Options for Fiscal Policy Reforms to Assist Control Motor Vehicle Emissions

Final Discussion Paper

April, 2015

Low Carbon Support Programme to Ministry of Finance, Indonesia

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Preface

This Discussion Paper was prepared by Restiti Sekartini as sub-consultant to the United Kingdom Low Carbon Support Programme to the Ministry of Finance Indonesia. Work occurred in close collaboration with the Center for Climate Change and Multilateral Financing Policy (PKPPIM), Fiscal Policy Agency (BKF), Ministry of Finance of the Republic of Indonesia under overall leadership of its Director Dr. Syurkani Ishak Kasim, management supervision by Dr. Syaifullah and Bp Suharto Haryo Suwakhyo, with the lead counterpart being Dr. Amir Hidayat with supporting team members being Windy Kurniasari and Adisti with initial support and guidance from Dr. Joko Tri Haryanto. The strong support and involvement of PKPPIM officials in undertaking this study is gratefully acknowledged. Management of the study within the LCS Programme was undertaken by Paul Butarbutar.

Disclaimer

Inquiries Regarding this Discussion Paper

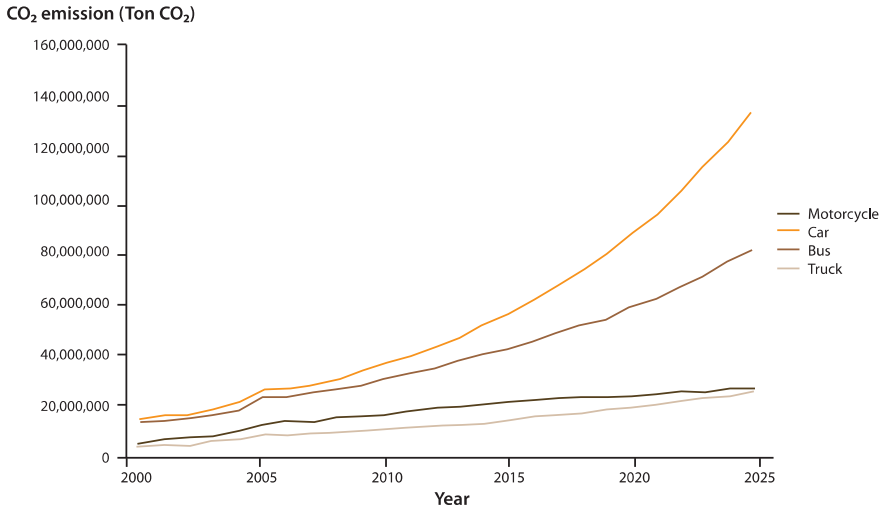
Any inquiries regarding this Discussion Paper or other reports of the LCS Program may be addressed to enquiries@lcs.or.id.

Executive Summary

This study was undertaken jointly by the Centre for Climate Change Financing and Multilateral Policy (PKPPIM) in the Ministry of Finance Indonesia (MOF) and the United Kingdom funded Low Carbon Support Programme to the Ministry of Finance Indonesia (LCS). The main purpose of the study was to review existing fiscal arrangements and to explore fiscal policy reform options for improving the control of motor vehicle Green House Gases (GHG) emissions in Indonesia.

Increasing prosperity and economic growth increases the demand for cars and this has led to heightened traffic jams and pollution. Indonesia has declared an intention to cut CO_2 emissions by 26 % in 2020 (compared to business as usual) and as cars are an increasing source of CO2 emission (see Graph A) policies to reduce vehicle related emissions will be important (transport related emissions are forecast by DNPI to grow from 72 million tons of CO2 in 2013 to 232 million tons in 2030). The current tax systems for motor vehicles (national sales and local annual renewals) does not have provisions that directly link the tax rate with CO_2 emission and has fallen out of line with international best practice which has moved towards direct links with CO2.

Graph A. CO2 Emission from Motorized Vehicles by Category 2000-2025



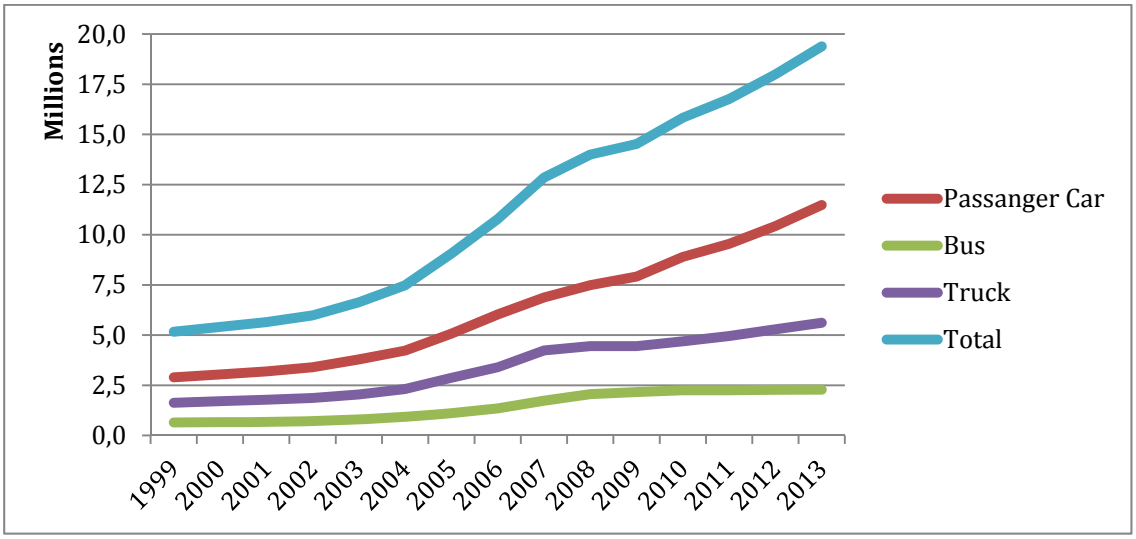
Source: BPPT and Ministry of Environment (2009)

Unpublished data from the Association of Indonesia Automotive Industries (GAIKINDO) enabled the study to conduct a multivariate regression analysis to determine factors affecting car-buying decisions. Indonesians prefer their cars to be inexpensive (which typically means not European) and which provides for more than 5 passengers and/or is equipped with an engine smaller than 1600 ccs. GHG emissions are not yet a significant buying factor under the existing fiscal regime.

Best international practice shows that fiscal policies (taxes and subsidies) with direct linkages to CO2 emissions results in more sales of CO2 low-emission cars and lower overall emissions. The United Kingdom scheme is disincentive-only, while the French system also has subsidies for low emission cars. Indonesia fiscal system is more suitable for reforming towards the UK system due to its simplicity and lack of complication for giving out subsidies to individual car owners. Static simulation results showed that with CO2-base tax rates for new cars, total CO2 emissions would be

reduced by 37.1 % and total car sales would decline 26.5 % but government revenues would increase by 10.1 %.

Graph B. Number of Cars by Type, 1999-2013 (million units)



Source: Statistics Indonesia (BPS)

To reduce substitution with used cars reform of the annual renewal car tax (organized by Local Governments) is imperative. Annual collection amounts are quite significant. In Jakarta, the motorized vehicle tax brought in 5.1 trillion rupiah or 15.7 % of all local tax income in 2014 budget. In East Java Province this annual tax brings in relatively even more at 4.3 trillion rupiah or 37.2 % of all local revenue. Jakarta and East Java have also initiated a progressive tax whereby the rate increases with the number of car registered under the same name and address. However, the system is easily and commonly avoided by registering the cars under different names (or even in different province with lower rates).

Lack of data prevented us the conduct of a simulation on reform of the annual tax towards a CO2 linked system. However, it is likely that there are tax rates that will reduce emissions while increasing government revenue. Coordination and convergence between local governments in administering annual vehicle taxes (PKB) is necessary to avoid a race to the bottom. Lower purchase taxes and the PKB could be used as incentives to speed up gas conversion. In addition increasing and ensuring supply of conversion kits, gas stations and gas supplies will be important.

GAIKINDO has requested a two years adjustment period to finish their current stock and to introduce models with lower emissions that could lead to higher car sales than simulation results in the future. GAIKINDO also suggested improvements and increasing the capacity of vehicle testing facilities to avoid bottlenecks.

GAIKINDO stated that the major car brands would not produce out of factory gas powered vehicles thus no factory guarantees are available. However, GAIKINDO would cooperate with certified car repair stations on providing specifications and knowledge sharing. Therefore, lowering purchase and annual taxes for cars with gas conversion kits is the more suitable policy.

National government, especially the Ministry of Finance, the Ministry of Industry, the Ministry of Transportation, the Ministry of Energy and Mineral Resources; and the

Ministry of Environment and Forestry need to work and coordinate closely together to design appropriate CO2 linked fiscal incentives along with corresponding supporting policies to reduce C02 emissions from cars including to increase conversion to gas powered cars.

Local governments need to link the rate of annual renewal taxes with C02 emissions in addition to price and progressivity. They also need to coordinate their tax policies to prevent avoidance and to prevent a race to the bottom in competition with other regions.

List of Abbreviations

AFV	Alternative Fuel Vehicles
ASEAN	Association of South-East Asian Nations
BKC	*Barang Kena Cukai* (Excisable Goods)
BKF	*Badan Kebijakan Fiskal* (
BPPT	*Badan Pengkajian dan Penerapan Teknologi* (Agency of Assessment and Application of Technology
BPS	*Badan Pusat Statistik* (Statistics Indonesia)
BPUE	*Bengkel Pelaksana Uji Emisi* (Emission Test Workshop)
CC	Cylinder Capacity
CH4	Methane
CN	Cetane Number
CO	Carbon Monoxide
CO2	Carbon Dioxide
EMR	Environmental Ministerial Regulation
GAIKINDO	*Gabungan Industri Kendaraan Bermotor Indonesia* (Association of Indonesia Automotive Industries)
GHG	Green House Gasses
GDP	Gross Domestic Product
HC	Hydro Carbons
HEV	Hybrid electric vehicles
ICCT	International Council on Clean Transportation
IRS	Internal Revenue Service
KBH2	*Kendaraan Bermotor Hemat Energi dan Harga Terjangkau* (Energy Efficient and Affordable Prices Four Wheel Motor Vehicles)
LCGC	Low Cost and Green Car
LCS	Low Carbon Support Programme
LGV	Liquefied Gas For Vehicle
LIPI	*Lembaga Pengetahuan Indonesia* (Indonesian Institute of Science)
MoE	Ministry of Environment
N2O	Nitrous Oxide
NOx	Nitrogen Oxides
OBD	On Board Diagnostic
OLS	Ordinary Least Square
PKB	*Pajak Kendaraan Bermotor* (Vehicle Tax)
PKPPIM	*Pusat Kebijakan Pembiayaan Perubahan Iklim dan Multilateral* (Centre for Climate Change Financing and Multilateral Policy)
PM	Particulate Matter
PP	*Peraturan Pemerintah* (Government Regulation)
PPnBM	*Pajak Penjualan Atas Barang Mewah* (Sales Tax on Luxury Goods)
RON	Research Octane Number
Sox	Sulfur Oxides
SUV	Sport Utility Vehicles
ToR	Terms of Reference
UK	United Kingdom
UU	*Undang-undang* (Law)

VED	Vehicle Excise Duty
WHO	World Health Organization

Table of Contents

List of Figures

List of Tables

1. Introduction

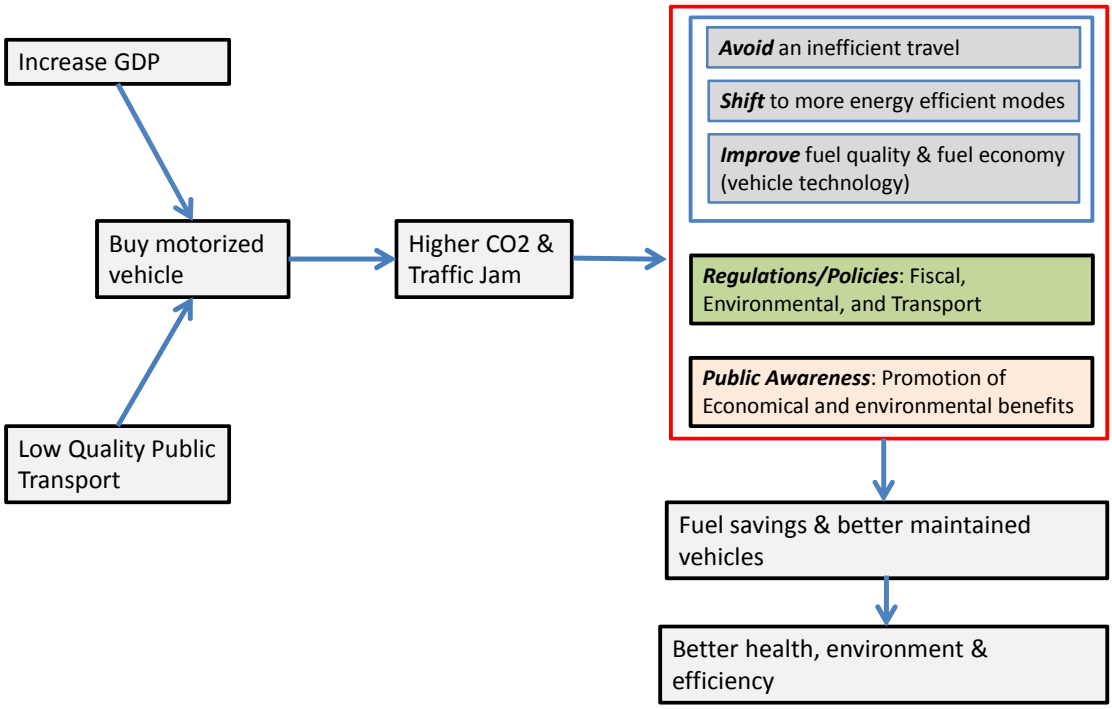
1.1. Background

This study was undertaken jointly by the Centre for Climate Change Financing and Multilateral Policy (PKPPIM) in the Ministry of Finance Indonesia (MOF) and the United Kingdom funded Low Carbon Support Programme to the Ministry of Finance Indonesia (LCS). The main purpose of the study was to review existing fiscal arrangements and to explore fiscal policy reform options for improving the control of motor vehicle GHG emissions in Indonesia.

A World Health Organization (WHO) study found that Jakarta ranks as the 25th most polluted city in the world in 2014. Only three other major cities in ASEAN were more polluted than Jakarta: Manila and Quezon City in Philippines at ranking 13 and 17 followed by Yangon in Myanmar at ranking 18.

At the midst of a tight race to escape the middle-income trap, a pollution-prone and low health society will reduce productivity and endanger Indonesia's economic prosperity and competitiveness. Serious and systematic policy is needed to reduce pollution per vehicle, reduce the growth of vehicles, and to encourage a switch to public transportation.

Figure 1.1. Problem Mapping



As shown in Figure 1.1 there are numerous factors influencing the growth in motor vehicles and resultant pollution and CO2 emissions growth. Increased GDP and low quality public transport influence increases in vehicle ownership. Related influences are easy processes and requirements for buying motor cycles and cars through installment credit, the low price of cars (e.g. the development of Low Cost Green Cars). Inefficient public transportation systems in all major cities of Indonesia also create longer travel times and distance. The availability of subsidized fuel has also provided major incentives to use of private motor vehicles.

