Chapter 4

Transport Situation in Jakarta

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CHAPTER 4
Transport Situation in Jakarta

1. Introduction

This Chapter will conduct micro approach analysis of the energy efficiency related issues in a transport sector by selecting Jakarta of Indonesia as a model city. In addition, the Chapter will select target area and provide information on traffic conditions of the area which will be utilized in a simulation analysis in the next Chapter.

The reason for selecting Jakarta of Indonesia as a model city will be explained as follows.

- Jakarta is one of a large city in the region where facing chronic traffic congestion and corresponding problems.
- Necessary date set for simulation analysis (Origin-Destination data of traffic) can be easily obtained by a support of JICA Indonesia.

For conducting such simulation, the model specification should be designed to correspond with socio-economic setting of the location, the direction of on-going policy, priority for implementing the policy and the financing capacity for potential implementing agency to test the simulation results on the ground.

To serve the information for modelling work of simulation analysis, we observed current socio-economic and urban transportation in DKI Jakarta, including the review of on-going policy initiatives in Jakarta. An exercise for setting up the priority for implementing policies in transport sector conducted by Coordinating Ministry of Economic Affair is also reported as one of consideration to specify the simulation model. Moreover, a specific observation on financial capacity for the potential implementing agency is conducted to estimate the scale of infrastructure improvement to be simulated. Then, a recommendation for the site of simulation model is provided with the description of current situation and future development plan of the influencing area.

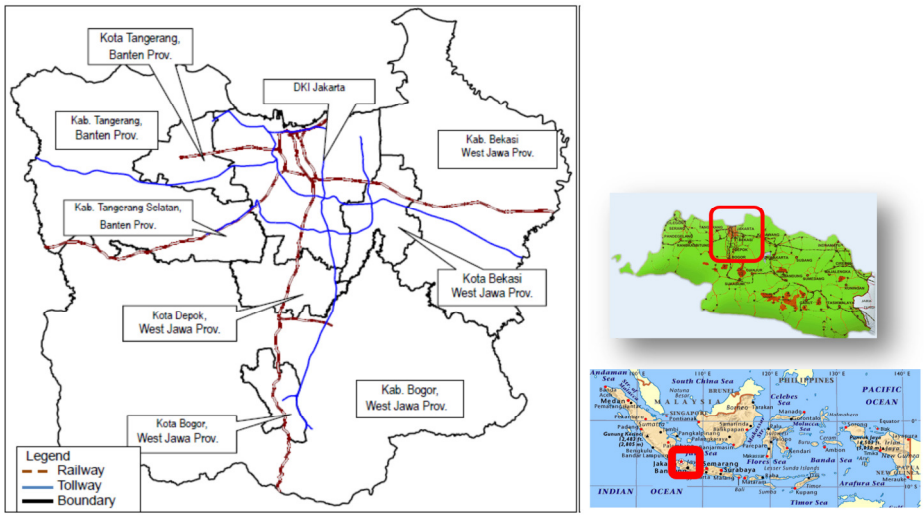
2. Socio-Economic Setting of DKI Jakarta

2.1 Land Use System

Spatial development in the Jakarta City is strongly influenced by the presence of other cities around it, namely Bogor, Depok, Tangerang, and Bekasi as the satellite cities of

