



Republic of Indonesia

Indonesia Climate Change Sectoral Roadmap ICCSR



Summary Report
Transportation Sector

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Indonesia Climate Change Sectoral Roadmap – ICCSR

Summary Report: Transportation Sector

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The Indonesia Climate Change Sectoral Roadmap (ICCSR) is meant to provide inputs for the next five year Medium-term Development Plan (RPJM) 2010-2014, and also for the subsequent RPJMN until 2030, laying particular emphasis on the challenges emerging in the forestry, energy, industry, agriculture, transportation, coastal area, water, waste and health sectors. It is Bappenas' policy to address these challenges and opportunities through effective development planning and coordination of the work of all line ministries, departments and agencies of the Government of Indonesia (GoI). It is a dynamic document and it will be improved based on the needs and challenges to cope with climate change in the future. Changes and adjustments to this document would be carried out through participative consultation among stakeholders.

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Remarks from Minister of National Development Planning/ Head of Bappenas



We have seen that with its far reaching impact on the world's ecosystems as well as human security and development, climate change has emerged as one of the most intensely critical issues that deserve the attention of the world's policy makers. The main theme is to avoid an increase in global average temperature that exceeds 2°C, i.e. to reduce annual worldwide emissions more than half from the present level in 2050. We believe that this effort of course requires concerted international response – collective actions to address potential conflicting national and international policy initiatives. As the world economy is now facing a recovery and developing countries are struggling to fulfill basic needs for their population, climate change exposes the world population to exacerbated life. It is necessary, therefore, to incorporate measures to address climate change as a core concern and mainstream in sustainable development policy agenda.

We are aware that climate change has been researched and discussed the world over. Solutions have been proffered, programs funded and partnerships embraced. Despite this, carbon emissions continue to increase in both developed and developing countries. Due to its geographical location, Indonesia's vulnerability to climate change cannot be underplayed. We stand to experience significant losses. We will face – indeed we are seeing the impact of some these issues right now- prolonged droughts, flooding and increased frequency of extreme weather events. Our rich biodiversity is at risk as well.

Those who would seek to silence debate on this issue or delay in engagement to solve it are now marginalized to the edges of what science would tell us. Decades of research, analysis and emerging environmental evidence tell us that far from being merely just an environmental issue, climate change will touch every aspect of our life as a nation and as individuals.

Regrettably, we cannot prevent or escape some negative impacts of climate change. We and in particular the developed world, have been warming the world for too long. We have to prepare therefore to adapt to the changes we will face and also ready, with our full energy, to mitigate against further change. We have ratified the Kyoto Protocol early and guided and contributed to world debate, through hosting the 13th Convention of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), which generated the Bali Action Plan in 2007. Most recently, we have turned our attention to our biggest challenge yet, that of delivering on our President's promise to reduce carbon emissions by 26% by 2020. Real action is urgent. But before action, we need to come up with careful analysis, strategic planning and priority setting.

I am delighted therefore to deliver *Indonesia Climate Change Sectoral Roadmap*, or I call it ICCSR,

with the aim at mainstreaming climate change into our national medium-term development plan.

The ICCSR outlines our strategic vision that places particular emphasis on the challenges emerging in the forestry, energy, industry, transport, agriculture, coastal areas, water, waste and health sectors. The content of the roadmap has been formulated through a rigorous analysis. We have undertaken vulnerability assessments, prioritized actions including capacity-building and response strategies, completed by associated financial assessments and sought to develop a coherent plan that could be supported by line Ministries and relevant strategic partners and donors.

I launched ICCSR to you and I invite for your commitment support and partnership in joining us in realising priorities for climate-resilient sustainable development while protecting our population from further vulnerability.

Minister for National Development Planning/
Head of National Development Planning Agency



Prof. Armida S. Alisjahbana

Remarks from Deputy Minister for Natural Resources and Environment, Bappenas



To be a part of the solution to global climate change, the government of Indonesia has endorsed a commitment to reduce the country's GHG emission by 26%, within ten years and with national resources, benchmarked to the emission level from a business as usual and, up to 41% emission reductions can be achieved with international support to our mitigation efforts. The top two sectors that contribute to the country's emissions are forestry and energy sector, mainly emissions from deforestation and by power plants, which is in part due to the fuel used, i.e., oil and coal, and part of our high energy intensity.

With a unique set of geographical location, among countries on the Earth we are at most vulnerable to the negative impacts of climate change. Measures are needed to protect our people from the adverse effect of sea level rise, flood, greater variability of rainfall, and other predicted impacts. Unless adaptive measures are taken, prediction tells us that a large fraction of Indonesia could experience freshwater scarcity, declining crop yields, and vanishing habitats for coastal communities and ecosystem.

National actions are needed both to mitigate the global climate change and to identify climate change adaptation measures. This is the ultimate objective of the *Indonesia Climate Change Sectoral Roadmap*, ICCSR. A set of highest priorities of the actions are to be integrated into our system of national development planning. We have therefore been working to build national consensus and understanding of climate change response options. The *Indonesia Climate Change Sectoral Roadmap* (ICCSR) represents our long-term commitment to emission reduction and adaptation measures and it shows our ongoing, inovative climate mitigation and adaptation programs for the decades to come.

Deputy Minister for Natural Resources and Environment
National Development Planning Agency

A handwritten signature in black ink, appearing to read 'Hayati'.