Latest emissions cost abatement data from DNPI (2014) on the transport sector indicates: (i) GHG emissions from the transportation sector are expected to increase from 72 million tons of CO2 in 2010 to 232 million tons in 2030 (lower levels than compared to 2009 levels – though subject to upward revisions after sharp reductions in world oil prices since the projections were made); (ii) projected GHG emissions are mainly linked to growth in numbers and usage of passenger cars; and (iii) the transport sector has scope for significant GHG emissions reductions at low or negative costs to society with potential for low cost reductions through more efficient technologies; changes in fuel types; through modal shifts in vehicle types. Reductions can be supported by more appropriate motor vehicle taxing policies.

Indonesia has numerous rules and regulations about motorized vehicle emissions with a full summary of these set out in chapter 3 of this reports. Environmental Ministerial Regulations (EMR) No 5/2006 and 4/2009 set exhaust gas emission (not GHG emissions) thresholds for old and new cars. Law 322 of 2009 on traffic and road-base transport states in section 210 that all vehicles on the road must pass emission (non GHG) and noise standard tests.

The role of local government in reducing GHG emissions is through the implementation of the Regional Action Plan (RAD) to Reduce GHG Emissions. As stipulated in the Presidential Regulation No.61/2011 on National Action Plan to Reduce GHG Emission (RAN GRK), the national Government in cooperation with local government has developed 33 Provincial Local Action Plan for Greenhouse Gas Emission Reduction (RAD-GRK) ratified by a Governor Regulation. With such regulation, governors are encouraged to collaborate with District/City Governments to reduce emissions in their regions.

Regional governments also have a role in this area. EMR 12/2012 on Guideline for Regional emissions controls states that Governors are obligated to send annual reports on air quality to the Minister of Environment (Section 10) with Regents / Mayors responsible for monitoring. Each Governor in their territory should set emissions standards for motorized vehicles equal to or stricter than national standards (section 7).

The authority in the aforementioned laws and regulations and related legal instruments could be used to limit motorized vehicle exhaust emissions as well as to set testing mechanism and for setting up incentive systems that put a monetary value on emissions and encourage vehicle owners to better maintain their vehicles and/or buy new vehicles that produce lower exhaust emissions. More appropriate policy would result in a triple win for Indonesia: better health, better environmental quality and higher productivity.

1.2. Terms of Reference and Evaluation Questions

The core objectives of the study as set out in the TOR were:

i. To provide a summary and policy analysis of existing central and regional government regulations and practices in implementing these regulations related to vehicle GHG emissions. This analysis should focus on fiscal arrangements but should also include documentation of existing physical standards and testing technologies including standards relating to alternative fuel sources;

ii. To provide recommendations regarding options for the possible implementation of new fiscal policy initiatives such as excise and other imposts based on analysis of the feasibility and desirability of imposing such further

excise or other fiscal imposts on motor vehicle GHG emissions. The analysis undertaken should include legal, administrative, economic; and environmental assessments; and

iii. To conduct at least one public focal group discussion meeting to test the accuracy and acceptability of the studies draft recommendations by sounding out relevant stakeholder groups. The discussion meeting should be convened after presentation of the draft final report with the results of the discussions taken into consideration when preparing the final report.

Further evaluation questions that arose from kick off meetings and initial discussions are as follows.

1) What would be the most suitable methodology to assess economic, and environment impact of policy change;
2) What would be the legal and administrative changes needed to properly implement the preferred policy;
3) What would be the role sharing of central and local governments; and
4) How could policy support gas-powered cars and increase conversion rates.

1.3. Data Collection Instruments

The primary data was gathered via deep interviews with government officials including the Fiscal Policy Office - BKF (especially Officials of the Centre for Climate Change Financing and Multilateral Policy - PKPPIM); the Association of Indonesian Automotive Industries – GAIKINDO; and experts on environmental policy and climate change policy.

The secondary data included reviews of laws, regulations, and decrees related to the control motor vehicle emissions and excise instruments that are available and applied in Indonesia. Secondary data also included published data from the Indonesian Statistics Agency (BPS) and car manufacturers about emissions and major characteristics of vehicles. Unpublished data on car sales by type were also obtained from GAIKINDO.

A Focus Group Discussion was conducted on 29th January 2015 which was helpful as it allowed: (i) a gathering of stakeholders to share latest developments on vehicle emissions reduction measures; (ii) discussion of the rationale, purpose and timing of the study; (iii) gathering of inputs and collection of data for the study and discussion of follow-up needs; and (iv) discussion of the likelihood for successful implementation of any recommended regulatory and fiscal incentive / disincentive reforms. While there was robust discussion at the FGD there was also broad support for the core recommendations contained in this current report.

Subsequent chapters in this report cover:

- Chapter 2 reviews international best practice;
- Chapter 3 reviews existing regulatory and fiscal instruments of relevance;
- Chapter 4 addresses CO2 calculation methods and data;
- Chapter 5 proposes a fiscal policy framework to reduce emissions; and
- Chapter 6 summarizes the main conclusions and recommendations.

2. International Best Practice

2.1. Overview

This chapter reviews international best practice with review of a range of international experiences with focus on best practice in a number of countries found to be in the forefront of implementing fiscal policy arrangements to address motor vehicle emissions. Conceptually the chapter is divided into two parts, (i) more traditional approaches focused on indirectly addressing CO2 emissions; and (ii) more recent approaches that aim to more directly address CO2 emissions, including provision of targeted incentives. Figure 2.1 provides examples for eight countries involving a mix of direct and indirect approaches to addressing CO2 emissions.

Controlling energy demand and greenhouse gas (GHG) emissions from personal and commercial vehicles has become a major challenge for all large cities in the world. Curbing growth in vehicle numbers, reducing private vehicle travel demand; and improving vehicle fuel efficiency are three key elements to reducing overall oil demand and for reducing pollution. A wide variety of approaches to addressing these and related areas have been introduced in different parts of the world.

Figure 2.1. Varying International Approaches for Addressing Motor Vehicle Emissions

Nation	Incidence	Direct CO_2 Measures	Attribute-Based CO_2-Related Measures	Targeted Incentives
United Kingdom	One time	First year special registration tax	—	—
	Annual	Excise duty based on CO_2 for regular cars and AFVs	—	—
United States	One time	Gas-guzzler tax	—	Tax credits for HEVs and AFVs
France	One time	Bonus-malus (feebate) based on CO_2 for regular cars and AFVs	Registration tax based on fiscal horsepower, reduced rates on AFVs	—
	Annual	Annual tax on high CO_2 cars	—	—
Germany	Annual	Annual circulation tax component based on CO_2	Annual circulation tax component based on engine size	Exemption for BEVs
Brazil	One time	—	Registration tax based on engine size	—
China	One time	—	Excise duty based on engine size Acquisition tax based on engine size	—
India	One time	—	Excise tax based on vehicle classes Special duty based on engine size	Lower tax rate for HEVs and zero tax for BEVs
Japan	One time	—	Acquisition tax based on engine size, reduced rates for special vehicles	Exemption for next-generation vehicles
	Annual	—	Tonnage tax based on weight, reduced rates for special vehicles[a] Auto tax based on engine size, reduced rates for special vehicles and next-generation vehicles	Exemption for next-generation vehicles[b] —

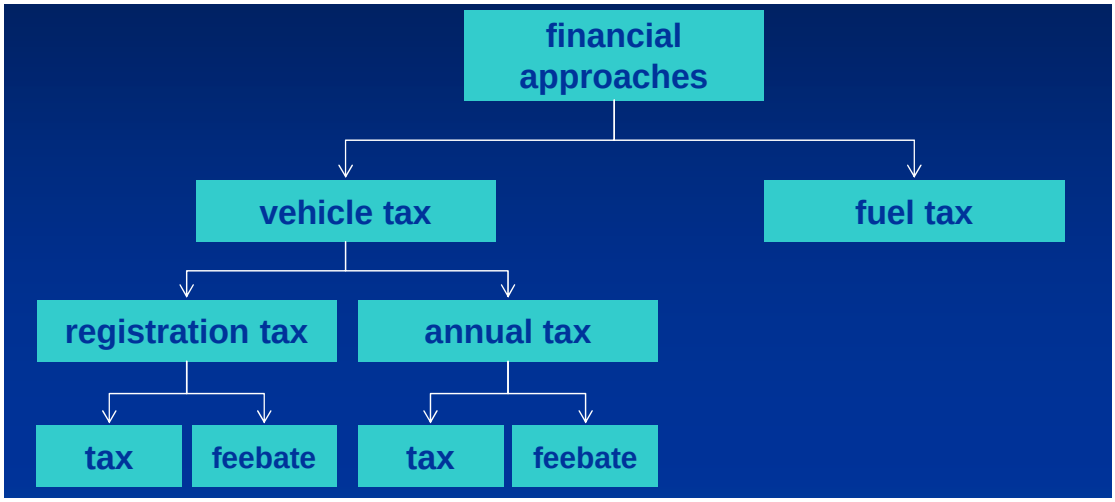
A general schema of fiscal considerations and options that are under consideration in one form or another in most countries are set out in Figure 2.2.

Refer to Figure 2 the first option is to either put emission price on vehicle or the gasoline. Fuel tax is better economically since strongly correlated with usage. Low emission car that used in high frequency would produce more emission in a year than inefficient car with big cylinder size that used infrequently. However, the reality of politics of fuel in Indonesia is unappealing. The parliament is still at the stage of discussion whether possible to slightly reduce fuel subsidy. A carbon tax on fuel, attractive as it is, is only feasible for future when the political climate has change.

Therefore, the option is either to apply the polluter-pay-principle at the registration tax or annual tax. Registration tax is monetary sum that paid one time by motorized vehicle owner when s/he purchases the item. The owner pays annual tax when s/he extends the operating license. Theoretically it is possible to put all the cost on registration tax but doing that would result in very high vehicle price that also has its socio-political drawbacks. The optimal policy and best practice around the world is to spread the cost at the two posts.

Further policy is to only have disincentive scheme for vehicle owner, with higher emitter need to pay more, or to also have incentive scheme for low-emitter. While it is fairer to give subsidy to efficient and/or technological advance vehicle.

Figure 2.2. Broad Fiscal Options for Addressing Motor Vehicle GHG Emissions



2.2. Traditional Focus on Indirect $C0_2$ Measures

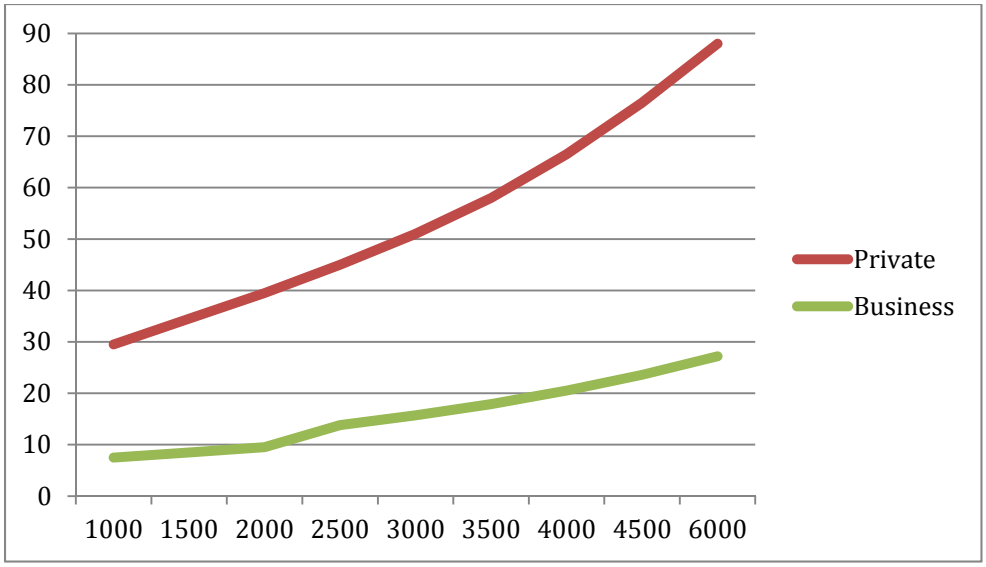
The majority of countries, including Indonesia, Japan, Brazil, China, India and the USA have introduced policies that involve variable fees and taxes paid by vehicle owners based on specific vehicle attributes (such as engine size or vehicle weight) that have an inexact and indirect relationship to CO_2 emissions. This has been something of a default policy for decades where the concern was typically more on progressivity and increasing government revenues rather than Green House gas (GHG) and other emissions. Larger engine sizes and heavier vehicles almost always mean higher vehicle prices and require enhanced ability of owners to pay a larger percentage and absolute amounts of sales taxes. Concerns for climate change and GHG emissions have only arisen more recently and policy inertia takes time to overcome.

2.2.1 Japan

The one time purchase tax paid for the same car is much higher for private use than for business use, as a form of government support to the business sector. However, both have increasing tax rates for higher engine sized cars. The problem with this approach is the low effectiveness of application of the "polluter pays" principle and inadequate incentives for low emission vehicles (most hybrid cars have much lower emissions to combustion compared to conventional vehicles of similar engine size). Shifting from attribute-based policies to CO_2 focused approaches and shifting from purchase price percentage-based taxes to absolute dollar / yen taxes would make these policies more efficient as low-CO_2 emission incentives. The one time purchase tax does provide exemptions for next generation vehicles.

Annual registration renewal taxes in Japan are similarly based on the weight of the vehicle and engine size with differentiation for special vehicles. Exemptions also apply to next generation vehicles. Annual renewal arrangements in Japan are displayed in Figure 2.3.

Figure 2.3. Annual Car Passenger Tax in Japan (in thousand yen and cc)



Source: http://www.pref.aichi.jp/global/en/living/taxes/tax.pdf

2.2.2 United States of America

Another application of this common arrangement is the "Gas Guzzler Tax" in America (which demonstrates elements of both the indirect and direct approaches to addressing CO2 emissions. After experiencing significant economic upheaval after the oil embargo and price shocks of the 1970s, President Jimmy Carter passed the Energy Tax Act of 1978 that included a provision intended to discourage the production and purchase of fuel-inefficient vehicles.