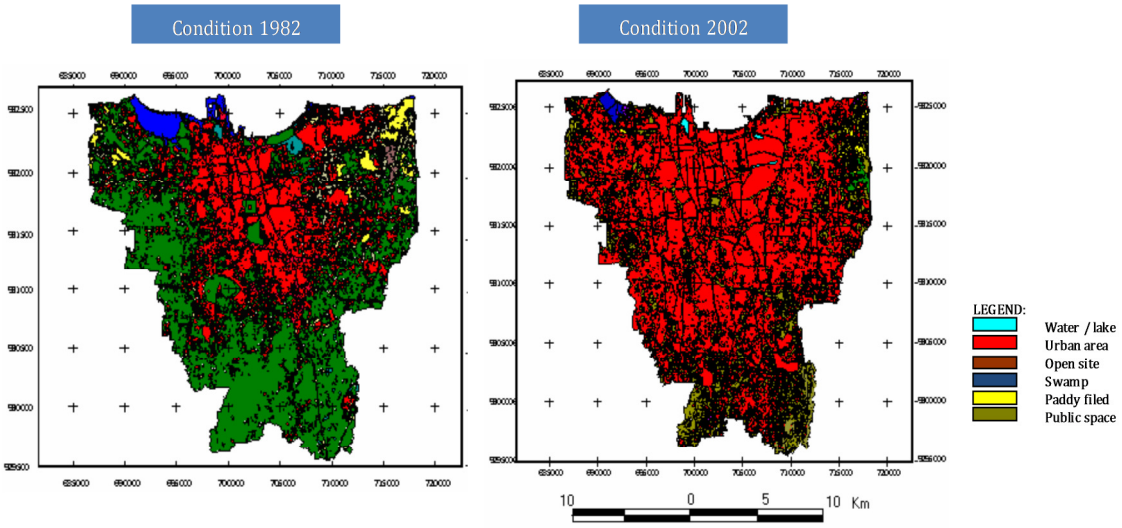
Jakarta. Social and economic interaction between the City of Jakarta and surrounding cities has created an agglomeration of Greater Jakarta region so called JABODETABEK (Jakarta, Bogor, Depok, Tangerang, Bekasi) with the complexity of social and economic issues.

Figure 4-1: Map of JABODETABEK region



The development of land use in Jakarta City shows that the urban physical development has experienced to spread wider from the center to the sub-urban areas as illustrated in the Figure 4-2. During 1983 to 2002, the housing development has been moving from the center area to the east, west, and south areas.

Figure 4-2: The Image of urban sprawl development in Jakarta region



Source: Landsat Image (2002).

From the trend of the spatial development of JABODETABEK, the location of "work force" area does not have much change where the tendency of the increased intensity remains at the center of Jakarta City. The pattern of people movement creates a commuter travel and this has given an impact on the road traffic and capacity.

The disharmonic situation of development situation between the land use development and the development of road infrastructure within the JABODETABEK has been triggered by inconsistency in the spatial development implementation. In addition, the spatial development of JABODETABEK did not experience the process of synchronization, and the inconsistency of spatial development amongst the cities surroundings the Jakarta City, especially in the suburban areas.

The above situation is reflected in the randomized people movement pattern which leads to inefficient utilization of existing transportation infrastructure. This situation has been more aggravated by the condition of the rapid growth of land use. This also happens in other cities in Indonesia in general, as shown in Table 4-1 which shows that Indonesia has rapid growth rate of urbanization and the highest level of urbanization amongst the cities within the East Asia region. [1]

[1] Cities in Transition: Urban Sector Review in an Era of Decentralization in Indonesia, East Asia Working Paper Series, Dissemination Paper No. 7, The World Bank. 2003.

Table 4-1: The growth and level of urbanization in the East Asia Region

		Urbanization Level		
		Low (<20%)	Medium (20-40%)	High (>40%)
Urbanization Rate	Rapid (>4%)	Cambodia Lao PDR		**Indonesia** Philippines
	Moderate (2-4%)		China Myanmar Vietnam	
	Slow (<2%)	Thailand		Mongolia

Source: the World Bank, 2003

The current trends, the role of the private sector in the spatial development is dominant where the growth of new activity centers does not consider the carrying capacity of existing transport networks. Based on the trend of development process seems that the development intensity is running scattered in various locations and not concentrated in the certain areas. This condition finally has formed the phenomenon of urban sprawl.

This situation creates an irregular travel patterns and with a growing motorcyle it tends to generate the motorized short trips pattern which makes less of advantageous from the aspect of mass public transportation service provision. This is possible because the existing paradigm is that the provision of transport infrastructure and service is an obligation of government but the strategic action to make it into realization is not in place. Furthermore, the government is likely to encourage the private sector to play their role without being aware of its ability to prepare and provide the sufficient transportation infrastructure in terms of both time and cost. This condition is also exacerbated by the inconsistency in the planning and implementation of policies in the border areas (sub-urban). This situation is reflected in the transportation problems such as traffic congestion.[2]

