F	I	"Branding" campaigns	-	-	-	Not in discussion	-
I	F	E	CO_2 based vehicle taxation/registration fees	-	-	-	Not in discussion	-

I	F	R	Tyre standards	-	-	-	Not in discussion	-
I	F	R	Aerodynamic standards	-	-	-	Not in discussion	-
I	F	I	Information on efficiency to companies	-	-	-	Not in discussion	-
I	F	I	Driving information	-	-	-	Not in discussion	-

*ASI (G): Avoid, Shift, Improve, General
**Types of policy instruments: Economic (E), Regulatory and planning (R), Information & Communication (I), Investments in infrastructure (Inv)

***Status: not in discussion, intended, planned, partially implemented, implementation ongoing, implemented (see Section 3.3 for explanation)

****Assessment/Remarks are related to scope, impact, key successes, progress, etc

Annex 11. Challenges in transport data in Asian countries

Fabian and Patdu (2011) identifies the common challenges of Asian countries in collecting transport-related data:

Availability of Basic Transport Data in Asia

- Data availability differs greatly across the data types

Transport Data Flow and its Impact on Quality and Availability

- Data availability differs greatly across the data types

System of Transport Data Collection and Maintenance

- Type of data collected / generated is influenced by its need (driver) with different, sometimes overlapping, data requirements
- Fragmented generation of transport data
- Fragmented responsibility for collection of different types of data and the absence of an organisation with a mandate and organisational capacity to integrate different data sets
- Private sector is a relevant player in transport data collection but their database are typically not openly shared to public
- Information generated at the project/city/province level is usually stored at the local levels, unless required by the national government
- Limited budget allocation for transport data collection, processing and management

Comparability of Transport Data within and between Countries

- Lack of harmonized classification and methodologies

Source: Background Paper for the Sixth Regional EST Forum in Asia:
http://cleanairinitiative.org/portal/sites/default/files/Background_Paper_on_EST_Data_and_Indicators_FINAL.pdf

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