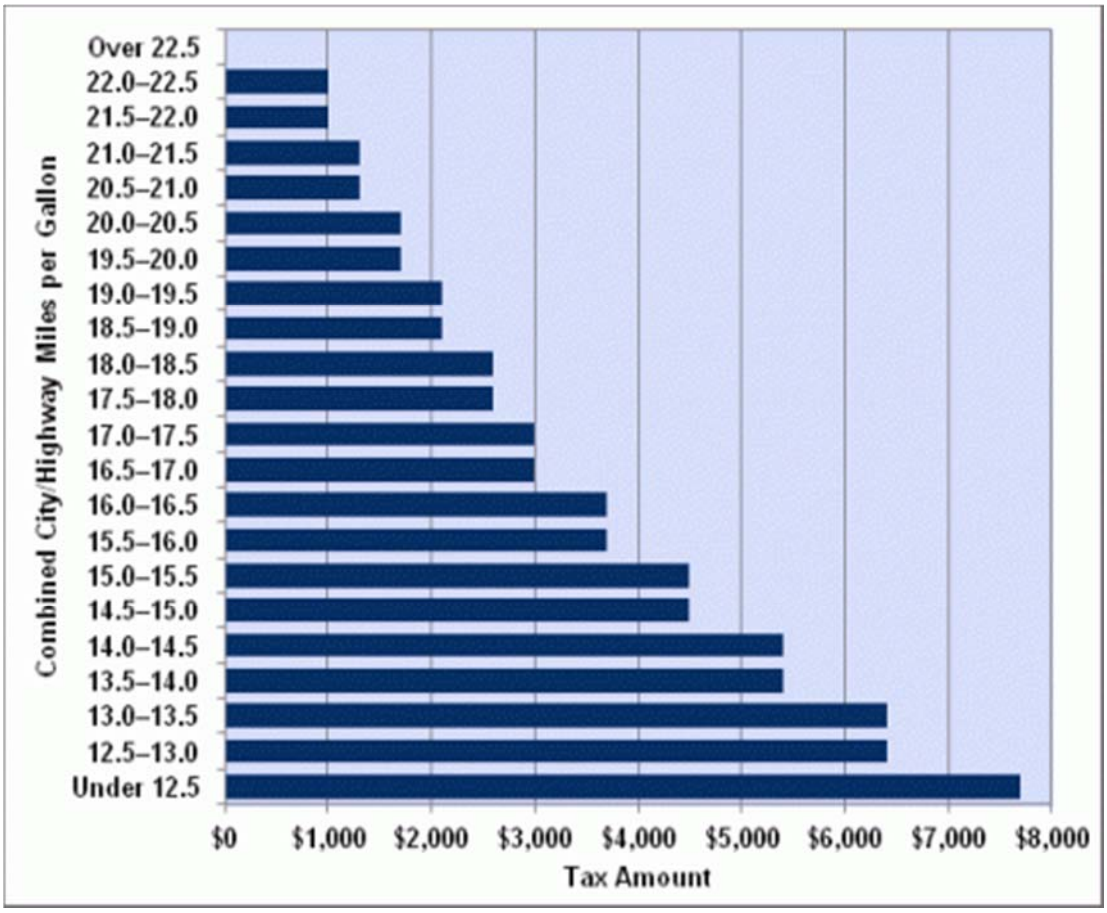
The Gas Guzzler Tax is assessed on new cars that do not meet defined fuel economy levels. As shown in Figure 2.4 The tax rate goes from $1,000 for vehicles that get at least 21.5 mpg (9.1 km per liter), but less than 22.5 mpg (9.6 km per liter) all the way up to $7,700 for vehicles that get less than 12.5 mpg (5.3 km per liter).

These taxes apply only to passenger cars. Trucks, minivans, and sports utility vehicles (SUV) are not covered because these vehicle types were not widely available in 1978

and were rarely used for non-commercial purposes. The Internal Revenue Service (IRS) is responsible for administering the gas-guzzler program and collecting the taxes from car manufacturers or importers.

The USA also provides some tax exemptions for hybrid electric vehicles (HEV) and natural gas fueled vehicles (AFV).

Figure 2.4. Gas Guzzler Tax Rate in America by Fuel Efficiency Category



Source: White House Office of Energy Efficiency and Renewable Energy[1]

2.3 More Recent Implementation of Direct C02 Measures

The last decade has seen some innovative countries moving to directly link their car tax and excise instruments with $C0_2$ emissions.

2.3.1 United Kingdom

In 2001 the United Kingdom (UK) introduced a graduated Vehicle Excise Duty (VED) system, with excise tax bands based on CO_2 ratings, as an incentive to purchase vehicles with lower emission ratings. The system applies to regular and gas fueled vehicles. The system applies to both initial purchases and annual renewals of registrations. Applicable rates in the United Kingdom in recent years (which are increasingly high for grams of CO2 emitted per kilometer) are set out in Table 2.1.

[1] http://energy.gov/eere/vehicles/fact-724-april-23-2012-gas-guzzler-tax-levied-new-cars-low-fuel-economy accessed December 30th 2014

Table 2.1. United Kingdom VED Bands and Rates

VED bands and rates for cars registered on or after 1 March 2001 (graduated VED)					
VED band	CO_2 emissions (g/km)	Tax year 2012-13		Tax year 2013-14	
		Standard rate*	First year rate*	Standard rate*	First year rate*
A	Up to 100	£0	£0	£0	£0
B	101-110	£20	£0	£20	£0
C	111-120	£30	£0	£30	£0
D	121-130	£100	£0	£105	£0
E	131-140	£120	£120	£125	£125
F	141-150	£135	£135	£140	£140
G	151-165	£170	£170	£175	£175
H	166-175	£195	£275	£200	£285
I	176-185	£215	£325	£220	£335
J	186-200	£250	£460	£260	£475
K[26]	201-225	£270	£600	£280	£620
L	226-255	£460	£815	£475	£840
M	Over 255	£475	£1,030	£490	£1,065

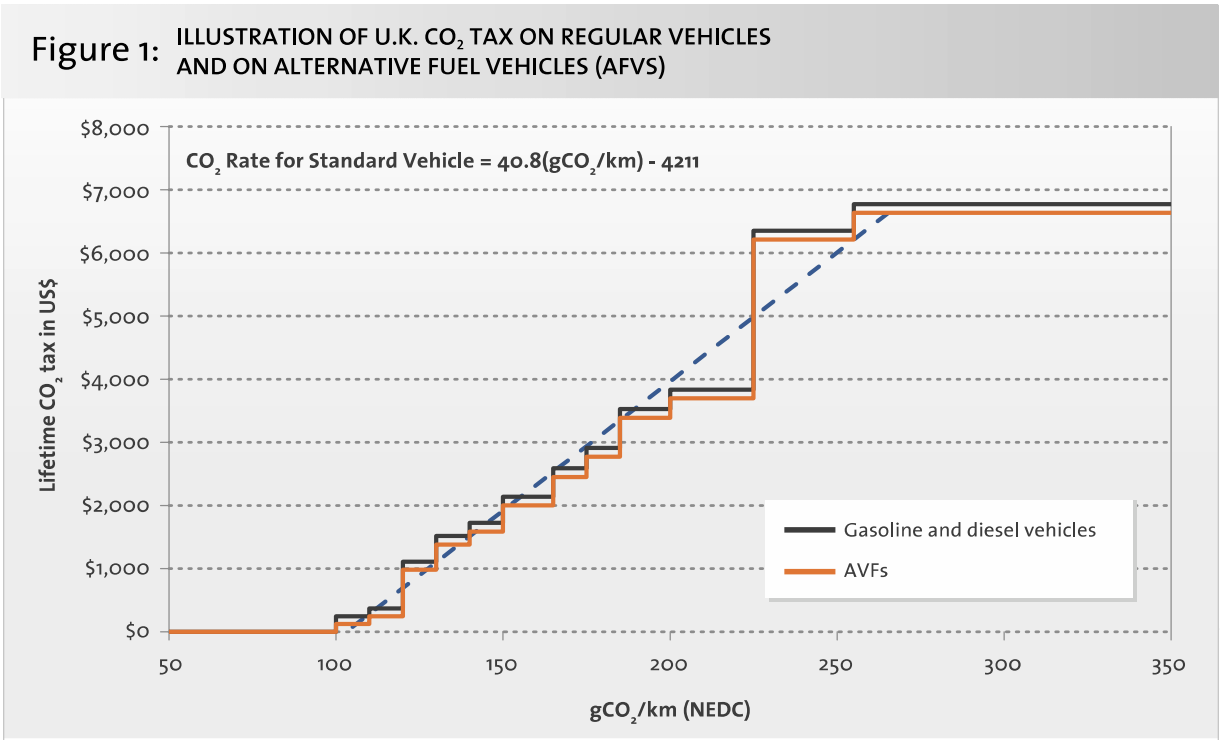
Source: UK Vehicle Certification Agency (https://www.gov.uk/vehicle-tax)

The ratings are based on theoretical CO_2 emission rates per kilometer (based on 14 different emissions bands). VED consists of a first year rate to be paid once only and a standard rate that is paid annually. Figure 2.5 illustrates estimates of CO2 based taxation over the lifetime of different vehicle types. There is clear progressivity with vehicles with very low CO2 emissions paying negligible lifetime tax while those with high emissions pay almost US$ 7,000 over the vehicles lifetime. Alternative fuel vehicles pay marginally lower levels than standard vehicles at the same level of emissions.

An assessment of the impact of this change showed the average C02 emissions of new company cars, which are quite significant in the UK, decreased by 31.6 % from 196g/km in 1999 to 134 g/km in 2009 (Lane 2009).

Numerous countries have since followed the UK initiative including Germany, the Netherlands, Sweden and Norway all of whom have similar CO2 related schemes. France also has a similar but slightly differentiated approach.

Figure 2.5. UK CO2 Lifetime Taxes at Varying Emission Levels

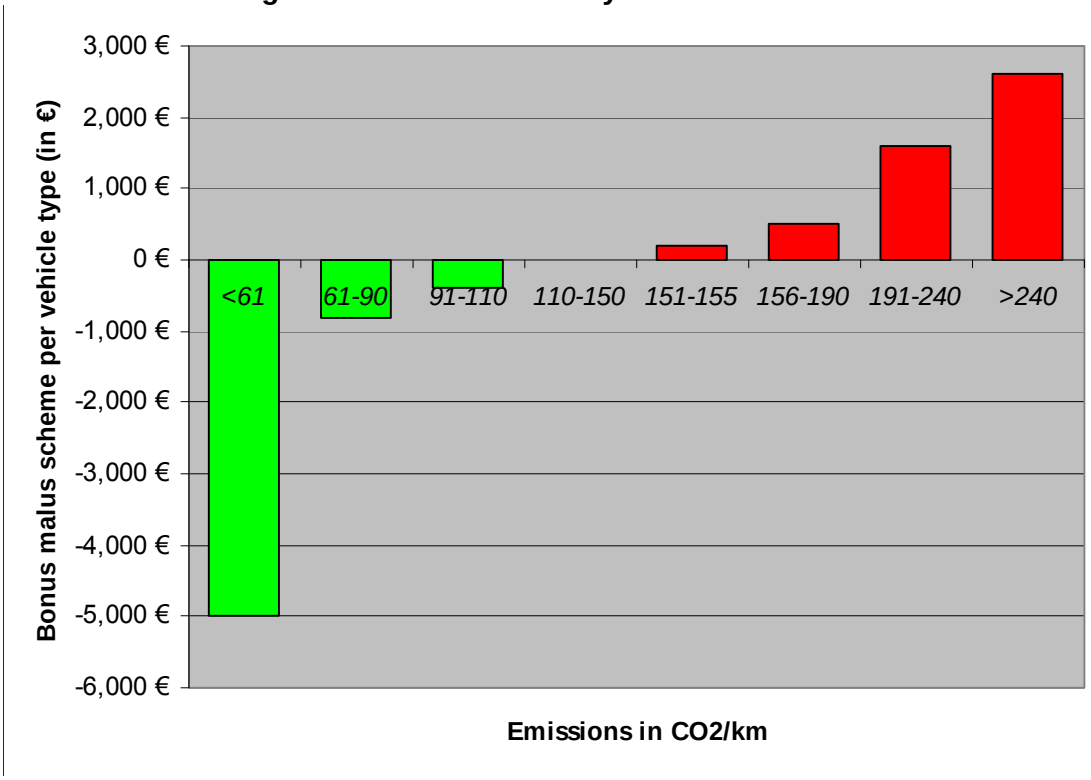


2.3.2 France

The UK uses a dis-incentive only system, with owners of higher emission vehicles paying more – however, no subsidy is paid to owners of low emission cars. As a variant on this France uses a fee-bate system whereby purchasers of high C02 emitting vehicles need to pay once only penalty fees while those with low-emitting vehicles get cash rebates that have the effect of reducing vehicle price. The mixed penalty and bonus scheme is illustrated in Figure 2.6. The bonus and penalties scheme of cross subsidies makes low-emission cars even more attractive to consumers than a disincentives only system. In the case of vehicles with CO2 emissions less than 61 g/km the owner receives a five thousand Euro reduction in car price. Alternatively vehicles with high CO2 emissions exceeding 240gm/km pay a penalty tax of two thousand six hundred Euros.

The French system also calculates annual renewal taxes based on varying levels of CO2 emissions with progressively higher rates for higher emissions. Reduced rates apply for gas fueled vehicles.

Figure 2.6. Bonus – Penalty Scheme in France



Source: ICCT (2011)

2.3.3 Singapore

Singapore has adopted a similar system to France. Rebates apply to vehicles with CO2 emissions below 160 g/km. Amounts of rebates are higher than in France peaking at S$ 20,000 for purchase of vehicles with CO2 emissions below 100 g/km. Penalties are also higher peaking at S$ 20,000 for purchase of vehicles with CO2 emissions above 271 g/km.

2.3.4 Thailand

Thailand is essentially following the UK framework and is based on Euro 4 standards with Eco cars defined as those consuming less than 5 litres per 100 kilometers and emitting below 120g of CO2 per kilometer receiving gradated tax benefits. The initial purchase tax for an eco-car is 17% compared to the standard rate of 30%.

2.3.5 State of California, USA

California has developed strong targets and related fiscal linked policies to radically reduce use of conventional vehicles over the period to 2050. These include targets for: (i) 50% reductions in GHG emissions from conventional vehicles by 2025; (ii) electric vehicles to represent 15% of new sales by 2025; and (iii) conventional vehicles to shrink to very low proportions of total vehicles (below 8%) by 2050 to be replaced by hybrids, plug in hybrids and hydrogen fuel cell and battery electronic vehicles.

2.4 Summary of International Best Practice

International best practice is generally perceived to be largely based in Europe with initial vehicle purchase and annual renewal taxes all directly linked to CO2 emission

levels. These can be disincentives only (e.g. United Kingdom) or provide a mix of incentives and disincentives (e.g. France). In Asia some countries such as Singapore and Thailand have followed the European model with Singapore having adopted an even stronger mix of incentives and penalties than France or other European countries. The Indonesian system continues to be based on now outdated approaches and warrants upgrading to meet international best practice. Within the ASEAN region Singapore would represent a useful model for further study prior to design of an alternative system best suited to Indonesia.

3. Existing Regulatory and Fiscal Instruments to Control Exhaust Emissions of Motorized Vehicles

3.1 Background to the Regulatory Regime

The Government of Indonesia has issued and imposed numerous regulations to control exhaust emissions from motorized vehicles. Exhaust emissions from motor vehicle can lead to local and global impacts. Emissions that can lead to local impacts include: particulate matter (PM 10-micron size, or 2.5-micron), Nitrogen Oxides (NOx), Sulfur Oxides (SOx), Hydro Carbons (HC); and Carbon Monoxide (CO). Exhaust emissions with a global impact (Greenhouse Gases) consist of Carbon Dioxide (CO2), Methane (CH4), and Nitrous Oxide (N2O). This chapter provides a detailed review of existing regulations.

All existing regulations on vehicle exhaust emissions only regulate the emissions of Carbon Monoxide (CO) and Hydro Carbons (HC) for gasoline-fueled vehicles and opacity for diesel-fueled vehicles. Greenhouse Gas (GHG) emissions or fuel economy measures have not yet been regulated.

The existing regulations regulate either the vehicles as sources of exhaust emissions (e.g. application of emissions standards) or the activities of motor vehicles (e.g. regulations on traffic engineering; electronic road pricing, parking policy, staggering working/school hours, etc.). Some regulations on fuel also have been applied e.g. fuel quality standards, the use of environmentally friendly fuels, etc.

The primary ways to reduce GHG emissions from transport are:

- **“Avoid policies”** which address transport energy use and emissions by slowing travel growth via city planning and travel demand management. “Avoid” policies also include initiatives such as virtual mobility programs (e.g. tele-working) and implementation of logistics technology;
- **“Shift policies”** enable and encourage movement from motorized travel to more energy efficient modes, such as public transit, walking, cycling and freight rail. For example, increases in affordable, frequent and seamless public transport can alleviate local congestion while improving access and travel time to destinations and reducing household expenses on travel; and
- **“Improve policies”** can reduce energy consumption and emissions of all travel modes through the introduction of more efficient fuels and vehicles. “Improve” policies include tightened fuel-economy standards and increased advanced-vehicle technology sales (e.g. clean diesel trucks and hybrid and plug-in electric cars).