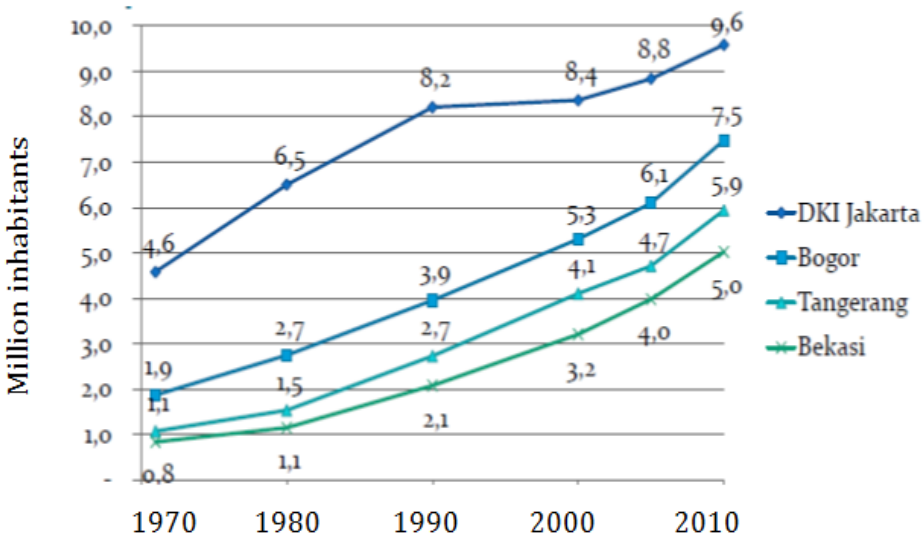
2.2 Population Growth

The growth of population in Jakarta City and its surrounding cities during the last five decades (1970-2010) can be seen in the Figure 4-3. In 2010, the number of population of DKI Jakarta Province is approximately 9.6 million. During 1970 to 2000, the population growth in DKI Jakarta Province tends to decrease from 3.5% per year (1970-1980) to 0.2% per year

[2] The Macro Transportation Concept of Jakarta, Local Transportation Agency of DKI Jakarta, 2010

(1990-2000). This figure experienced to increase again during 2000 to 2010 with the number of population growth 1.3% annually.

Figure 4-3: The population growth of JABODETABEK (1970-2010)

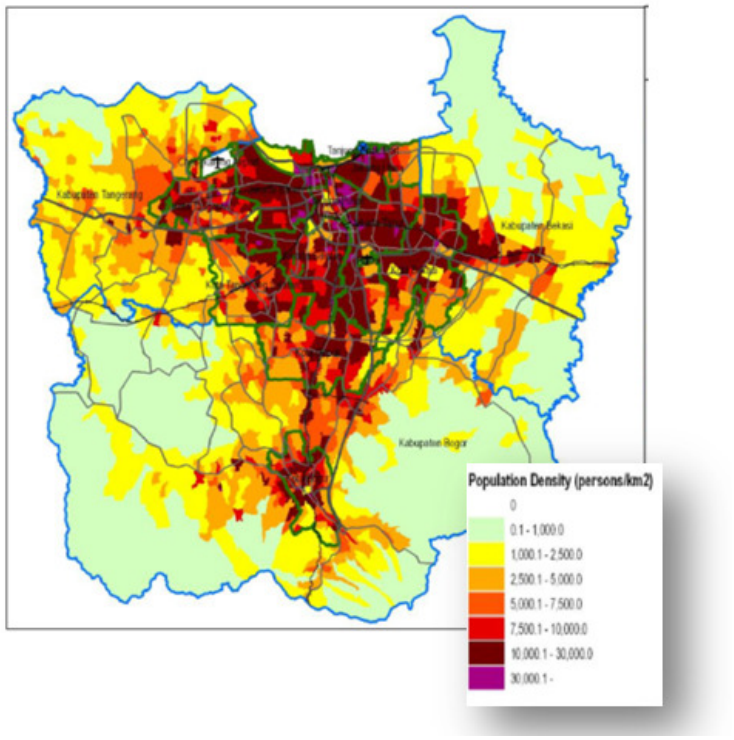


Source: Statistics Indonesia.

In the context of JABODETABEK region, number of population living in this region has reached 26.6 million inhabitants[3] or approximately 10% of the total population of Indonesia in 2010 (amounting to 237.6 million inhabitants).[4] The highest density of population in Jakarta City reaches 30 thousand people per kilometer square where generally is located in the core of Jakarta City (central and northern side).

[3] The physical mobility at Metropolitan Jakarta: Urban Spatial, Marco Kusumawijaya, 2011
[4] Trends of the Selected Socio-Economic Indicators of Indonesia, BPS, February 2012

Figure 4-4: The population density of JABODETABEK (2010)



Source: Kusumawijaya (2011).