U. Hayati Triastuti

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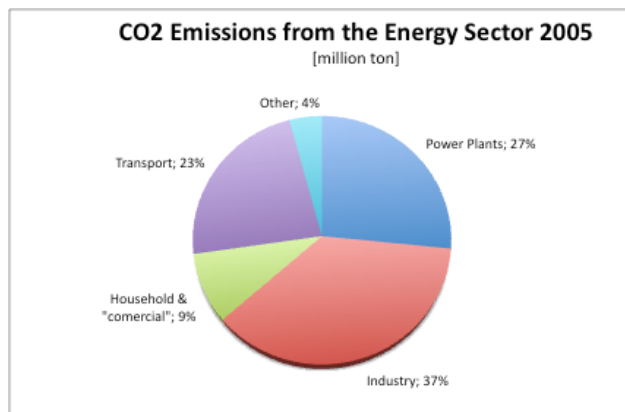
Summary Report

Climate Change Roadmap Transport Sector

1 MITIGATION IN THE TRANSPORTATION SECTOR

1.1 Emission Status

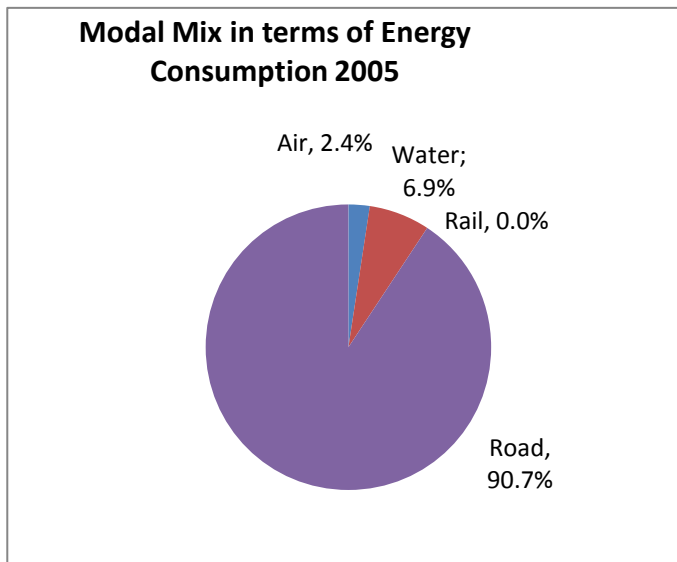
Transport is a major source of greenhouse gas (GHG) emissions in Indonesia. In 2005, it contributed 23% of the total CO₂ emissions from the energy sector or 20.7% percent of the country's overall CO₂ emissions. The sector generates annual emissions of about 68 million tons of CO₂ equivalents, representing 23% of the total energy sector CO₂ emissions in 2005. This was the third largest contribution to energy-sector emissions, eclipsed only by emissions from industrial sources and power plants.



Source: Indonesian National Greenhouse Gas Inventory under the UNFCCC, "Enabling activities for the preparation of Indonesia's Second National

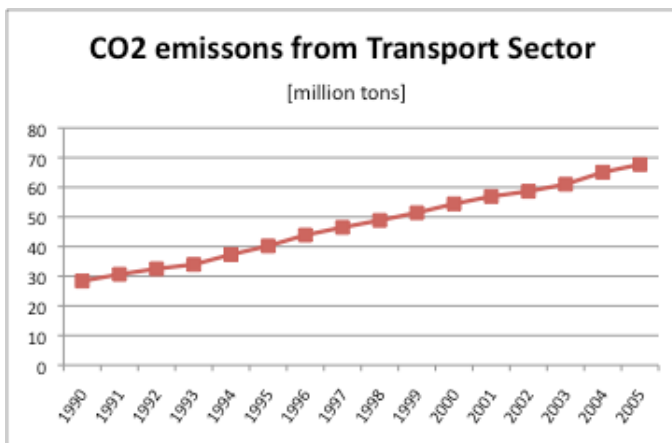
Besides being a major source of greenhouse gas (GHG) emissions, the transportation sector is also the biggest

contributor to air pollution, especially in urban areas where motor vehicle usage is concentrated. Emissions of local pollutants from road transport have been growing at an average annual rate of 8-12%. Based on the Ministry of Environment's research in 2005, in Java's big cities (including Jakarta, Bandung, Semarang, and Surabaya), motorized road vehicles are the major source of air pollution. They contributed almost 99% of local pollutants in Jakarta, including about 73% of NO_x and 89% of HC gas emissions. Since reduction of motor vehicles' fuel consumptions would simultaneously reduce emissions of CO₂ and local pollutants, mitigating GHG emissions has major co-benefits for urban dwellers.



Road transport represents around 90% of CO₂ emissions from the transport sector. This is by far the single biggest source of CO₂. The other transport sub-sectors have significantly smaller contributions, as summarized in the following diagrams.