In accordance to the scope of this study, this review of regulations covers regulations relating to motorized vehicles as the emissions source. The objective of these regulations is to control vehicle exhaust emissions to meet emissions standards. These regulations include:

- Regulations that push people to choose lower emission vehicles when they decide to buy vehicles; and
- Regulations that push people to operate and maintain their in-use vehicle so that they always meet the emissions standards.

The application of the 'polluter-pays-principle' can be implemented through vehicle registration taxation and / or annual motor vehicle taxation. The registration tax is a tax that is paid one time by the owner of the motor vehicle when they purchase a vehicle.

Annual motor vehicle tax is a tax that must be paid once a year when its operation license had to be extended.

The rules and regulations of motorized vehicles consists of various levels, from the highest level of the Constitution Act/Law following by lower level regulations such as Government Regulation, Ministerial Regulation, Local Regulation and Decree of Governor/Mayor/Regent. Ministerial Regulations, which were issued after the enactment of Law No. 12/2011 concerning the Establishment of Legislation, are acknowledged (Article 8 paragraph 2) and have binding force as legislation with the requirements of:

- Mandated by higher level legislation; or
- Established by appropriate authority.

This review of existing regulations focuses mainly on fiscal arrangements but also includes documentation of physical standards and testing technology, including standards relating to alternative fuel sources.

3.2 Regulations Related to Fiscal Policies

Regulations related mainly to fiscal policies and which have the potential to control exhaust emissions from motor vehicles are summarized in Table 3.1.

Table 3.1. Regulations Related to Fiscal Policies

Regulations	About	Fiscal Policies	Analysis of Suitability
Law 28 of 2009	Local Tax and Local Retribution	- The amount of vehicle tax is determined based on a vehicle's sale value and weight/load (degree of road damage or pollution which will be caused by the vehicle) - Progressive rates of tax are applied for ownership of more than one (1) motor vehicle	This Law has the potential to encourage people to: - Choose a vehicle with lower pollution (local and global pollutants) levels - Limiting the number of motor vehicles owned
Government Regulation 22 of 2014	Amendment to Government Regulation 41 of 2013 on Taxable Goods Categorized as Luxury Goods - for Motor Vehicles Subject to Sales Tax on Luxury Goods	Registration tax of motor vehicle is associated with several parameters that could potentially affect the level of emissions, for example a cylinder capacity (cc), fuel type, and weight/load	This regulation can be improved by linking the rate of vehicle registration tax with motor vehicle emissions (particularly CO2 emission) based on the parameters of technical specifications of vehicles
Regulation of the Minister of Finance Number 64 / PMK.011 / 2014	Vehicle type that is charged Tax on Luxury Goods Sales and Procedures for Exemption of Taxes on Luxury Goods Sales	This is a derivative of Government Regulation 22 of 2014	
Government Regulation 41 of 2013	Taxable Goods Categorized as Luxury Goods for Motor Vehicles Subject to Sales	Sales Tax on Luxury Goods for Vehicle taxation of Low Cost and Green Cars (LCGC) is zero (0) % which applies to gasoline cars (1200 cc) and diesel cars (1500	In principle, fuel-efficient vehicles produce lower emissions per-km trip. However if the frequency of use is high, then LCGC remains a source of

Regulations	About	Fiscal Policies	Analysis of Suitability
	Tax on Luxury Goods	cc) with the following requirements: - Fuel consumption of at least 20 km / liter of fuel or other equivalent energy sources - Using fuel with 92 RON for gasoline and Cetane Number (CN) 51 for diesel fuel.	emissions with potentially significant contributions. There can be deviations from the original purpose of LCGC, including; - LCGC were originally intended for the market outside Java island, but the reality is even more purchases in the Jabodetabek area; - LCGC are supposed to use non-subsidized fuel, in fact they were still allowed to use subsidized fuel, premium; - LCGC fuel consumption of 20 km/l is doubtful. Some LCGC users find it difficult to get 20 km/l. Fuel consumption is influenced by driving behavior and traffic conditions. An OBD system (On Board Diagnostic)[2] could help ensure minimum fuel consumption of 20 km/l
Regulation of the Minister of Industry Number 33 / M-IND / PER / 7/2013	Taxable Goods of Luxury Category For Vehicles That Taxable as Luxury Goods Sales	As a derivative of Regulation No. 41 Year 2013	
Law Number 39 Year 2007	Excise	There are some opportunities for the imposition of excise duty on motor vehicles because the use of motor vehicles should be charged with reasons of justice and balance and fit the requirements of the excise law	The Fiscal Policy Agency in MOF had conducted a study on the opportunities to control motor vehicle exhaust emissions through the imposition of excise policy for reasons of justice (load) and health (the impact of motor vehicle exhaust emissions). But there are some considerations that still need to be studied to strengthen the design of imposition.

Law Number 28 Year 2009 on Local Taxes and Retribution

This law provides for:

- A basis for local governments (Provincial level) to regulate motor vehicle taxes (ownership and / or control by individuals and institutions), including progressive taxation of vehicle ownership.
- The motor vehicle tax is the multiplication of two (2) main elements, namely:
    - Selling Value Vehicle (market price); and

[2] Most 1996 and newer vehicles have standardized computer systems (also known as On-Board Diagnostics - OBDII) that continually monitor the electronic sensors of engines and emission control systems, including the catalytic converter, while the vehicle is being driven to ensure they are working as designed. When a potential problem is detected, a dashboard warning light called a malfunction indicator light (MIL) is illuminated to alert the driver. An OBD system detects a problem well before symptoms such as poor performance, high emissions or poor fuel economy are recognized by the driver. An OBD emission test provides a comprehensive picture of a vehicle's emissions status because it evaluates emissions during daily operating conditions whereas a tailpipe test measures emissions only at a particular moment in time. Early detection helps to avoid costly repairs and lowers emissions.

  - o The weights which reflect the relative level of damage to roads and / or environmental pollution due to the use of motor vehicles are expressed in coefficient whose value is 1 (one) or greater than 1 (one) ("Weight").

- The imposition of tax rates on motor vehicles on the basis of the weighting for environmental pollution is not well promoted with the community, so people typically only know that the motor vehicle tax is based on the sales value of motor vehicles. Raising levels of public awareness about environmental pollution being able to affecting the amount of tax that should be paid, is important so encouragement should be given to people to choose environmentally friendly vehicles.
- The Jakarta administration is one example of an aggressive Local Government seeking to reduce ownership of motor vehicle through progressive increases in tax rates from 2014 for those with two or more vehicles.

Government Regulation 22 of 2014 – Sales Taxes on Vehicles

- One of other lower level regulations under this is the Minister of Finance Regulation Number 64 / PMK.011 / 2014 concerning Type of Motor Vehicles Subject to Sales Tax on Luxury Goods and Procedures for Exemption from the imposition of Sales Tax on Luxury Goods.
- Table 3.2 summarizes existing vehicle Sales Taxes in Indonesia. Generally cars with larger engine cylinders produce more emissions than those with lower cylinders and are thus taxed at higher prices. Diesel engines on average emit fewer emissions than gasoline cars. Thus, the existing framework is not unrelated with emissions though it is an indirect relationship;
- However, recent advances in technology also make it possible for larger cylinder cars to produce less-emissions over the same period of running time than smaller vehicles. Therefore, there is room for policy improvement in the current framework to strengthen correlation between emissions and the registration tax.

Table 3.2. Sales Taxes for Cars under GR 22 of 2014

Tax Rate (%)	Gasoline	Diesel
10	- 10 – 15 passenger - <10 passenger & cc<1.5 l	- 10 – 15 passenger - <10 & cc <1500
20	-<10 & 1.5<l<2.5 (non-sedan) Double cabin	<10 & 1500<cc<2500 (non-sedan) Double cabin
30	Sedan cc = <1500 Non-sedan, 4x4 & cc= <1500	Sedan cc =<1500 Non-sedan, 4x4 & cc= <1500
40	Sedan (4x2) 2.5<l<3 Non-sedan (4x4) 1.5<l<3	Sedan (4x2) 1.5<l<2.5 Non-sedan (4x4) 1.5<l<2.5
50	Golf Car	Golf Car
60	Snow/Beach/mountain vehicle	Snow/Beach/mountain vehicle
125	cc>3000 Trailer/semi-trailer/caravan	cc>2500 Trailer/semi-trailer/caravan

Government Regulation 41 of 2013 – LCGC Vehicles

- One of other lower level regulations under this is Ministerial Decree No. 33 / M-IND / PER / 7/2013 on the Development of Four Wheel Energy Efficient and Affordably Priced Vehicles.
- Regulates the development of energy efficient and affordably priced four wheel motor vehicles (KBH2) and low cost and green cars (LCGC).

- Development of car production LCGC is a Motor Vehicle Production Development Program with the provision of facilities in the form of Value Added Tax Relief on Luxury Goods (PPnBM).
- Article 3, paragraph 1 (c) of the Government Regulation indicates that for energy-efficient and affordably priced cars, the Sales Tax will be zero (0) percent of the sales price providing the following requirements are met:
    - Fuel consumption of at least 20 km/liter or other equivalent fuel for gasoline cars from 980 - 1200 cc and diesel cars up to 1500 cc; and
    - Type of fuel must meet minimum specifications for Research Octane Number (RON) 92 for the ignition spark combustion engine and Cetane Number (CN) 51 for diesel.
- Policies related to LCGC should be evaluated, particularly on the impacts to the environment because of high public interest in owning LCGC vehicles. Based on data from the Indonesian Automotive Industry Association (GAIKINDO), the number of LCGC sales from October until end of 2013 was as much as 51,180 units. While from January until July 2014, car sales in Indonesia had reached 733,716 units with 13.52 percent of these being LCGC.

Law 39 of 2007 on Excise

- Some countries have imposed excise policies for motor vehicles, such as: (i) the state of Massachusetts - United States, applies an excise on motor vehicles and trailers; (ii) British excise tax revenue from motor vehicles and fuel reached 6 per cent of total tax revenues in fiscal year 2010-2011; (iii) The Malaysian government has imposed a motor vehicle excise tax since 2004.
- Law 39 of 2007 provides the space for expanding excise objects. Article 2 paragraph (1) regulates the characteristics or nature of goods that can be subject to excise. The addition of excisable goods can occur through government regulation. The reason for allowing the imposition of excise duty on motor vehicles is that the use of motor vehicles should be controlled by the nation for the sake of fairness and balance.

3.3 Regulations Related to Environmental Matters

Most regulations of the Minister of Environment related to motor vehicle exhaust emissions control come under Law 32 of 2009 on the Protection and Management of the Environment, in the following articles:

- Article 18 on environmental standards, includes emissions standards which are mandated to be further stipulated by Regulation of the Minister;
- Article 42 paragraph 2c, provides for incentives and disincentive and is to be further regulated by Government Regulation.

Further details are provided in Table 3.3.

Table 3.3. Regulations from Ministry of Environment of Motor Vehicle

Regulations	About	Fiscal Instrument	Analysis of Suitability
Regulation of the Minister of Environment 5 of 2006	Emission Standards of In-Use Motor Vehicles (only regulates HC & CO for gasoline-fueled	Unlocks the potential for increased revenue of Local Governments from tariffs and sanctions related to	- Some local governments have developed Local Government Regulations which obligates emissions testing as a requirement of the Annual Motor Vehicle Tax

Regulations	About	Fiscal Instrument	Analysis of Suitability
	vehicles and opacity for diesel-fueled vehicles)	emissions test violations	payment. However, its implementation is very limited. - Authorized car workshops apply emission tests for the diagnosis of engine condition - The procedure for emissions testing follows the ISO which is set out in an Annex of the Regulation - The parameters tested for gasoline are HC and CO, while for diesel it is opacity (smoke)
Minister of Environment Regulation 4 of 2009	Emissions Standards for Type Approval of Motor Vehicle (only regulates HC & CO for gasoline-fueled vehicles and opacity for diesel-fueled vehicles)	No	- These regulations are implemented for new vehicles that are ready to be produced and marketed so that the vehicle has a good baseline to fulfil emissions standards. - The procedure for emissions testing refers to the ISO and is set out in an Annex to the Regulation - The parameters tested for gasoline are HC and CO, while for diesel is opacity (smoke)
Minister of Environment Regulation Number 12 of 2010	Implementation of Air Pollution Control at Province or City Level	No	This Regulation is the basis for local governments to set the emissions standard for motor vehicles. The standard should be stronger or at least equal to the Regulation of the Minister of Environment
Government Regulation Number 41 of 1999	Air Pollution Control	No	Emissions Standards of motor vehicles are determined by considering the dominant parameters, fuel quality and existing technology. In fact, the fuel still contains high levels of sulfur so that emissions standards cannot be fully complied.
Minister of Environment Regulation 23 of 2012	Amendment to the Regulation of the Minister of Environment 10 of 2012 on Emissions Standard of Motor Vehicles New Type Category L3	Nothing	New Types of Motor Vehicles Category L3 is a new type of two wheeler motor vehicle with a cylinder capacity of more than 50 (fifty) cm3 or with a maximum design speed of more than 50 (fifty) km/h for any kind of driving force.
Draft of Government Regulation	Environmental Economic Instruments	Motor vehicles have impact on natural resources and the environment that is subject to a tax rate that includes costs to the environment.	Environmental economic instruments provide a set of economic policies to encourage the Government, local government, or any person towards environment conservation. The draft of this Government Regulation is still in the process of settlement by all stakeholders. However, if a fuel or other related carbon tax is to be imposed through this Government Regulation, then the existing Tax Law Number 28 Year 2009 is likely to need amendment since there is no definition or provision of carbon tax in it.

Minister of Environment Regulation 5 of 2006 – Vehicle Emission Standards

- The scope of this regulation covers exhaust gas emission limits, test methods, test procedures, evaluation, and reporting of the compliance of implementation of emissions standards in the use of motor vehicles.
- The enforcement target is "In-Use Motor Vehicles" that is vehicles that have been manufactured, assembled or imported and are operating in the territory of the Republic of Indonesia.
- The motor vehicles which are regulated are categorized into types:
    - L (motorcycle);
    - M (4 or more wheeled vehicles to transport people);
    - N (4 or more wheeled vehicles to transport goods); and
    - O (lorry or articulated vehicles to transport goods).
- The vehicle must be tested periodically in accordance to the rules and regulations;
- Parameters to be tested are as follows:
    - CO and HC for vehicle types L and M, N, and O which have an ignition spark motor driving system;
    - Opacity is measured on the condition of free acceleration for vehicle types M, N, and O which have compression ignition combustion piston engines (diesel); and
    - CO2 and O2 gas analyzer testing that has the ability to measure CO2 and O2 so that the parameters of CO (carbon monoxide) that are shown are corrected CO.
- Method of measurement refers to the SNI as stated in the Regulation Annex of the Minister of the Environment Regulation.
- The emission tests can be conducted in a public or private testing facility that has been certified as mentioned in the regulations.
- The Regent/Mayor is responsible for the emissions testing of in-use motor vehicles that are registered in the region. He must report the emissions test program to the governor at least every 6 (six) months and announce the results of the emission tests at least once a year to the public through print and electronic media.
- The Governor is responsible for coordinating the activities of the implementation of emissions test in their territory. At least once a year, the Governors must carry out an evaluation, announce the results to the public through print and electronic media, and report the emission test results conducted by the Regents / Mayors in its territory to the Minister.
- The Governor can set the standard of motor vehicle exhaust emissions in the region equal to or more stringent than the standard in the Minister of Environment Regulation, however without any addition or subtraction of the number of parameters as listed in the Annex of the Regulation. If the Governor has not yet set standards for motor vehicle exhaust emissions in the region, then he can apply the standards according to the Minister.