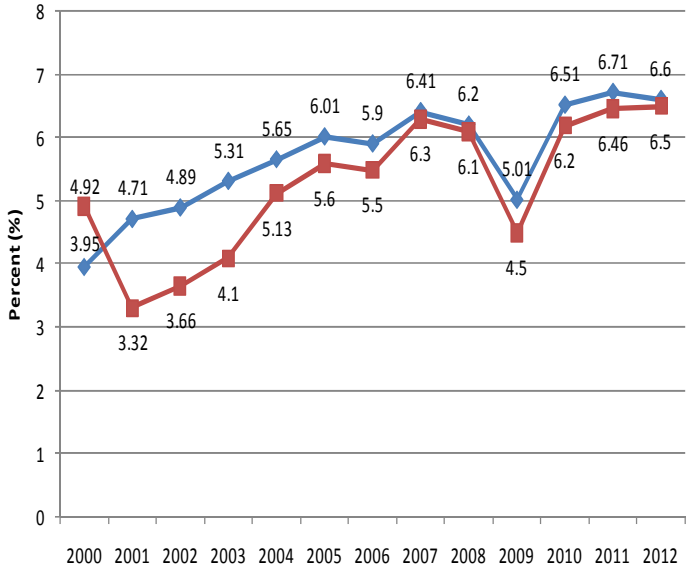
The existence of strong interaction between the City of Jakarta and its surrounding cities has created a roundtrip journey population which was estimated at 20.7 million trips per day trip[5]. The population of cities around the Jakarta City continues to increase with the similar pattern of growth during that period. The urban sprawl effect of DKI Jakarta has increased the number of population and the people mobility in the surroundings cities of Jakarta. This condition has stimulated the increase of transportation demand or needs in Jakarta.

2.3 Macro Economy Condition

The economics of DKI Jakarta Province during 2000-2012 tends to increase from year to year (see Figure 4-4). The highest increase was in 2011 with a growth rate of 6.71 %. Meanwhile, the lowest growth occurred in 2000 with a rate of 3.95 %. In the latest year, the province's economy grew by 6.6 % per year or experienced to decrease when compared to the previous year.

[5] The Macro Transportation Concept of Jakarta, Local Transportation Agency of DKI Jakarta, 2010

Figure 4-5: The economics growth of DKI Jakarta during 2000-2012 (%)



Source: Statistic Agency of DKI Jakarta Province.

In 2010, the regional GDP of DKI Jakarta Province by market price reached approximately 862 trillion IDR while by 2000 constant price which was recorded by local government statistic agency has reached around 396 trillion IDR. The condition of macro economics of DKI Jakarta Province during 2000-2010 can be seen in Table 4-2.

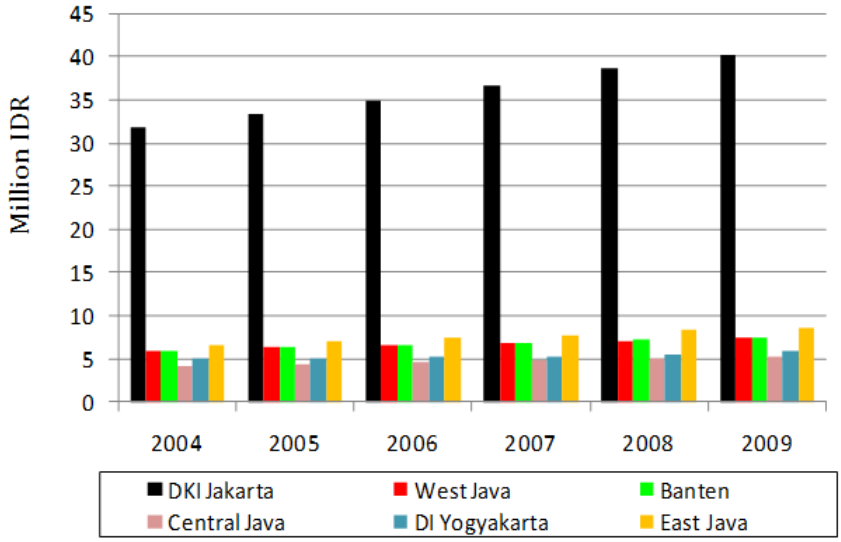
Table 4-2: The macro economics of DKI Jakarta Province during 2000-2010

Ekonomi Makro	2000	2005	2010
Regional GDP by 2000 Constant Price (trillion IDR)	228	295	396
Annual growth of Regional GDP (%)	3.95	6.01	6.51
Regional GDP by Market Price (trillion IDR)	228	436	862
Regional GDP per capita by market price (million IDR)	27	49	89
Regional GDP per capita by 2000 constant price (million IDR)	28	33	41

Source: Statistic Agency of DKI Jakarta Province.