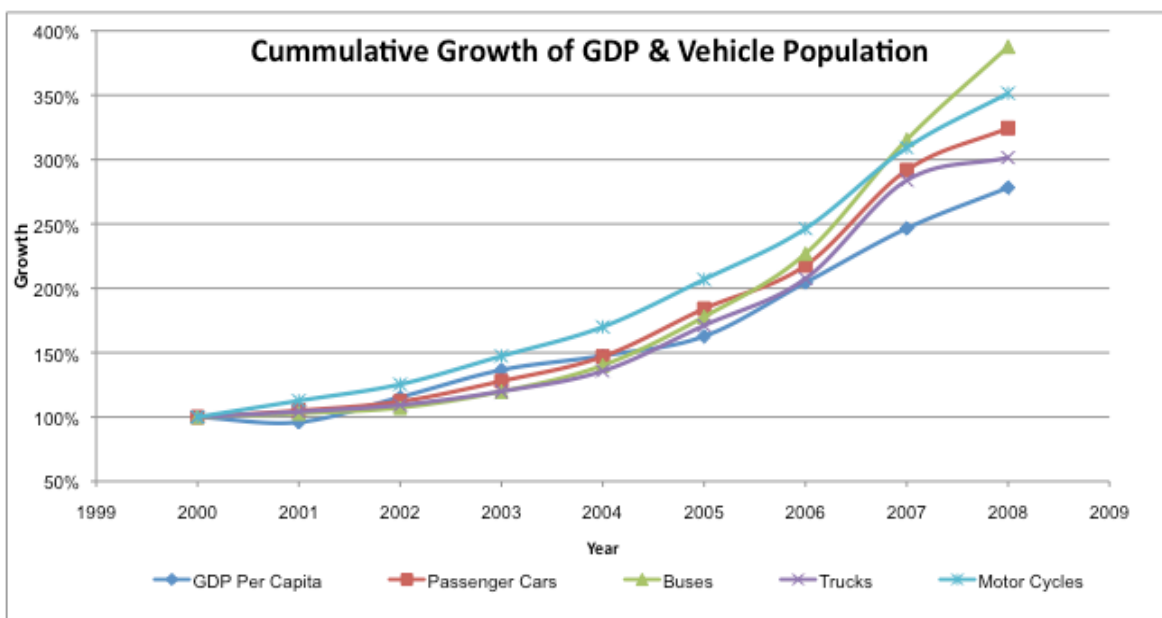
Source: “Why Have CO₂ Increased in the Transport Sector in Asia? Underlying Factors and Policy Options”, Policy Research Working Paper, The World Bank Development Research Group Environment and Energy Team, September 2009



The fuel sales data show that transport-related CO₂ emissions have been steadily increasing, climbing from about 40 million tons in 1995 to over 54 million tons in 2000 and to around 68 million tons in 2005.

Source: Handbook *Statistik Ekonomi Energi* 2006, Ministry of Energy and Mineral Resources

A closer look at the vehicle population confirms the increasing trend of CO₂ emissions in past years, a trend that grew at faster rates than Indonesia’s GDP. After the stagnant years of 1997-2001, Indonesia’s GDP per Capita grew from \$748 in 2001 to \$2,170 in 2008, meanwhile each cohort of the vehicle population grew by more than tripled in size. (See the following diagram.)



Source: GDP data from World Resources Institute (<http://www.wri.org>), and Vehicle Population data from Statistik Indonesia 2009, BPS

If there is no intervention to stem the growth in vehicle ownership, the country’s vehicle population will grow at an accelerated rate. With GDP projected by various international organizations to grow at a rate of 4.5% or more annually, Indonesia’s vehicle population is expected to expand at a rate that is faster than GDP. This is attributable to various factors including the high elasticity of vehicle ownership for individuals at lower income levels (GDP per Capita lower than \$20,000) and the deterioration of the public transport sector. The slow expansion of road infrastructure (that has currently been at 1.0% in urban areas and 5.1% in outer-urban areas¹) was thought to be one of the few factors that could restrain the vehicle population growth. However, the increase of vehicle ownership in Jakarta (currently at 250 passenger cars per 1000 people, during a period when GDP per Capita is around \$4000/person) contradicts this assumption, despite widespread exposure to traffic congestion. The following diagram shows one forecast of vehicle population through 2025 and 2035.

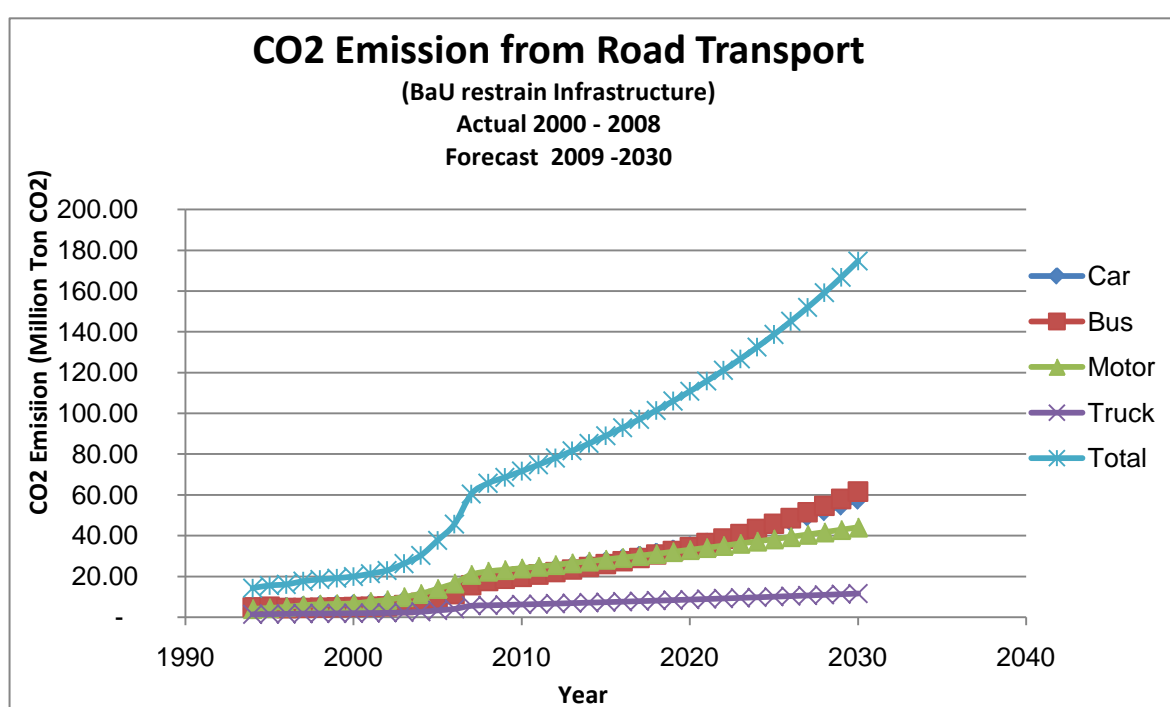


Note:
 2-W = 2-wheeler (motorcycle, etc.); 3-W = 3-wheeler (tricycle, etc.); HCV = heavy-duty commercial vehicle; LCV = light-duty commercial vehicle; SUV = sport utility vehicle.