Box 1. The Implementation of Emissions Tests in DKI Jakarta

Jakarta has implemented a Vehicle Inspection and Maintenance Program voluntarily since 1996 which became mandatory in 2005 through Local Regulation No 2 of 2005 on Air Pollution Control, which was followed by the Governors Regulation No. 92/2007 on Vehicle Inspection and Maintenance Program, and the Governors Regulation No. 31/2008 on Emissions Standards. Emission tests should be carried out every 6 months for public transport, private vehicles and motorcycles. Parameters measured are carbon monoxide (CO) and Hydro Carbon (HC) for gasoline-fueled vehicles and opacity for diesel-fueled vehicles. Passing the emissions test is one of the motor vehicle tax payment requirements (Article 19, paragraph 5). The Jakarta Provincial Government has prepared 238 workshops for the emissions test (BPUE *or Bengkel Pelaksana Uji Emisi*) and 568 technicians have been certified. The cost of the emission test is according to the market mechanism, but with the maximum tolerated is 50 thousand rupiah. Vehicle owners who pass the emissions test will get a sticker and book marks evidencing passing the emissions test (TLUE or *Tanda Lulus Uji Emisi*). If it does not pass, the vehicle owner will receive a letter containing the notice to perform vehicle maintenance at BPUE, at the latest a week after notification and report it to Jakarta Province.

The Implementation of Local Regulation No 2 of Year 2005:

- Vehicle Inspection and Maintenance Test has not been implemented effectively, there are many vehicles that do not pass or are not tested. People think that emissions test is voluntary.
- Emissions test as a requirement of tax payment is still constrained by Jakarta Revenue Office procedures which consider enforcement will decrease revenue from motor vehicle tax.
- On the road law enforcement of emission test compliance is still constrained by national level Law 22 of 2009 on Traffic Articles which Article 210 (paragraphs 1 and 2) mandates that every motor vehicle shall meet the requirements of exhaust emissions and noise, but there is no Government Regulation which regulates it in more concrete terms.
- The Vehicle Inspection & Maintenance Program has been stopped due to the law constraints of TLUE provision.
- Sanctions of violation fines of 50 million rupiah as well as the legal maximum of 6 months in prison have not been in place. Under Act 22 of 2009 Section 218, sanctions of two months in prison or a fine of 500 thousand exist but are not applied.

Implementation of Emission Tests in Surabaya

Emissions tests for private motor vehicle in Surabaya are still voluntary based. The Government of Surabaya is consistently campaigning for clean air through the implementation of free of charge car emissions testing and minor repairs periodically at several locations. During the year, the Government of Surabaya City holds emissions testing more than 50 times. The citizens of Surabaya City welcome and actively participate in these events.

The parameters measured are carbon monoxide (CO) and Hydro Carbon (HC) for gasoline-fueled vehicles and opacity for diesel-fueled vehicles.

The free of charge emissions tests and minor repairs aim to increase public awareness so that the public will always participate in maintaining air quality of Surabaya.

The legal basis for the implementation of the emissions tests in Surabaya is Local Regulation No. 3 of 2008 on Air Pollution Control. But there is no follow-up regulation which regulates the emission test in detail and requires emissions testing for private motor vehicles tax payment.

Emission test events were also conducted by the Ministry of Environment (LH) and Forestry which plans to issue a new policy that all motor vehicles that perform vehicle registration renewal must pass the emissions test. If the policy is enforced, it is necessary to prepare the supporting facilities. For example, in Surabaya, vehicle registration renewal can be conducted through mobile services in parks and malls; therefore it will be necessary to provide emissions test equipment. Emissions test events were also carried out for public transport in some terminals.

The Minister of Environment Regulation Number 4 Year 2009 on the Motor

New Vehicle Exhaust Emission Standards:

- New motor vehicles that are ready to be produced and will be marketed or already operating motor vehicle on the road but which will be produced with changes in the design of the engine and/or transmission systems, or completely built-up motor vehicles that are not yet operational in the territory of the Republic of Indonesia must address specific standards.
- The regulation targets the responsible party of business production unit of new types of motor vehicles and/or importers of completely or incompletely built-up motor vehicles.
- The content of this regulation is generally the same as the in-use motor vehicles.
- The type approval test of motor vehicle exhaust emissions is a one-time test and is part of the technical requirements for certifying road worthy vehicles.

Overview of Implementation of Ministry of Environment Regulation 5 of 2006

- Vehicles that do not pass the emissions test need to undergo maintenance in order to meet emission limits, although it is not stated in the Regulation of the Minister.
- The national standards are not applied evenly because not all of the local governments implement the emissions control regulations.
- As a law enforcement effort, some local governments provide policing such that vehicles that have not passed the emissions testing are not allowed to pay the annual vehicle tax which means the vehicles cannot operate on the road.
- A well-maintained vehicle engine will have an optimized combustion process that means more efficient fuel consumption and lower emissions.
- In general, regulations applying to new vehicles have been adhered to by motor vehicle producers since this test is part of roadworthy test requirements prior to sale.
- The Indonesia Government should consider following policies of an increasing number of countries by including CO2 emissions through measuring gCO2/km in the type approval test.
- In European countries, for more than fifty years, vehicles have been tested in controlled laboratory environments to determine their official emission values. However, as recent analyses by the ICCT (the International Council on Clean Transportation – Working Paper 2014-9 October 2014) and other research institutes demonstrate, official laboratory test results reflect less and less the actual experience of average drivers on the road. The growing gap between official laboratory and real-world on-road emission values negatively affects consumers (who spend more on fuel), governments (whose vehicle tax revenue drops), vehicle manufacturers (which have no level playing field and lose credibility) and society as a whole (not meeting emission reduction targets as anticipated). Hence, there is common agreement that a revision of the vehicle test procedures is needed in order to make them better reflect real-world driving.
- A lot of hope is riding on the Worldwide Harmonized Light Vehicles Test Procedure (WLTP), which was developed at the United Nations level through UNECE in recent years and is now ready for implementation at the regional and country level.
- Completion of the Draft Government Regulation on Environmental Economic Instruments will be important in Indonesia to add to the tool-kit of economic

instruments available to address motor vehicle emissions. Further work on the use of excise instruments also needs to be considered.

Ministry of Environment Regulation 12 of 2010 - Regional Air Pollution Control

- In Article 7, paragraph 1, the Governor can set the emissions standards of motor vehicle exhaust emissions equal to or more stringent than the motor vehicle exhaust emissions nationwide.

Government Regulation 41 of 1999 on Air Pollution Control

- Article 8, paragraph 2: emissions standards of motor vehicles are determined by considering the dominant parameters and the quality of fuels and raw materials, as well as existing technologies.
- Articles 31 to 36; air pollution control from mobile sources including the supervision of compliance of exhaust emission standards, inspection of exhaust emissions for type approval and in-use motor vehicles, on-road ambient air quality monitoring, on-road exhaust emissions inspection of motor vehicles and procurement of unleaded gasoline and low sulfur diesel fuel in accordance with international standards.

Draft of Regulation of Environment Economic Instruments

The Draft of Regulation of Environment Economic Instruments is still being refined. In the draft the use of motor vehicles is one of the activities that have an impact on natural resources and the environment so that the tax rate imposed on these activities shall include the costs to the environment. Environmental costs in the determination of tax instruments and rates should take into account the potential for environmental impact of the use of natural resources and the environment.

The calculation is based on the potential impact of depletion of natural resources, environmental pollution and environmental damage. The procedure for making the environmental cost calculation is to be based on the potential impact to the environment with the tax rate to be set in a later Ministerial Regulation.

This Government Regulation could help reduce CO2 emissions of motorized vehicles in operation in ways such as:

- Environmental taxes based on fuel economy. The highest fuel consumption per-km travelled, the higher the environmental tax that should be paid, therefore people will try to improve fuel economy which means CO2 reduction, or
- Environmental tax based on fuel consumption. The more fuel consumption the greater environmental tax should be paid therefore people will try to reduce fuel consumption by i.e. reducing km travelled which means CO2 reduction.

The use of local revenue derived from tax levies on business objects and/or activities which affect natural resources and the environment should be closely considered for the financing of environmental protection and management in accordance with legislation.

3.4 Related Transportation Regulations

The basic Regulation of the Ministry of Transportation regarding motor vehicle exhaust emissions control is Law 22 of 2009 on Traffic and Transportation, especially in the following articles:

- Article 48, paragraph 3: Exhaust emissions of vehicles are one of the requirements of roadworthiness. Further provisions on technical requirements and road worthiness are to be regulated by government regulation.
- Article 49: motor vehicles to be operated on the road are required to pass roadworthy tests with emissions testing as one of the test parameters
- Article 210; every single motor vehicles operating on the road shall meet the requirements of exhaust gas emission limits and noise levels; as further regulated in a government regulation.

Further details are set out in Table 3.4.

Table 3.4. Regulation by Ministry of Transportation

Regulations	About	Fiscal Instrument	Analysis of Suitability
Government Regulation 55 of 2012	Vehicle standards	No	This regulation is potentially a tool to control exhaust emissions of motor vehicles because of the requirement for new vehicle tests and periodic tests
Regulation of Directorate General of Land Transportation Number: Sk.78 / Aj.006 / Drjd / 2008	The use of Liquefied Gas For Vehicles (LGV)	No	This regulation could encourage the use of cleaner fuels, namely gas
The Director General of Land Transportation Number: Sk.1544 / Aj.402 / Drjd / 2006	Implementation of Exhaust Emission Test (only regulates HC & CO for gasoline-fueled vehicles and opacity for diesel-fueled vehicles) of a new vehicles being produced (current production)	No	This regulation stipulates in detail the implementation of the emissions test of type approval, thus minimizing the potential for air pollution

Government Regulation 55 of 2012 on Vehicle Emissions

- Articles 64 and 65, outlines the requirements of motor vehicle exhaust emissions as part of the roadworthy tests; and

- Article 121 regarding new vehicle approval tests and periodic tests, with vehicle categories referring to the Ministry of Environment Regulations 55 of 2006 and 4 of 2009.

Regulation of DG of Land Transportation: Sk.78 / Aj.006 / Drjd / 2008 on Liquefied Gas Fuels for Vehicle (LGV)

- The regulation contains technical regulations for the use, maintenance and inspection of vehicles with LGV fuel.

Regulation of DG of Land Transportation: Sk.1544 / Aj.402 / Drjd / 2006 on the Implementation of Exhaust Emission Test for New Vehicles Produced

- This regulation contains detailed technical rules that support MoE Regulation Number 4 of 2009 on emissions standards for new vehicle types.

3.5 Regulations Related to Fuel

Table 3.5. Regulations Related to Fuel

Regulations	About	Fiscal Instrument	Analysis of Suitability
Minister of Energy and Mineral Resources Regulation 20 of 2014	Second Amendment to the Regulation of the Minister of Energy and Mineral Resources Regulation 32 of 2008 on the Provision, Utilization, and Commercial Governance of Biofuels as an Alternative Fuel	No	Biofuel blending into fuel at the fuel station will increase the quality of the fuel so as to reduce emissions of pollutants from motor vehicles
Regulation of the Minister of Energy and Mineral Resources 1 of 2013	Control of Fuel Usage	No	The use of non-subsidized fuels to potentially reduce air pollution due to better quality and the more efficient nature of the fuel
Decision of the Director General of Oil and Gas Number 978.K/10/DJM.S/2013	Sulfur content in diesel fuel 48. Allowable Sulfur content: - 3500 ppm until end of 2015 - 3000 ppm started from 1st of January 2016 - 2500 ppm started from 1st of January 2017 - 500 ppm started from 1st of January 2021 - 50 ppm started from 1st of January 2025	No	Low sulfur content in fuel is a necessity for adopting more advanced technologies which can reduce vehicle exhaust emissions
Decision of the Director General of Oil and Gas Number 933.K/10/DJM.S/2013	Quality of gasoline RON 88	No	The Oil and Gas Governance Reform team recommended to stop importing gasoline RON 88 (premium) with the aim of easing control of the oil mafia in Indonesia and so people can get a better quality fuel (RON 92) with fuel prices increased. The use of better fuel quality can maximize the use of fuel-saving and low emissions engine technology.

3.6 Local Government Regulations

Some Local Governments have been following up on the Regulation of the Minister of Environment on emissions standards, some examples of Local Government regulations can be seen in Table 3.6.

Table 3.6. Local Government Regulations on Emissions Standard

Regulations	About	Fiscal Instrument	Analysis of Suitability
Jakarta Provincial Regulation 2 of 2005	Air Pollution Control	- Incentives can be applied to people who comply with motor vehicle emission standards which will be governed by a Governor's regulation - Passing an emissions test is one of the motor	- Regulation of incentives is not yet available - The obligation to pass the emissions test as a prerequisite for vehicle annual tax payments has not been implemented

Regulations	About	Fiscal Instrument	Analysis of Suitability
		vehicle tax payment requirements	
Jakarta Governor Regulation 92 of 2007	Emissions Testing and Maintenance of Motor Vehicles	- A derivative of Regulation 2 of 2005 which regulates in detail the technical implementation of the emissions tests - Enforced fines for violations	
Banjarmasin City Regulation 4 of 2003	Motor Vehicle Emissions Inspections	- Passing an emissions test is one of the motor vehicle tax payment requirements - Enforced fines for violations with max 5 million rupiah	Obligation to check and maintain vehicles to comply with emissions standards potentially reduces air pollution, but implementation has not been used as a prerequisite for vehicle registration renewal
Bandung Mayor Regulation 572 of 2010	Emission inspection for Motor Vehicle Exhaust Emissions Standards	Some public areas require emissions testing stickers to park the vehicle at that location	Implementation of mandatory sticker emissions testing area has not been promoted well
Yogyakarta Provincial Regulation 5 of 2007	Air Pollution Controls	Enforced fines for violations with maximum of 50 million rupiah	Potentially reduces air pollution

3.7 Other Regulations

Other related Regulations are set out in Table 3.7.

Table 3.7. Other Regulations

Regulations	About	**Fiscal** that	Analysis of Suitability
Letter from the Minister of Environment No. B / 38X / MENLH / PDALs / 12 / 2013	Information seeking decreases in city air pollution, especially for the transport sector which contributes 90% of air pollution	No	Appeal to the relevant institutions to encourage the compliances of motor vehicle emission standards
Letter from Minister of Home Affairs dated January 3 2014	Instructed the Head of Regions to require emissions testing as a requirement of annual vehicle tax payment	Raising revenue from emissions test tariffs	- This letter was in response to the letter from the Minister of Environment - Some regions followed up with the publication of a Regional Regulation

3.8 Excise Opportunities for Addressing Motor Vehicle Emissions

Opportunities for imposition of excise to address motor vehicle emissions include:

- According to the regulations and definitions State excise can be imposed on certain goods which have properties or characteristics of use that can cause negative impacts on society or the environment. As a result, their consumption and circulation needs to be monitored by the government.
- The goods subject to excise categorized, among others are; ethyl alcohol, beverages containing ethyl alcohol, as well as a variety of tobacco products, both cigarettes, cigars, tobacco leaves, shredded tobacco, or other processing results.