When viewed from the level of welfare of population, the Province of DKI Jakarta has a higher level of welfare relatively compared with other provinces in Java Island. Figure 4-6 shows the level of income per capita population of Jakarta (during the period 2004-2007) was higher than the other provinces in Java Island such as West Java, Banten, Central Java, Yogyakarta and East Java Provinces. Level of welfare of the population in Jakarta City when viewed from the province's GDP per capita is in the range of 31.83 to 36.73 million IDR in the same period.

Figure 4-6: The progress of regional GDP/capita of DKI Jakarta amongst other Provincesin Java Island during 2004-2009



Source: Central Bureau of Statistics of Indonesia.

The rapid growth of transport and communication sector development in Jakarta City could not be separated from the income growth. This sector has become the main sector of Jakarta City with the most rapid growth from year to year (see Table 4-3). One of the impacts of the development of Jakarta's people income is the private vehicle ownership growth which has been growing rapidly in the last decade.

Table 4-3: The growth of regional GDP of DKI Jakarta from the real sectors during 2001-2010 (in %)

No.	Sectors	2001	2005	2010
1	Agriculture	-2.79	0.98	1.27
2	Mining and quarrying	-1.01	-7.24	-1.73
3	Manufacturing industry	3.91	5.07	3.38
4	Electricity, gas and water supply	7.1	6.95	4.44
5	Construction	2.29	5.89	7.09
6	Trade, hotel and restaurant	5.44	7.89	6.95
7	**Transport and Communication**	**14.16**	**13.26**	**14.80**
8	Finance dwelling and business service	4.19	4.1	4.12
9	Services	4.09	5.06	6.68

Source: Regional statistics of DKI Jakarta Province (2010)

Jakarta regional income structure consists of two main components i.e. revenue from local tax and balance fund from the Central Government. The amount of revenue from local tax of Jakarta City was about 81.72 % of total revenue. In the last three years (2008-2010),

the acquisition tax of Jakarta City reached an average of 9.2 trillion IDR, with an increase of 6.7 % annually.[6]

3. Current Situation of Public Transportation

3.1 Trend of private vehicle ownerships and people mobility

Transportation system in Jakarta is supported by land, sea, and air transportation. As the capital of Indonesia, the development of transportation in Jakarta City is the densest among other provinces. According to the DKI Jakarta Police Office recorded that the number of motor vehicles in Jakarta is consistently increasing each year. It can be seen from the number of vehicles registered from annually. In 2011, total vehicle in Jakarta is recorded more than 13 million. Motorcycle is still dominant by number more than 9 million, followed by passenger cars (2.5 million), and the rests are trucks and buses (0.9 million).

Table 4-4: Number of motorized vehicles in DKI Jakarta Province (in unit)

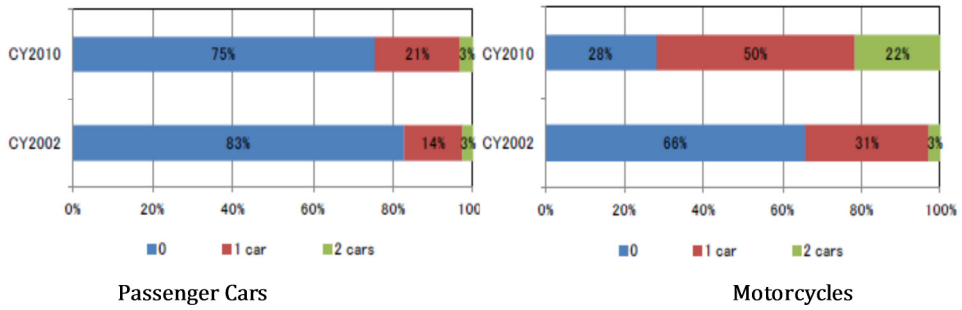
Year	Motorcycle	Passenger Cars	Trucks	Buses	Total
2001	1,813,136	1,130,496	347,433	253,648	3,544,713
2002	2,257,194	1,195,871	366,221	254,849	4,074,135
2003	3,316,900	1,529,824	464,748	315,652	5,627,124
2003	3,940,700	1,645,306	488,517	316,396	6,390,919
2005	4,647,435	1,766,801	499,581	316,502	7,230,319
2006	5,310,068	1,835,653	504,727	317,050	7,967,498
2007	5,974,173	1,916,469	518,991	318,332	8,727,965
2008	6,765,723	2,034,943	538,731	308,528	9,647,925
2009	7,518,098	2,116,282	550,924	309,385	10,494,689
2010	8,764,130	2,334,883	565,727	332,779	11,997,519
2011	9,861,451	2,541,351	581,290	363,710	13,347,802