Source: ADB 2006 in “Energy Efficiency and Climate Change Considerations for On-road Transport in Asia”

¹ Analysis data from Ministry of Public Works data

If one assumes that there is no change in the transport demand pattern (e.g. due to expansions of land conversion along a pattern comparable to the current one), similar travel behavior (e.g. no reduction in vehicle-kilometers travelled, no modal shift due to the continuing deterioration of public transport and no Transport Demand Management(TDM) measures) as well as no improvements in vehicle fuel economy, then vehicle fuel consumption, and the associated CO₂ emissions from road transport will increase significantly. The expected increase is illustrated in the following diagram.



1.2 Mitigation Potentials

There are three primary strategy available to reduce greenhouse gas emissions in the transport sector. These are: **Avoid** (i.e. avoid or reduce travel or the need to travel); **Shift** (i.e. shift to more environmentally friendly modes); and **Improve** (i.e. improve the energy efficiency of transport modes and vehicle technology).

1. **Avoiding or reducing the distance travelled** through careful land-use planning allows Indonesians to maintain their personal mobility while reducing the vehicle-

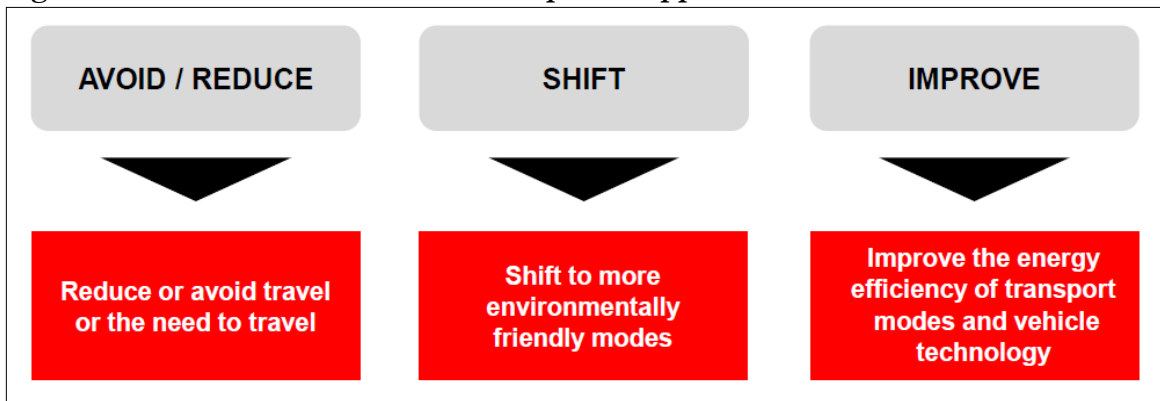
kilometers travelled. This notion of mobility is defined as the possibility to achieve different human activities such as business, work, purchase, leisure and other social and cultural activities. Integrated, dense structures of housing, working and shopping facilities and places for leisure allow people to practice their activities without experiencing long transport distances. A transit-orientated pattern of development further increases the density along a highly efficient public transport. As a result of sustainable transport measures already implemented, an individual may take a decision not to travel for certain trips or to reduce the distances traveled. The number of travels and the total daily trip length can be reduced in this way due to mixed land use, and shorter distances to trip destinations.

2. **The modal Shift** strategy aims to satisfying each citizen's remaining transport needs using the most environmentally friendly transport modes possible. The different transport modes – walking, cycling, riding in busses, trains, or ships and driving cars – have different environmental impacts. Strategies to encourage modal shifts can result in a higher proportion of trips being made by walking or cycling. These non-motorized modes have the lowest impact on the environment, followed by riding in buses or trains, while driving cars has the heaviest impacts.

A secondary objective is to shift as many trips as possible to public transport vehicles, such as buses or rail. Although there are CO₂ emissions associated with both bus and rail trips, the high occupancy levels in these modes means the emissions of greenhouse gases per passenger-km is reduced by a factor of 4-8, compared to the average private vehicles. Transport Demand Management (TDM) measures, such as congestion charges, parking limitations and usage fees, play an important role as incentives for modal shifts.

3. **Improve vehicle technologies and fuels:** The third strategic pillar involves improvements in vehicle technology as well as lowering the carbon content of fuels. Where private cars and other low-occupancy vehicles continue to be used, the strategy of improving vehicle energy efficiency and decarbonizing vehicle fuels can help to reduce emissions significantly.

Figure 1: The “Avoid / Reduce-Shift-Improve” approach



Applying these strategies to the Indonesian context means developing a comprehensive approach to GHG reduction and identifying a set of practical policies. The table on the following pages outlines a suite of measures that could enable Indonesia to achieve a meaningful GHG emissions reductions in the transport sector.

The abatement cost of CO₂ emissions reductions for each policy measure (calculated in USD/ton of avoided CO₂) is obtained by dividing the present value of the cost associated with emissions reductions by the cumulative total CO₂ reductions over the analysis period, and. Highlights of the analysis are presented in Table 1 below.