- Addition or subtraction to the category of goods subject to excise is possible by a Government Regulation.
- The basis for excise application is the total production of goods subject to the excise, which must be paid at the time of issuance of the plant or storage area. Thus, the imposition of excise is placed upstream and requires consumers to pay the excise upfront. This differentiates excise and taxes, although there is a common purpose and goal between them.
- One of the objectives of the imposition of excise duty is as a means of controlling consumption. However, Customs can also be directed to achieve certain goals. Given the nature of the imposition of selective and discriminatory excises, a mechanism is needed that allow to control over the physical goods subject to excise duty, among others is through attaching excise stamps.
- The current excisable goods (BKC) which are currently in effect in Indonesia need to be revised, namely tobacco excise, excise ethyl alcohol, and excise on beverages containing ethyl alcohol. One option to reduce emissions from vehicles is by imposing an excise on fuel. In principle at least there can be a case for a tax on fuel varying with the output of all harmful emissions.
- Every motor vehicle should be tested for its exhaust emissions, if the vehicle exceeds the emission standards the externality should be taxed because the pollutants emitted by motor vehicles have negative impacts on health, causing global warming and climate change. In addition, the use of motor vehicles also causes congestion and increases the need for fuel subsidies. However, the current standards for emission testing are very easy to pass; only old vehicles, which do not use catalytic converters, would have problems in passing emission tests. Moreover, exhaust emissions tests will only measure the CO2 concentration, which indicates the quality of combustion in the engine. Therefore the existing emission standards should be reviewed. While for promoting efficient fuel consumption or low CO2 in gr/km, a fuel tax for vehicle use needs to be considered.
- Imposition of excise could be differentiated according to the classification of vehicles owned by the consumer, such as energy use. Energy-efficient cars and wasteful energy would be subject to different tax rates.
- The implementation of the imposition of excise duty on motor vehicles in various countries shows the diverse range of applications, depending on the objectives to be achieved, such as reducing emissions, tackling congestion, and to protect the domestic automotive industry.
- Excise on motor vehicle emissions have been implemented in some countries, such as Thailand, South Korea, Singapore, Malaysia, and the Philippines.

In Indonesia, excise should be feasible to be charged to the motor vehicles with the following considerations:

- From the legal aspect, Law 39 of 2007 provides the scope to expand tax objects subject to excise. Article 2 adjusts the characteristics or nature of the goods subject to excise. The reason for the imposition of excise duty on motor vehicles is the need to use the State tax burden for the sake of fairness and balance.
- From the health side, the fuel used in motor vehicles can have a negative impact for the community or the environment. This is consistent with several epidemiological studies that concluded the close relationship between the level of urban air pollution and the incidence (prevalence) of respiratory disease.

- In terms of function, excise is an effective instrument for controlling consumption. In the case of motor vehicles, motor vehicles with the application of excise will have higher prices, so that will give the effect of a decline in demand for such motor vehicles. This would result in decreasing the negative externalities, along with the reduced number of motor vehicles.

4. CO2 Calculation Methods

4.1. Overview

As elaborated in Chapter 2 some countries have applied the determination of the purchase tax or the annual motor vehicle based on CO2 emissions (g/km) or fuel consumption (liters/ km). For example in the UK:

- CO2 emissions for each car model allows consumers to buy cars with a minimum impact on the environment and allows the Government to impose a car tax at different rates for different CO2 levels;
- Some car manufacturers in the UK promote green cars (CO2 emissions below 150 g/km) which can save hundreds of pounds from the annual tax payment. The latest figures show that driving a car with low CO2 emissions can save the cost of tax payments up to £ 400 per year; and
- Information on CO2 emissions of a new car for sale can be obtained from manufacturer's brochures, the V5 form and from websites, but the information is not always completed with adequate explanations on how the CO2 figure is obtained.

In Indonesia, the only fiscal policy which takes into account motor vehicle fuel efficiency relates to cheap car or Low Cost Green Cars (LCGC). LCGC get relief (deletion) of Value Added Tax of Luxury Goods (PPnBM) for gasoline-fueled cars up to 1,200 cc and diesel-fueled cars up to 1,500 cc with one of the requirements being fuel consumption of 1 liter enabling a minimum of 20 kms of travel.

It is important to make the estimates of CO2 as accurate as possible. Emissions of CO2 depend on, and are estimated from the amount of each fuel type used. In this study, CO2 emissions are considered the most suitable basis of for designing fiscal policies related to motor vehicles.

4.2. Measuring CO2 Concentration by Using Gas Analyzers

In Indonesia measurement of exhaust emissions from motor vehicles is carried out by the method of standards for sustainable development (SNI). For diesel-fueled vehicles, the parameter measured is opacity values or levels of smoke density of exhaust gas. While for the gasoline-fueled vehicles, parameters measured are emission of Hydro Carbon (HC) and Carbon Monoxide (CO).

The equipment for measuring HC and CO is a gas analyzer, some of which are able to measure CO2 emissions. CO2 emissions measured by using a gas analyzer are presented in the form of concentration or in units of %.

A complete combustion process of motor vehicle fuel with oxygen will only produce H2O and CO2 with CO2 values of 12% to 16%. However, this condition cannot be achieved because the fuel does not consist purely of C and H elements only, but also the air which is sucked into the engine's combustion process does not only contain pure O2, therefore CO2 values ranging between 12% up to 16%. However, it can be stated that the more perfect the combustion process, the higher concentration of CO2 emissions.

A Carbon Dioxide Analyzer is the most suitable equipment to measure the concentration of CO2 which has the working principle that the ambient air is sucked in

through the inlet and flows out through a plastic tubing pipe into the CO2 Analyzer where the concentration of CO2 gas sample is measured by measuring how much infrared light is absorbed by the gas sample flowing through a multi-cell correlation filled unit on one side of the CO2 cell reference.

It should be noted, at the time of measuring CO2, O2 rate movements should be observed, and if the value of O2 is high (above 3% or more); this shows the possibility of leakage of exhaust. If the exhaust is leaking, then the CO2 value cannot be used as an accurate benchmark of the combustion process.

Values of CO2 concentration (%) which are measured by using a gas analyzer show the level of burning fuel completion (concentration) but cannot indicate the level of efficiency of vehicle fuel consumption (g CO2 / km traveled). In other words, the results of these measurements do not show greenhouse gas emissions resulting from fuel combustion.

4.3. CO2 Data from Vehicle Manufacturers

Information on CO2 emissions from motor vehicle manufacturers is usually included in technical specifications of the vehicle, the information of CO2 amount is based on results obtained in laboratory tests.

The tests are implemented on a moving machine (dynamometer) by performing simulations that replicate various driving conditions. The weakness of this test is that it is difficult to get a driving pattern in the laboratory which fully represents the real conditions on the streets. Laboratory tests ignore the distortions caused for example by wind, rain, surfaces and gradient that occur in the real world.

In some European countries, the government uses CO2 data from vehicle manufacturers to determine the amount of tax to be paid by the public, while the community uses the data to choose the type of vehicle with a level of registration tax and annual tax payments in accordance to their desires / abilities.

4.4. Estimation of CO2 Emissions (g/km) by Formula

4.4.1. The Formula for Estimating CO2 Emissions

CO2 emissions in grams per-km travelled of a motor vehicle or in grams per liter of motor vehicle fuel consumption show the CO2 emission load on a unit basis. Therefore, the more efficient fuel use achieved, the lower the burden of CO2 emissions.

Here CO2 emissions are directly related to the amount of fuel used. In addition, CO2 emissions are influenced by how the vehicle is driven (e.g. speed, acceleration and load on the vehicle), the type of vehicle, type of fuel; and the technology used to control emissions (e.g. catalysts).

The approach to formula estimation of CO2 emissions consists of:

- The top-down method which starts from the data that describes the total amount of pollution activities in all geographic regions studied, such as total sales of fuel or the total length of the road. Spatial distribution (disaggregation) total emissions is done by assuming that the pollutant load is proportional to the variable that has

the same geographical distribution of polluting activities, such as population and length of road per unit area.

- The bottom-up approach which starts from local data units (the smallest available), for example the volume of traffic on the roads. To obtain the total emissions in a geographical area, all individual pollutant loads are added.

The use of both methods is determined by factors such as: the availability of local data; the level of required data quality; usefulness of pollutant load estimates; and others.

The simplest way to estimate the exhaust emissions from motor vehicles is to use fuel-based emission factors; but this is only done if there is not sufficient data for a more complete method.

Formula for estimating CO2 emissions (g/year) of a motor vehicle are as follows:

$$CO2 \text{ emissions} = \sum (CO2 \text{ Emission Factor} \times \text{Intensity of Activity})$$

Where:

- The intensity of activity = fuel consumption (liters/year) or vehicle km travelled (km/year); and
- The emission factors (grams of CO2 per liter or kg of fuel consumed, or grams of CO2 per kilometer traveled).

To calculate the load of pollutants based on the above equation, there are three necessary parameters, namely:

1) The number of motor vehicles operating on the highway;
2) Emission Factors - the mass of pollutants in grams or kilograms per kilogram or per liter of fuel consumed per kilometer travelled of the vehicle. and
3) Vehicle Kilometers Traveled – VKT is the average vehicle miles traveled per period (e.g. per year).

4.4.2. The Number and Types of Vehicles

Emission rates depend on the type of vehicles. The vehicle types defined in this study follow the Ministry of Environment definitions with the category of motor vehicles consisting of the following:

- Motor cycles;
- Passenger Cars (Gasoline fuelled-engines);
- Passenger Cars (Diesel fuelled-engines);
- Buses; and
- Trucks.

4.4.3. Emission Factors

Emission factors are obtained from the measurement of the number of installations which represent a source of pollution, with an assumption that the resulting emissions factors can be applied to all installations from the pollution source.

Emission factors can be classified as follows:

- Fuel Based Emissions Factors that relates to changes in the activity rate, distribution, and the burning of fuel with changes in fuel consumption. For

example, 1 kiloliter of fuel oil combustion in the furnace at the power plant will generate 1.84 kilograms of PM10 emissions or can be stated that emission factors for PM10 of the furnace in a power plant is 1.84 kg/kl;

- Activities based emissions factors that relate to changes in process activities, distribution, and fuel burn with intensity of activities. For example, the combustion of gasoline in a motorcycle engine that moves with an average speed of 40 km/h will emit 0.1 grams of NOx per kilometer traveled or emission factor is 0.1 g/km.

Figure 4.1 summarizes a draft Regulation of the Minister of Environment on Motor Vehicle Emission Factors;

Figure 4.1. CO2 Emission Factors for Road Transport in the IPCC Guidelines

No	gr CO2/kg of Fuel	Petrol	Diesel
1	USA	3,172	3,172
2	Europe	3,180	3,140

Source: *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*

4.4.4. Intensity of Activity

The use of vehicles in aggregate is the average mileage per vehicle multiplied by the total number of vehicles. This simple relationship shows the factors that influence emissions and emphasizes the importance of interactive and integrated policies to reduce emissions.

The type and amount of pollutants emitted from the various categories of vehicles is affected by the level of the use of the vehicle in tons or kilometer kilograms. The intensity of pollution, i.e. the amount of pollutants emitted (in grams of pollutant per unit of activity) is influenced by a variety of variables, including the characteristics of the engine, vehicle technology (or catalytic emission control equipment), fuel characteristics, age and vehicle maintenance, and use of the vehicle (Reynolds and Broderich, 2000).

The vehicle kilometers Traveled - VKT is calculated on all vehicles operated on the road. To determine the average length of the trip, data and statistics that can be used include the Motor Vehicle Testing system (PKB) or the Inspection and Maintenance Private Passenger Car (P & P), which in some countries is based on the following parameters:

- Vehicle category;
- The model and year of manufacture;
- Plate number;
- Identification of the vehicle (especially if the vehicle number plate has changed);
- Date and levels on vehicle inspection (inspection emissions); and
- Odometer readings.

In Indonesia, the odometer readings are not recorded either in the Vehicle Annual Tax Payment system or in the I & M system. Ideally, if the characteristics of the motor vehicle for each category and descriptive models represented in the Annual Tax Payment system or in the Inspection and Maintenance system included the fraction of vehicles that operate on the road for every model and year of manufacture; and the total travel length for each category and model of the vehicle could be obtained.

Figure 4.2. Length of Average Journeys of Motor Vehicles Per-Year

No	Motor Vehicle Type	Km/Year
1	Motor Cycle	8,202
2	Three Wheelers	17,577
3	Passenger Car (Gasoline)	15,000
4	Passenger Car (Diesel)	46,685
5	Bus	73,172
6	Truck	25,805

Source: 2008, Final Report of Academic Paper Volume II

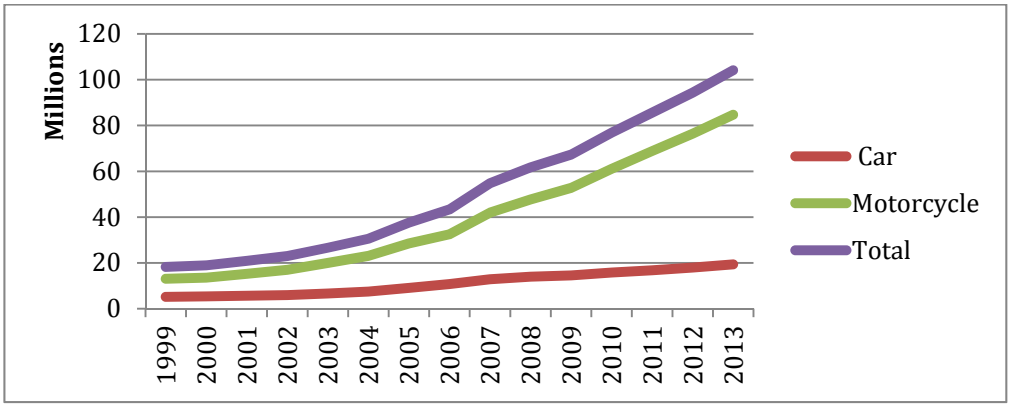
Emissions Factor, Waty Suhadi, Yayasan Swisscontact Indonesia

5. Fiscal Policy Options to Reduce Emissions

5.1. Motorized Vehicles

The number of motorized vehicles in Indonesia has been increasing significantly since the financial crisis in 1998 with motorcycles enjoying the lion's share of the boom. Graph 5.1 shows the number of existing car and motorcycle in Indonesia where during 1999-2013 the number of cars has increase 375 % from 5.1 million to 19.4 million and motorcycles have increased 649 % from 13.1 million to 84.7 million. The middle classes that have experienced increases of income have switched to motorcycles, and to a lesser extent cars; from the poorly managed and performing public transportation options.