Table 1 Abatement Cost Estimation by Policy Measure

Policy / Measures	Spending type	Total Cost Relative to BAU	NPV (rel. to BAU) (disc. rate: 12%)	Cumulative CO ₂ abatement (Mil.Ton)	Abatement Cost	
		(Mill. Rp.)	(Mill. Rp.)		(Mill. Rp./mil.ton CO ₂)	(US\$/mil.ton CO ₂)
“Avoid” Measures	public	9.9	150	0.89	185.96	18.6
	private	74.3	32			
“Shift” Measures	public	88.0	529	5.48	248.51	24.9
	private	133.1	152			
“Improve” Measures	public	25.3	53	4.80	236.52	23.7

Table 2: Overview of GHG reduction measures in the transportation sector (land transport)² in Indonesia until 2030

No	Measure	Description	Way to achieve GHG emission reduction	GHG emission reduction in 2020 against total baseline	Co-benefits	Required Policy Measures and Instruments	Responsibilities	Reference to other measures
“AVOID / REDUCE” Measures / Smart growth oriented transport planning								
1.	Integrated Land Use and Transportation Planning	Development of a guideline for urban development / transport planning, including rules on land use. In hands walking/cycling infrastructure and pedestrian zones. Applying traffic impact control (TIC) in urban development.	Avoid/reduce kilometers driven through giving access to destinations that are at low distances through promoting.	2%	Lower emissions of local pollutants Equity between poor and wealthy people	Minister of Transportation (MoT) Decree and Local Regulation and Government Decree	Province and City Planning Agency	Public transport improvements (in terms of transit oriented development)
2.	Promote modern logistics systems	Introduction of a modern logistic platform Time restrictions for business district areas	Reduction of empty haulage	2-3%	Lower emissions of local pollutants	Minister of Transportation (MoT) Decree	Provincial and Municipal Transportation Agency	
No	Measure	Description	Way to achieve	GHG emission	Co-benefits	Required	Responsibilities	Reference to

² We assume that this table is only meant for land transport sector. Therefore under column 5 we predict for land transport only

			GHG emission reduction	reduction in 2020 against baseline		Policy Measures and Instruments		other measures
"SHIFT" Measures / Travel Demand Management								
<i>PULL Measures</i>								
3.a.	National Urban Transport Policy	Develop, consult and approve national urban transport policy and strategy, including a financing scheme for sustainable urban transport investments	Selection of best proposals through comprehensive city mobility plans. Contribute to public transport investments and NMT infrastructure	(see below)	Improvement of mobility options Lower emissions of local pollutants	Government Decree on TDM, followed by MoT Decree on TDM	MoT	Create public transport funding mechanism, fed through fuel and vehicle taxation
3.b.	Public Transport Improvement Programme	Measures to improve and increase high quality public transport (Utmost importance)	Attract people to public transport and hence reduce private car use.	6-8%	Improvement of mobility options Lower emissions of local pollutants	MoT Decree on BRT/ Transit System Guidelines	Provincial and Municipal Transportation Agency	Closely related to a better NMT infrastructure
3.c.	NMT National Development Program	Measures to promote cycling, walking and the use of public space	Attract people to walk and cycle and hence reduce private car use.	2%	Improvement of mobility options Lower emissions of local pollutants	Decision Letter of Director about NMT Technical Guidelines	Municipal Transportation Agency	Closely related to high quality public transport
3.d.	Campaigns and , Education program at schools	Training and outreach material to provide information about public transport and NMT options	Raise awareness on options for environmentally friendly modes and thus reduce private car use	1%	Improvement of mobility options Lower emissions of local pollutants	Ministry of Education Decree on Socialization of Environmental Control	Provinces and Cities Ministry of Education	Only applicable if public transport and NMT infrastructure is available

No	Measure	Description	Way to achieve GHG emission reduction	GHG emission reduction in 2020 against baseline	Co-benefits	Required Policy Measures and Instruments	Responsibilities	Reference to other measures
<i>PUSH Measures</i>								
3.e.	Congestion Charging and Road Pricing (needs to be combined with HQ public transport)	Setting higher fees under congested conditions to reduce traffic volumes Defining the area and installation of observation technologies Several specific types to implement congestion charging (Cordon ring, Area license, Corridor, Network)	Attract people to use other modes than private vehicle and so avoid/reduce kilometers driven	Jakarta 5-10% (Stockholm ³ : CO2 -14%, London ⁴ : CO2 -16%)	Stockholm: Increase in public transport ridership (+8%), Increase of retail sales (+10%) Peak hour congestion reduction (-22%) London: Peak hour congestion reduction (-26%)	Government Decree Earmarking	Municipal Transportation Agency	Revenues used for public transport improvements
3.f.	Parking Management and Pricing	Limit supply of free and low-charged parking areas Appropriate prices for parking (e.g. in downtown) Application of parking control system	Avoid/reduce kilometers driven through appropriate prices for parking Attract people to use more environmentally friendly modes and hence prevent car use	1%	Recovery of public space Lower emissions of local pollutants	MoT Decree on Parking Control which based on TDM	Municipal Transportation Agency	Public transport service improvements financed by parking charges

³ Source: Manfred Breithaupt (2008), "Environmental Vehicle Taxation: International Experiences", presented at the International Workshop on Integrated Transport for Sustainable Urban Development in China (15-17 December 2008).

⁴ Source: Impact monitoring – Sixth Annual Report, July 2008, Transport for London, available at <http://www.tfl.gov.uk/roadusers/congestioncharging/6722.aspx#tes>.

No	Measure	Description	Way to achieve GHG emission reduction	GHG emission reduction in 2020 against baseline	Co-benefits	Required Policy Measures and Instruments	Responsibilities	Reference to other measures
"IMPROVE" Measures								
<i>Cars and Motor Cycles</i>								
4.a.	CO2 Emission Standards for Passengers Cars	Set fuel efficiency emission standards for new vehicles according to international benchmarks like EU (130g CO2/km 2015)	Enforce technical change (e.g. fuel efficient tires etc.)	1-2%	Lower emissions of local pollutants Increase of energy security	Ministry of Industry Decree (Mol)	MoE, MoT	Could be supplemented by a phase out programme for inefficient cars
4.b.	CO2 Emission Standards for Motor Cycles	Set fuel efficiency emission standards for new motorbikes	Enforce technical change	1-2%	Lower emissions of local pollutants Increase of energy security	Ministry of Industry Decree (Mol)	MoE, MoT	Could be supplemented by a programme for e-bikes
4.c.	Fuel efficient government fleets	Stringent fuel efficient standards	Enforce technical change	1%	Lower emissions of local pollutants Increase of energy security	Government Decree on Official Vehicles Efficiency	MoE, MoT	
4.d.	Mandatory Inspection and Maintenance for all motor vehicles	Regulate inspection rules and enforce certification. This could be carried out by a. Certification of private garages b. Public authorities	Improving performance of existing vehicles	0.5-1%	Lower emissions of pollutants Increase of energy security Increase road safety	MoT Decree	MoE, MoT	Fuel efficiency standards

No	Measure	Description	Way to achieve GHG emission reduction	GHG emission reduction in 2020 against baseline	Co-benefits	Required Policy Measures and Instruments	Responsibilities	Reference to other measures
4.e.	Car Labelling	Introduction and enforcement of a "car label" that promotes high fuel efficiency standard and	Attract the use of CO2 efficient technology and raise awareness on the use of environmentally friendly vehicles	0% (as long as fuel subsidies reduce incentives to buy fuel efficient cars)	Increase of energy security Lower emissions of pollutants	Ministry of Environment (MoE) Decree	Minister of Environment (MoE) Ministry of Transportation Ministry of Industry and Trade	
4.f	Training Program for smart driving (eco-driving) incl. corporative drivers	Way of driving that increases efficiency of vehicle use / driving style	Raise awareness on ways to reduce fuel consumption and CO2 emissions caused by inefficient driving	0% (as long as fuel subsidies reduce incentives to buy fuel efficient cars)	fewer accidents noise level reduction	MoT Decree	Municipal Transportation Agency	
<i>Public Transport</i>								
5.a.	Adopt bus fleet replacement and modernization program (A precondition is that the bus industry can develop a model for cost covering at high service level)	Regulations of vehicle design (clear design standards) and use of modern technology and fuel consumption standards	Replace old technology through	0.5-1%		Ministry of Industry Decree	Gaikindo (The Association of Indonesia Automotive Industries)	High quality public transport

No	Measure	Description	Way to achieve GHG emission reduction	GHG emission reduction in 2020 against baseline	Co-benefits	Required Policy Measures and Instruments	Responsibilities	Reference to other measures
<i>Freight</i>								
6.a.	Adopt truck fleet replacement and modernization program (A precondition is that the bus industry can develop a model for cost covering at high service level)	Regulations of vehicle design (clear design standards) and use of modern technology and fuel consumption standards	Replace old technology through - wind shields	0.5-1%		Ministry of Industry Decree	Gaikindo (The Association of Indonesia Automotive Industries)	
<i>Fuels</i>								
7.a.	Introduction of a low carbon fuel quota	Regulation of fuel standards e.g. adding 2 nd generation biofuels (not palm oil) of about 10%, increase CNG use, electric cars and bikes)	Replacing fossil fuels through biofuels lead to reduced carbon emissions.	2-3%	CNG lead to reduction of local pollutants (!) Biofuels may compete with food production	Ministry of Energy Mineral Resources Decree	Minister of Energy Mineral Resources Ministry of Agriculture, Pertamina	
GENERAL MEASURES								
8.a.	Fuel Taxation (utmost importance)	Fuel tax imposed on the sale of fuel considered as a general tax or road user fee that increases the price for using the vehicle (Example: Fuel tax in Germany: 0.654 €-Cent/l Gasoline 0.47 €-Cent/l Diesel Germany slightly reduced CO2 emissions from land	Reduce kilometers driven through high prices for fuel Attract people to use more environmentally friendly modes and hence prevent them from car driving	0% (assuming that the fuel price increases to the average sales price of neighbour countries at least a doubling of existing fuel price over coming years, by approx. 20% per year)	Lower emissions of pollutants Increase of energy security	Ministry of Finance and Insudtry	Minister of Finance (MoF), MoT and General Directorate for Tax	Success of most measures in this table depend on appropriate fuel prices

		transport within the last 10 years mainly through the very high fuel prices)						
8.b.	Vehicle taxation (based on CO2 Emissions)	A levy on motor vehicles that is totally or partly based on the car's CO2 emissions and/or fuel consumption Example Ireland: Vehicles emitting less than 120g CO2 per km are taxed 100€ per year and those emitting 226g/km are taxed 2.000€ per year	taxation encourages to buy more fuel-efficient cars	n/a	Lower emissions of pollutants Increase of energy security	Ministry of Industry	Minister of Finance (MoF) General Directorate for Tax	Are complementary to fuel taxes

The measures and policies listed above are suitable for the Indonesian situation. **The estimated reduction potential all measures are implemented from 2010 until 2020 (see roadmap) will lead to a GHG reduction of at least 10 percent** below the Business-as-Usual scenario. The reduction potential from these measures actually increases significantly after 2020, as many of the measures have mostly longer term effects. For example, using land-use planning as an instrument to influence transport activities requires a time horizon of at least 25–30 years.