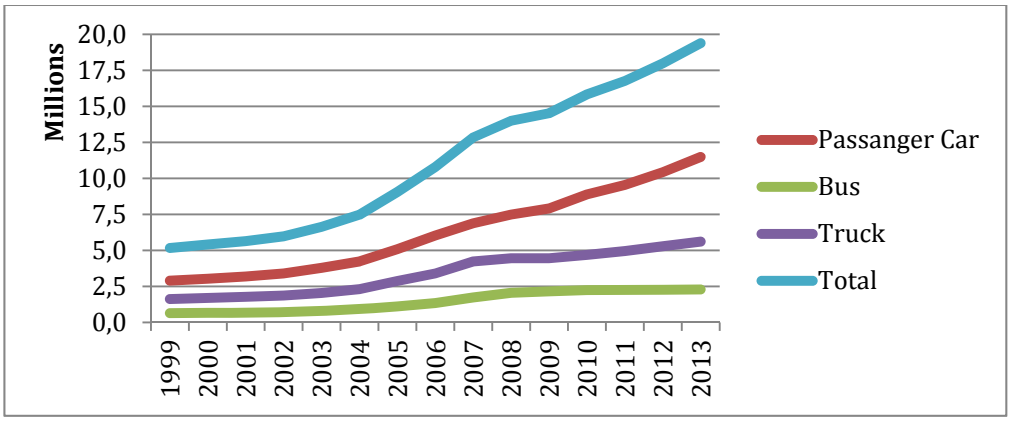
Figure 5.1. Number of Motorized Vehicle 1999 - 2013 (millions of unit)



Source: Indonesia Statistics (BPS)

The 14.3 million additional cars during the period are not spread equally between the categories as shown in Figure 5.2. Passenger car experienced the highest growth with 396 % from 2.9 million to 11.5 million. Buses had the second largest growth with 355 % from 645 thousand units to 2.3 million while trucks had slightly lower growth of 345 % from 1.6 million to 5.6 million. The growth of public transport has been significantly below growth of private and commercial vehicles.

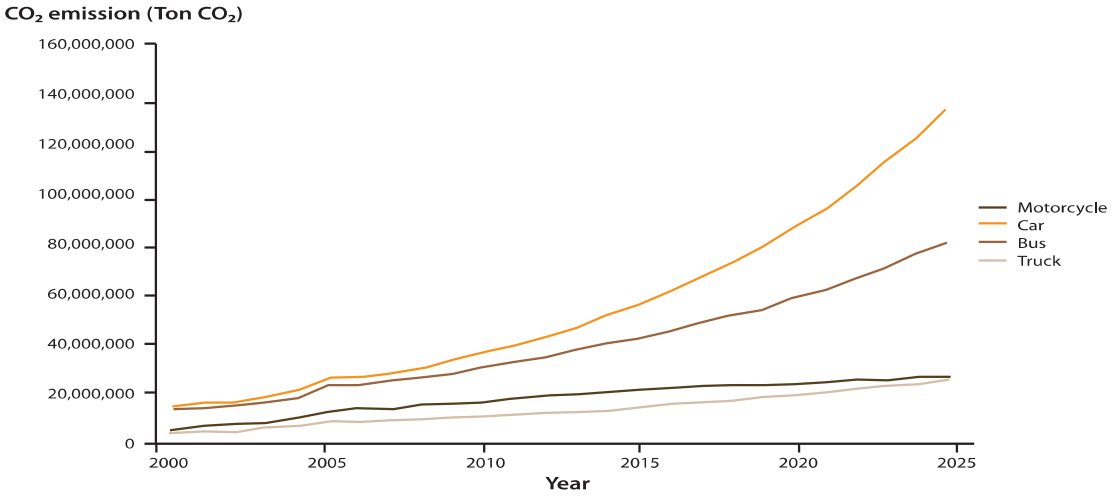
Figure 5.2. Number of Cars by Type, 1999 - 2013 (million units)



Source: Indonesia Statistics (BPS)

A study jointly conducted by the Ministry of Environment and the Agency of Assessment and Application of Technology (BPPT) projected that $C0_2$ emissions from cars will increase about 8 times from 2000 to 2025 touching 140 million ton $C0_2$ annually and become the largest emitter within the motorized vehicle category (Figure 5.3). The study also projected the number of cars in 2025 to reach 30 million units and motorcycles to exceed the 60 million threshold but the emissions from cars is significantly larger than for motorcycles.

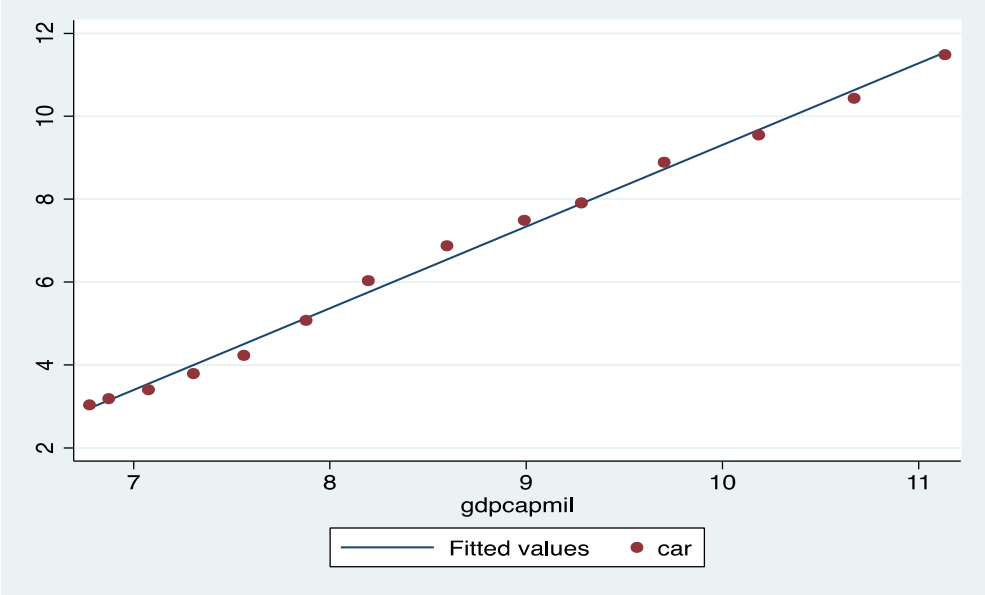
Figure 5.3. Emission from Motorized Vehicle by Category 2000 – 2025



Source: BPPT and MoE (2009)

The relationship between the number of passenger cars (in millions of unit at the Y axis) and GDP per capita (in millions of rupiah at the X-axis) is positive and significant as shown in Figure 5.4. A bivariate OLS regression between the two variables produces a quite strong correlation (adj. R^2= 0.979). The estimations indicate that a 1 % increase in GDP per capita will increase the number of car by 2.75 %

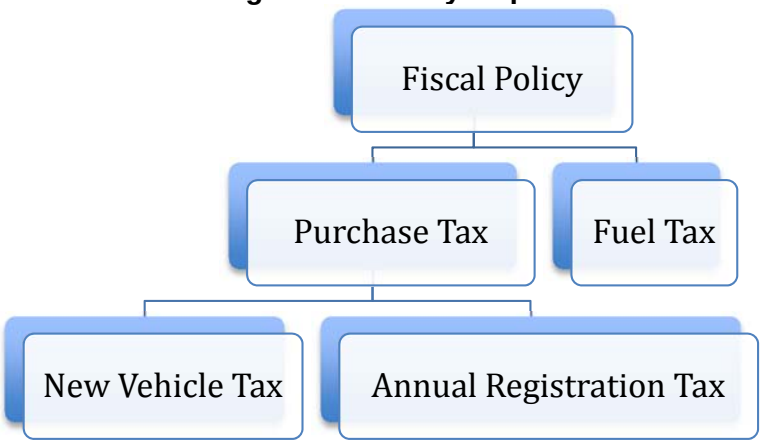
Figure 5.4. Passenger Cars and GDP per Capita, 1999 - 2013 (in million units & million rupiah)



Source: Indonesia Statistics (BPS)

Reduction of per-capita GDP growth is certainly not on the table, so the (limited) goals of this study are to incentivize people to switch to lower emission cars or to public transport. A framework of incentives to reduce emissions is set out in Figure 5.5. These include options of either including an emissions price on vehicles and/or on gasoline. A fuel tax is potentially better since it is exactly correlated with usage. Low emissions cars used in high frequency would produce more emissions in a year than an inefficient car that is used infrequently.

Figure 5.5. Policy Map



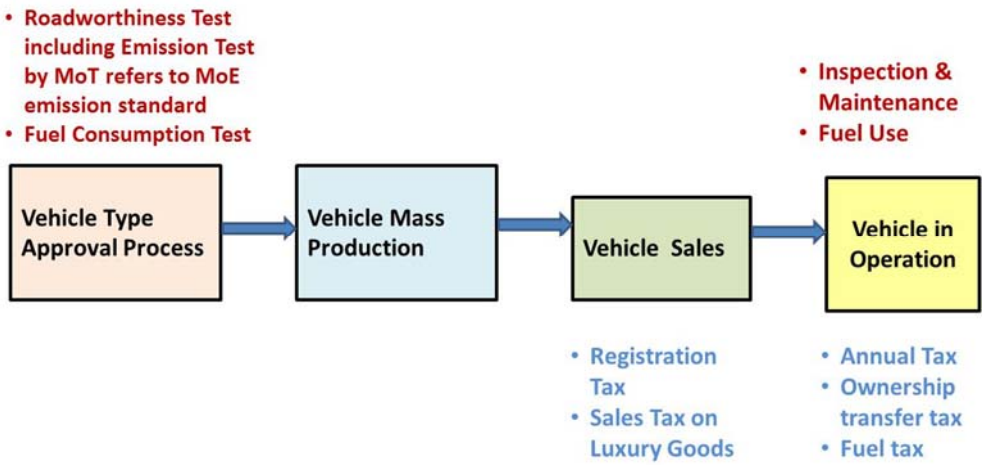
However, the reality of politics of fuel in Indonesia makes taxing of fuel difficult. The Government and Parliament have only recently decided to eliminate fuel subsidies on gasoline while subsidies on diesel remain. While an initial discussion on a possible fuel tax for vehicles is warranted policy reform is likely to be difficult. A carbon tax on fuel, attractive as it is, only appears to be feasible for the future when the political climate has changed.

Therefore, the main politically feasible option in the immediate term is to apply the polluter-pays-principle at either the purchase or on annual usage (or both). The purchase tax is a monetary sum that is paid one time by motorized vehicle owners when they purchase the vehicle. The owner pays an annual tax when they extend the operating license. Theoretically it is possible to put all the cost on the initial one off registration tax but doing that would result in very high vehicle prices that would also have socio-political drawbacks. The optimal policy and best practice around the world (e.g. Europe) would be to spread the cost at the two posts.

Furthermore there is a question of whether policy should only have a disincentive scheme for vehicle owners, with higher emitters needing to pay more, or whether there also should be an incentive scheme for low-emitters. While it is fairer to subsidize efficient and/or technologically advanced vehicles such as hybrids, electric or fuel cell vehicles, the challenges to the fiscal system are also greater.

The options for reform based on lifetime taxation arrangements for vehicles are further set out in Figure 5.6.

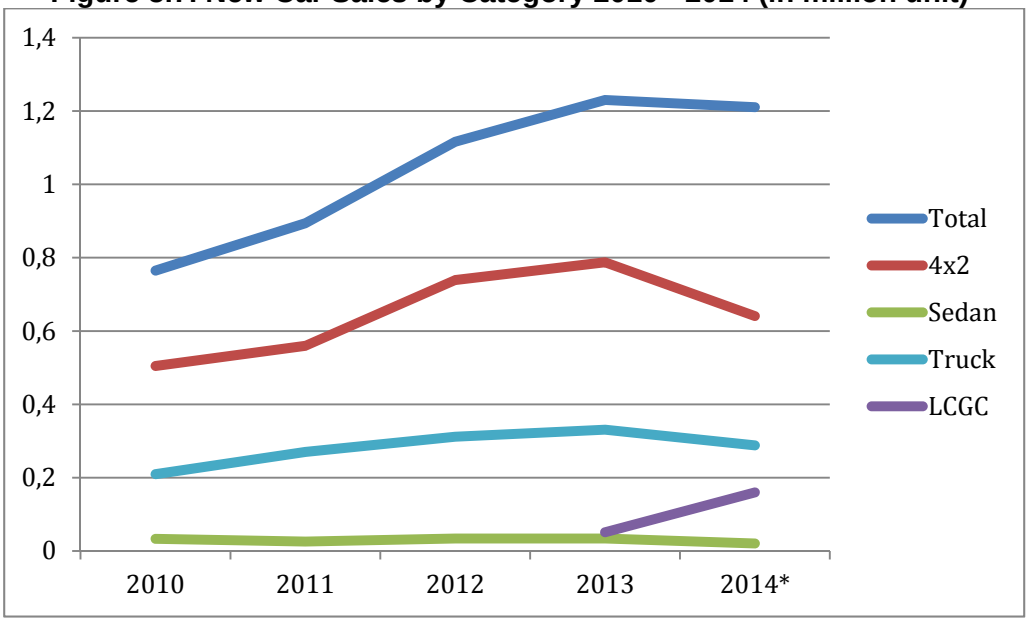
Figure 5.6. Vehicle Life Cycle



5.2. New Cars

New car sales have been experiencing very rapid growth. Figure 5-7 shows that total annual car sales increased 60.1 % from 764 thousand in 2010 to 1.23 million in 2014. The data for December has not available yet, but sales in that month just need to reach 20 thousands to break the 2013 record number.

Figure 5.7. New Car Sales by Category 2010 - 2014 (in million unit)



Source: GAIKINDO (Association of Indonesia Motorized Vehicle Producer)
Note: 2014 data only until November

The bulk of car sales were of the 4x2 type, a wide and versatile category of car that can accommodate 7 or more passengers that can be converted to carry large volumes of loads – although they are not fuel efficient and generate higher emissions. From 2010 to 2013, the type 4x2 made up 64.7 % of total car sales. However in 2014, the proportion dropped to 52.9 %. One of the likely reasons is a significant consumer switch to Low Cost Green Cars (LCGC) types that managed to reach 13.2 % of total

sales in the first eleven months of 2014 with its appealing price and characteristics. Sedans only made up 3.3 % of total sales in the same period.

Unpublished data provided by GAIKINDO (Association of Indonesia Automotive Industries) sets out the number of car sold in 2013 for 91 car types combined with publicly available data on car prices in Indonesia; and car emissions from the Vehicle Certification Agency of the UK Government (http://carfueldata.dft.gov.uk) enabled multivariable regression analysis with OLS (Ordinary Least Square) method in Strata software with results on the determinants of new car demand presented in Table 5.1.

Table 5.1. Regressions Results on Determinant of New Car Demand

Variables	Coefficient	P Significance
Price	-.8429***	0.003
Emission	.0009	0.852
D_famcar	1.6441***	0.001
D_smallcar	1.9294***	0.000
D_europe	- 1. 2740***	0.021
_cons	-0.0044***	0.012
Prob > F	0.000	
F.Stat	30.86	
Adj R-squared	0.6239	

Note: *** denote variables whose coefficient has 1 % significance or more while one and two stars denote variables with 10 % and 5 % significance respectively

The results provide strong explanation (62.39 %), despite only utilizing one-year of data and employing five independent variables. The correlation results show that Indonesians prefer their cars to be inexpensive (which typically means non- European vehicles as these are generally more expensive than similar Indonesian / Regional types). A one percent increase in price will decrease sales by 0.83 %) which applies to vehicles with more than 5 passengers and/or vehicles with engines smaller than 1,600 cc. However, the results do not indicate much consumer concern with emissions at current fiscal settings.

Then we conducted a simulation to see what would happen to car sales and government revenue if the tax rate were changed from that contained in Government Regulation 22/2014 that uses engine sizes as the basis (Table 3.1) towards a system that is directly linked to CO_2 emissions as presented in Table 5.2, with a sliding scale for new purchases from 5% at low emissions per kilometer to 40% at high emissions. Static simulation results indicated that with a C02-based tax rate, total emissions would be reduced by 37.1 % and total car sales would decline 26.5 % (particularly in the high emissions categories) but government revenue would increase by 10.1 %. Among the highlights of results, Toyota Prius would experience the highest increase by 645 times and Toyota Rush would experience the largest decline by 85.1 %.