Although these calculations have some unresolved uncertainties and they depend on assumptions concerning the future of Indonesia's economy, they nonetheless demonstrate that ambitious policies would enable Indonesia to significantly reduce GHG emissions and would also bring various co-benefits to cities and citizens. These co-benefits include better air quality, energy security, reduction of congestion, more equity between social groups, etc..

In order to achieve the optimal effect, it is necessary to combine the strategies into programmes or packages of practical, cost-effective measures. Three main programmes have been identified:

1. **A national urban transport policy** (which could lead to a 5-10 percent reduction in CO₂ emissions by 2020). This policy could be supported economically by an escalating fuel tax with tax revenues earmarked for transportation-related programs. A comprehensive transport policy is key for successfully tackling the transport sector challenges in Indonesia. This type of comprehensive urban transport policy would likely include an ambitious public transport improvement programme, promotion of non-motorized transport, transportation demand management measures, sound land-use planning etc. Therefore, it is essential to establish incentives for local governments to create good transport systems, and that encourage companies and consumers to choose energy-efficient modes or travel, co-locating their activities within short distances. To achieve this, it is essential to develop, consult and approve a national urban transport policy and strategy, including a financing scheme for sustainable urban transport investments. The selection of best proposals aligned with comprehensive city mobility plans will lead to expanded investments in public transport and in non-motorized transit (NMT) infrastructure. Earmarking revenues from increasing fuel taxes for transport-related projects can provide the financial resources for municipalities to buy more energy efficient motor vehicles and public transit equipment.
2. The third approach involves a package of policies related to **increasing freight transport efficiency**. This package has the potential to reduce CO₂ emissions by 2-3 percent in 2020). The package promotes accelerated replacement of existing vehicle fleets and promotes modern logistic systems that avoid empty back-hauls. The package also

includes incentives to promote the delivery of inter-urban freight by rail and ship .

3. **Fuel efficiency programmes** can reduce CO₂ emissions by 4-8 percent in 2020): CO₂ emission standards are necessary to bring more energy efficient vehicles into the market. This must be complemented by regular maintenance and inspection programs, an increasing fuel price (with elimination of subsidies, and increasing fuel taxes, as described above) as well as a CO₂-based vehicle tax. These measures can help individuals and firms to buy more efficient vehicles and cleaner fuels.
4. **Increased use of Renewable Energy** can lower CO₂ emissions by 1-2 percent in 2020. Currently, the use of renewable energy and biofuels in Indonesia is quite limited. The situation is likely to so limited for many years. Second generation biofuels that could have a substantial impact on CO₂ may be available in 5-10 years. Analyzing the life cycle costs of these second generation biofuels shows that the net impact of current, first-generation biodiesel may be quite small.

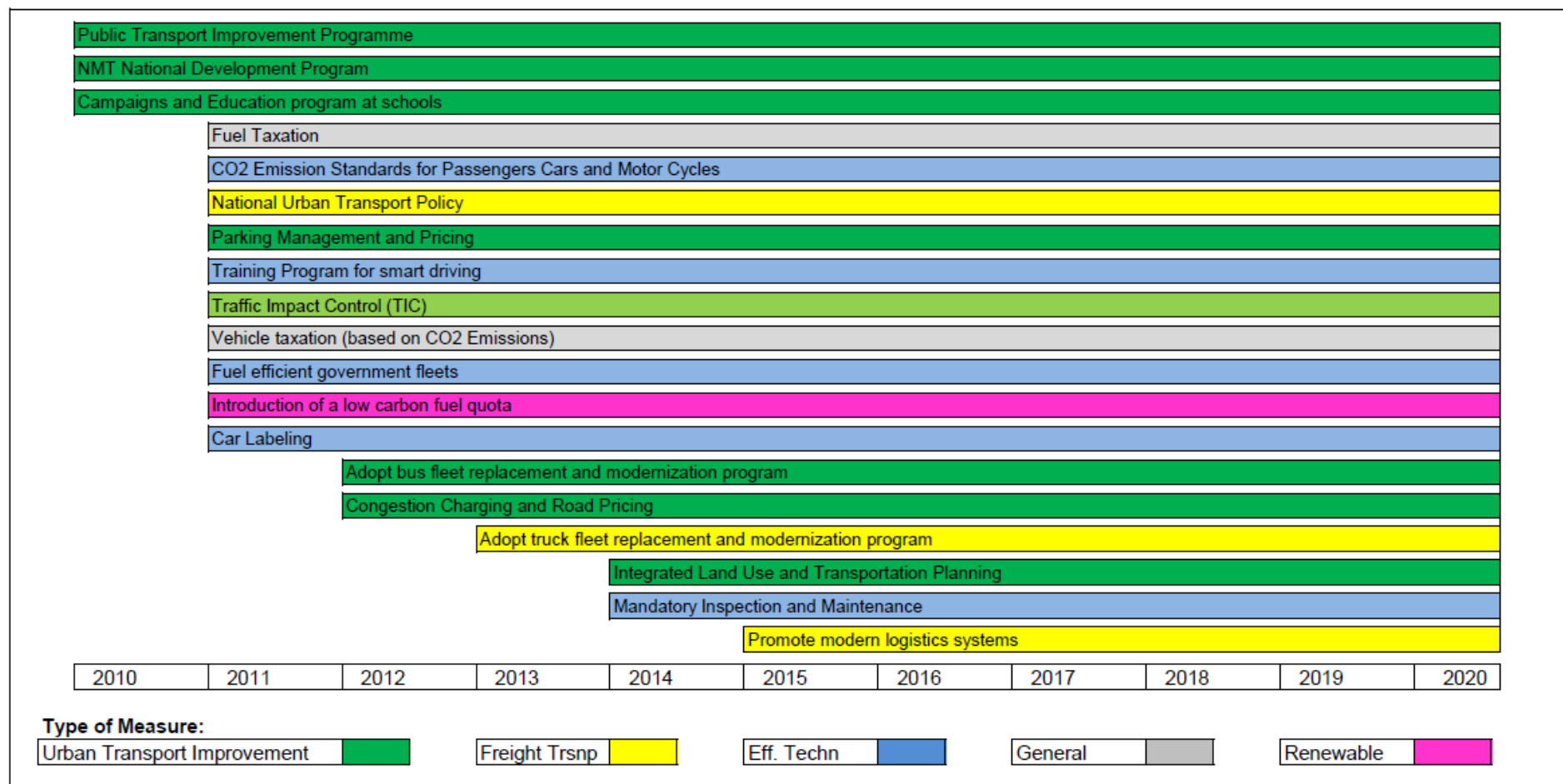
While programme 1 and programme 2 above focus on “avoid” and “shift” strategies the third package emphasizes the “improve” approach to energy efficiency. **For all these strategies, rising fuel prices are helpful. High fuel prices provide very visible incentives to users, encouraging them to drive less. High prices also create incentives for purchase of more fuel-efficient vehicles.** A characteristic of the transport sector is that all technologies need to be installed in a huge variety of sources (cars, trucks, etc.). As it is not possible to focus efforts on a few big emitters, there is a need to design policies that have effects on all transport users. Only intelligently combined bundles of policies that address both supply and demand can be successful. Hence, the success of the measures will often depend on how they are implemented “on the ground.”

Roadmap for implementation

The policies advance other national priorities in addition to GHG emissions reduction. They can help to overcome a variety of transport-related environmental problems and thus contribute to sustainable development. The most successful cities and countries (e.g., Switzerland) have the best transport systems. However, to achieve this level of performance in the transport sector, sustained political leadership and a vision of change is needed to overcome deep-seated barriers to implementation of market-based policies. Thus, in order to improve the transport system, a clear strategy and political commitment is essential.

The following figure shows a feasible way to tackle the climate and transport challenge and indicates a timeline of implementation (roadmap) for GHG reduction policies in Indonesia.

Figure 2: Roadmap for implementing GHG reduction measures in the (land-) transportation sector in Indonesia 2010 – 2030



Barriers

In order to pursue the Avoid-Shift-Improve strategy effectively, it is important that the following barriers be addressed:

- Policy paradigm –the existing transportation development mindset is based on a hope for high rates of motorization. This must be replaced by a policy paradigm that balances economic, social and environmental sustainability, and which recognizes the benefits of pursuing a low-carbon transport strategy
- Political acceptance – some policies may prove publicly unpopular in 2010, but these policies can be designed and packaged in a way that highlights the benefits of change in tangible and easily understood ways. Public awareness campaigns and other capacity-building measures can also play a large role in increasing political acceptability
- Financing –the current lack of financial resources to support low-carbon transport can be alleviated through the development of new funding mechanisms. Alternatively, by reallocating existing resources towards low-carbon transport, Indonesia could attract significant levels of international financial flows either in the form of ODA or various forms of UNFCCC and climate-related funding.
- Capacity building – can help institutions and their staff to become more fully empowered to implement low-carbon transport policies.
- Technology and knowledge transfer –appropriate technologies and knowledge can be transferred to Indonesia from our international partners in order to encourage the implementation of policies that promote low carbon transport.
- Data and monitoring –data on transport activity and emissions can be collected systematically and regularly, reducing the current dearth of statistical data. To realize an ambitious MRV framework, transport data collection is a key.

Potential support for GHG reduction measures

A main purpose of committing to action on CO₂ emissions reductions in transport is to acquire support for capacity building, technology transfer and international development assistance. It appears likely that the Copenhagen Green Climate Fund or other uni-lateral funds will be developed in Indonesia during 2010 in order to match international actions and new funding offers. The following table suggests support needed for the measures listed above.

Table 2: Potential support needed

Measure	Support needed
Fuel Taxation	Capacity building
Mandatory Inspection and Maintenance	Capacity building
CO2 Emission Standards for Passengers Cars and Motor Cycles	Technology transfer
National Urban Transport Policy	Capacity building, finance
Public Transport Improvement Programme	Finance
NMT National Development Program	Finance
Parking Management and Pricing	Capacity building
Campaigns and Education program at schools	n/a
Training Program for smart driving	Capacity building
Integrated Land Use and Transportation Planning	Capacity building
Vehicle taxation (based on CO2 Emissions)	Capacity building
Adopt truck fleet replacement and modernization program	Finance
Adopt bus fleet replacement and modernization program	Finance
Fuel efficient government fleets	Technology Transfer
Introduction of a low carbon fuel quota	Technology Transfer, capacity building
Congestion Charging and Road Pricing	Capacity building
Promote modern logistics systems	Capacity building
Car Labeling	Capacity building

Through their bi-annual communications to the UNFCCC, developing countries will report their GHG emissions and provide verification of NAMAs supported with international funds. By contrast, NAMAs that do not receive international support will be reviewed domestically. Having the opportunity to register NAMAs that include new policies and to gain international financial support for these increases their feasibility and attractiveness. So far, there are no other agreed provisions for measurement, reporting and verification (MRV) of achieved greenhouse gas reductions. However, a certain level of review is necessary to justify financial flows, capacity building activities, and support of technology transfer from developed countries. Hence, there is a need to carefully improve transportation and fuel sale statistics in Indonesia so as to be able to demonstrate easily and in a credible fashion the transport-related CO₂ emissions reductions that will have been achieved by implementing the associated policies and measures.