Table 5.2. Tax Rates Used in Simulation

CO2 Emission (g/km)	New Car Tax Rate
0-100	5 %
100-150	15 %
150-200	25 %
200-250	35 %
>250	40 %

5.3. Used Cars

5.3.1. Annual Motorized Vehicle Tax

Beside the one-time Central Government sales tax described in section 5.3, there is also the annual motorized vehicle tax (*Pajak Kendaraan Bermotor* or PKB) for cars on the road which is collected and received by Provincial Governments. There is no direct consideration for CO_2 emissions in the local tax rate of used cars. Only changing the initial purchase sales tax without altering the annual PKB could lead to substitution where people would buy 1-2 year old cars instead of new cars. The annual tax rates at present are determined as a percentage of car prices and are set by local governments independently.

The annual amounts collected are quite significant. In Jakarta, the motorized vehicle tax brought in 5.1 trillion rupiah or 15.7 % of all local tax income in the 2014 budget. In East Java Province, this tax was even more significant bringing in 4.3 trillion rupiah or 37.2 % of all local revenue.

Jakarta and East Java have also initiated a progressive tax arrangement whereby the rate increases along with the number of cars registered under the same name and address (see Table 5.3).

Table 5.3. Existing Car Tax Rate in Jakarta & East Java

No	Item	Jakarta	East Java
1	Tax on first car	2 %	1.5 %
2	Tax on second car	4 %	2 %
3	Tax on third car	6 %	2.5 %
4	Tax on fourth car onward	10 %	3.5 %

The application of this progressive tax based on motorized vehicle ownership has been implemented through coordination between the Revenue Office and the Agency for Population and Civil Registration which has complete and accurate demographic data such as ID cards and Family Card (KK). However, the system is fairly easily and commonly avoided by registering the car under a different name (or even in a different Province with lower rates). To avoid a race to the bottom and avoidance of PKB by using other people's names and addresses in neighboring and lower tax rate Provinces, good coordination and policy convergence is imperative. The Central Government could provide guidelines on lower-upper bands of PKB to thwart avoidance problem.

To consider what would happen to tax payers and government revenue if tax rates were higher or lower than the existing PKB towards a system that were directly linked to CO_2 emissions (g/Km), two possible options are presented in Table 5.4. These options provide an alternative to the existing scheme for the annual car tax for the first

car owned (the second, third and so on cars could still follow existing multiplication factors for multiple car owners).

CO2 emissions (g/Km) of used cars are assumed to be same as with new condition cars. However, we were unable to get registration and tax receipt data by car type from Jakarta and East Java Provinces that prevented us from conducting a full simulation with the two options. It is likely that higher annual rates based on emissions would also reduce sales of high emission vehicle; reduce total emissions while raising Government revenues.

Table 5.4. Options for Reformed Local Tax Rate in Jakarta for First Car

CO_2 Emission (g/km)	Annual Car Tax Rate (High)	Annual Car Tax Rate (Low)
0-100	1.5 %	1.5
100-150	2 %	1.75 %
150-200	2.5 %	2 %
200-250	3 %	2.25 %
>250	3.5 %	2.5 %

5.3.2. Initial Discussion on a Motorized Vehicle Fuel Tax

One of the fiscal policy options that could be elaborated to encourage people to operate in more fuel-efficient vehicles or in other words with low CO2 emissions is to impose a fuel tax on based on CO2 emissions of different vehicles.

Table 5.5. Options for a Fuel Tax Rate Based On CO2 Emissions (g/km)

CO_2 Emissions (g/km)	Addition or Reduction to the Applicable Fuel Tax Rate
0-100	- 2.0 %
100-150	- 1.5 %
150-200	+ 1.5 %
200-250	+ 2.0 %
>250	+ 3.0 %

When a car is registered, it could be categorized based on CO2 emissions (g/km) stated in the technical specifications. This policy could be linked with the government's program of utilizing RFID technology (Radio Frequency Identification) as a tool to assess and control the price of fuel that is supplied in motor vehicles in Indonesia at low cost.

The existing RFID Tag has functions as follows:

- Recording the identity of the vehicle;
- Recognizing the identity of the vehicle, both official and personal vehicles;
- Authorizing the system for vehicle refueling; and
- As a tool that must be used on all vehicles which will refuel.

For applying a vehicle fuel tax based on CO2 emissions, some adjustment should be made to the existing RFID Tag and vehicle data recorded in the Revenue Office System.

However, we were unable to get registration and tax receipt data by car type from Jakarta and East Java Provinces that prevented us from conducting a simulation with the option of fuel tax rate adjustments.

The administrative complexities and possibly costs of such a scheme may be difficult to implement with no known precedents elsewhere in the world to refer to. Providing rates were significantly progressive with high imposts for vehicles with high fuel emissions the effects on vehicle choices, CO2 emissions and local government revenues could all be expected to be significant.

5.4. Gas Conversion

Conversion of vehicles to gas has a long history in Indonesia. The first study was conducted by Ministry of Transportation in 1980 and the first prototype was launched in 1988 in Jakarta. Bandung, Surabaya, Bogor and Palembang followed suit later.

However, up until 2010 there were only 14 gas supply stations and 5,262 gas powered cars in Indonesia which is much lower than Malaysia with 170 gas stations and 51.3 thousand converted vehicles. (Hartanto 2010). Until now the growth of gas powered vehicles in Indonesia has mostly been with public buses. Jakarta has a local regulation (Perda 2/2005) targeting 350 gas powered buses by the end of 2015.

A 2011 study by the National Academy of Sciences (LIPI) estimated that a succesful 5 % conversion rate to gas powered vehicles would save 1.76 kilolitres of gasoline annually. The study also found that the main obstacles of gas conversion adoption are availability of gas supply/pumps, converter kits and effective monitoring and evaluation of the program.

Recent discussions with the General Secretary of GAIKINDO stated that the major car brands would not produce out of factory gas powered vehicles thus meaning there is no provision of a factory guarantee. However, GAIKINDO would cooperate with certified car repair stations on providing specifications and knowledge sharing on gas conversion. Therefore, lowering annual local tax rates for cars with gas conversion kit is a more suitable policy which is adopted in many European countries including the United Kingdom.

Current tax exemptions for low cost green vehicles should also be extended to hybrid (LNG / LPG) fuelled vehicles many of whom currently pay at the 40 per cent rate.

5.5. Broader Policy Considerations

As well as strictly fiscal policy measures there are broader policy considerations (a number of which will have some fiscal implications) that will also be important in attaining reduced motor vehicle emissions with a comprehensive package of approaches likely to be needed. Other broader considerations for a comprehensive reform package are covered briefly below.

5.5.1 Strengthening Mandatory Labelling of Vehicle Standards / Performance

There is need for strengthening mandatory labelling on the energy efficiency / GHG emissions levels of vehicles. The Ministry of Transport should consider making the labelling of the energy/CO_2 performance of vehicles obligatory either by revisions to PP 55 of 2012 or by new Regulation. Strong standards would ensure that consumers can effectively respond to price signals created by a reformed vehicle taxation regime. Sanctions and fiscal penalties could assist to enforce mandatory labelling over time.

5.5.2 Improving the Quality of Fuels

Introduction of stronger vehicle standards will require a reduction in the sulphur content of fuel which is very high by international standards. Average sulphur content of 3,500ppm for diesel and 500ppm for gasoline needs to be addressed. High sulphur levels slow the adoption of major pollution control technologies such as particulate filters and improved more efficient engine designs. Sanctions and fiscal penalties could be imposed to enforce significant reductions in sulphur content over time.

5.5.3 Providing Financing Mechanisms for Upgrading Bus / Vehicle Fleets

Fleet upgrading to take advantage of improved fuel efficiencies / CO2 intensities (e.g. change to CNG) requires availability of adequate financing which is not always readily available for transport corporates in Indonesia. The Government / MOF is considering implementation of a special financing facility to assist promoting energy efficiency. Should a new energy efficiency financing facility be established then the transport sector should be eligible for access this to assist in improving fuel efficiency and CO2 emissions reductions.

5.5.4 Need for Related Programs to Improve Traffic Control / Management and Access to Public Transport

Improved traffic control management to reduce congestion is important for reducing emissions and can be supported by local fiscal measures (e.g. traffic controls, parking management, congestion charging; and road charging). Improved public transport systems will also be important for facilitating the shift from private to public vehicles so reducing congestion, fuel usage and CO2 emissions. Savings from fuel subsidy removal and possible carbon pricing of fuel, along with more efficient systems for taxing vehicle sales and registrations could assist in meeting the costs of better traffic management and enhanced public transport services

5.5.5 The Need for Major Public Awareness Campaigns

While all the fiscal and non-fiscal proposals in this Report can provide appropriate price; economic and other signals to reduce vehicle emissions there will also be a need for related major public awareness campaigns to change public and corporate behavior. Such campaigns will require the support of public funding.

6. Conclusions and Recommendations

6.1. Conclusions

Increasing prosperity and economic growth increase the demand for motorized vehicles that leads to traffic jams and pollution in most major cities in Indonesia. Such conditions have been aggravated by the easy processes and requirements for buying motor cycles and / or cars (e.g. through credit installments; and lowly priced green cars); inefficient public transportation systems which create longer travel times and distance; and finally subsidized fuel has been the norm for long periods, at least up until late 2014, and still remains in some forms.

Without any international supports, Indonesia has declared intention to cut GHG emissions by 26 % by 2020 compared to business as usual. Specifically the Government plans to reduce 36% of the total targeted 26% from the energy and transport sectors alone. The private car is an increasing source of emissions. The current vehicle tax scheme (national sales tax and local annual taxes) do not have provisions that directly link tax rates with CO_2 emissions.

Unpublished data from Association of Indonesia Automotive Industries (GAIKINDO) enabled us to conduct a multivariate regression to determine factors affecting car-buying decisions. Indonesians prefer their cars to be inexpensive (which also typically means they are not European as it is typically more expensive for similar types) and which either contain more than 5 passengers and/or are equipped with engines smaller than 1600 cc. There is no concern about emissions amongst Indonesian consumers of policy makers at present.

Best international practice shows that fiscal policies (taxes and subsidies) that have a direct linkage with C02 emissions result in use of lower emission cars and lower overall emissions. The United Kingdom scheme is disincentive-only while the French system also has subsidy for low emission cars. The current Indonesian fiscal system is more suitable for adopting a UK type system due to its simplicity and lack of complication, being based on disincentive without giving out subsidies to individual car owners. Static simulation results showed that with C02-base tax rate for new cars, total emissions would be reduced by 37.1 %; while total car sales would decline by 26.5 %; but government revenue would increase by 10.1 %.

To reduce substitution with used cars reform of the annual renewal car tax (organized by Local Governments) is also imperative. Lack of data prevented the conduct of a detailed simulation but we it is likely there are tax rates that will reduce emissions while increasing government revenue. Coordination and convergence between local governments and the Central Government regarding vehicle annual taxes (PKB) is necessary to avoid a race to the bottom through competing regions. Lower initial purchase and annual taxes could also be used as Incentives to speed up gas conversion in addition to increasing and ensuring supply of conversion kits, gas stations; and supply of gas itself.

The adjustment of the fuel tax for cars based on CO2 emissions could be one important option for reducing fuel consumption though there has been long political aversion to removing fuel subsidies so movement to a regime where fuel is taxed in line with CO2 emissions will be politically difficult. There will also be administrative challenges to introducing such arrangements.

GAIKINDO has requested at least a two year adjustment period to finish their current stock and to introduce models with lower emissions that could lead to higher car sales

than simulation results in the future. GAIKINDO also suggests improving and increasing the capacity of vehicle test facilities to avoid bottlenecks. Major car brands are not likely to produce out of factory gas powered vehicles, thus such vehicles have no factory guarantee. However, GAIKINDO would cooperate with certified car repair stations providing specifications and knowledge sharing. Therefore, lowering purchase and annual taxes for cars converted to gas is the more suitable policy.

6.2. Recommendations

6.2.1. Some Required Fiscal Policy Adjustments

To assist control motor vehicles emissions fiscal policies need reform as follows:

- Fiscal policies applying to new cars (Car Registration Tax) under Government Regulation 22 of 2014 (as amended from Government Regulation 41 of 2013 needs to be reformed in terms of the tax base and rate being based in future directly on CO2 emissions;
- Fiscal policies for used cars (Vehicle Annual Tax or PKB, and a possible Motorized Vehicle Fuel Tax) require reform to Law 28 of 2009 regarding Local Government Taxes and Retributions. This should be followed by adjustments of Local Government Regulations in term of PKB and over time a Motorized Vehicle Fuel Tax; and
- A requirement for additional data in the Vehicle Registration Certificate (STNK) which provides for vehicle categories based on CO2 emissions or based on CO2 emissions being subject to mandatory vehicle labeling.

Such proposed reforms should be done through stakeholder participation and a series of public awareness campaigns.

6.2.2. The Role of Central Government

The Coordinating Ministry for Economic Affairs should take a lead role in coordinating among Ministries / Institutions to support the reform of policies for motor vehicles exhaust emissions reductions. The role of others Ministries would be:

- **The Ministry of Environment**
  - Development of national regulations, policies and standards to control air pollution from motor vehicles;
  - Monitoring, supervision, evaluation and documentation (reporting) the implementation of regulations and policies on air pollution control from motor vehicles;
  - Conducting capacity building of local governments to control air pollution from motor vehicles;
  - Improving mechanisms for oversight and control of air pollution from motor vehicles; and
  - Increasing the role of public/stakeholders in reducing exhaust emissions from motor vehicles.
- **The Ministry of Energy and Mineral Resources** should provide for mandatory low sulfur content fuels and environmentally friendly alternative fuels.

- **The Ministry of Industry** should encourage an environmentally friendly motor vehicle industry and supports the improvement of car workshops and technicians in reducing exhaust emissions from motor vehicles.
- **The Ministry of Trade** should tighten the import of higher emission motor vehicles with the aim of supporting reduced air pollution from motor vehicles.
- **The Ministry of Finance** should develop incentive and disincentive policies to encourage people to choose low emissions cars and to support compliance with the emissions standards.

6.2.3. The Role of Local Government

- Develop and implement a Local Regulation on emissions standards for motor vehicles at the same level or more stringent than the Central Government.
- Develop and implement a Local Regulation on Motor Vehicles Inspection and Maintenance requirements.
- Revise the existing Local Regulations on motor vehicle annual taxes by applying incentives and disincentives to ensure compliance to emissions standards.
- Conduct monitoring and reporting of the compliance of motor vehicles exhaust emissions standards.

6.2.4. Policies to Support Gas-powered Cars

The success of the transformation of gasoline/diesel-powered cars to gas-powered cars depends on:

- Government policies to revoke gasoline/diesel fuel subsidies (and over time considering vehicle fuel taxes) so that the gas becomes economically attractive;
- The availability of gas refueling stations with quality gas supplies that meet requirements;
- Government policies on the subsidy of converter kit purchases and retrofit processes;
- The readiness of gas-powered car maintenance workshops; and
- The reduction of gas-fueled vehicles registration and annual taxes.

6.2.5. The Need for other Broader Policy Reforms

Fiscal policy reforms alone will not be enough to address issues of motor vehicle emissions. Other broader reforms (some of which have fiscal policy implications) that will require close consideration are: (i) strengthening mandatory labelling of vehicle standards / performance; (ii) improving the quality of fuels; (iii) providing financing mechanisms for upgrading bus / vehicle fleets; (iv) pursuit of related programs to improve traffic control / management and access to public transport; and (v) there will be a need for related major public awareness campaigns.

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