Source: Regional statistics of DKI Jakarta Province (2012).

JUTPI (Jabodetabek Urban Transportation Policy Integration, 2010) has indicated that the rate of car ownerships around 17 % in 2002 and this figure has increased to 25 % in 2010 (see Figure 4-7). The number of motorcycle owners has been increasing rapidly. The share of motorcycle owners of all households was one third in 2002. However, it was more than 70 % in 2010. Furthermore, the number of households that have two or more motorcycles has been increasing rapidly (see Figure 4-8).

[6] Quoted from Revenue and Expenditure of DKI Jakarta Province during 2008-2010

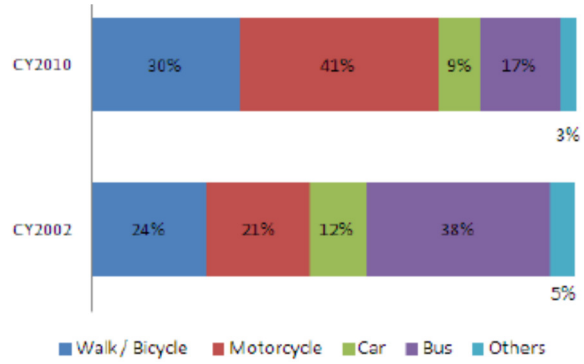
Figure 4-7: The change of number of private cars owned by households (2002 and 2010)



Source: SITRAMP, JUTPI Commuter Survey Report (2012).

According to JUTPI project (2010), based on the strong economic growth, the number of low income households has been reducing. The share of middle income households, those with a monthly household income of more than 1.5 million Rupiah and less than 6 million Rupiah, has been growing rapidly and is now more than 50 %. It seems that this condition has influenced the way people to own their private motorized vehicle.

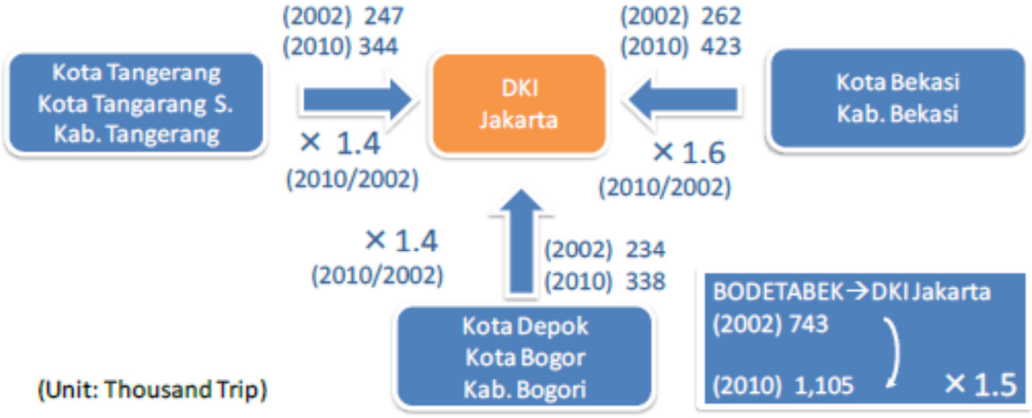
Figure 4-8: The change of transportation mode commuting in Jakarta (2002 and 2010)



Source: SITRAMP, JUTPI Commuter Survey Report (2012).

The area and population of DKI Jakarta is almost the same as the specified districts in Tokyo Metropolitan area. The number of commuters to Jakarta has been increasing dramatically and is now 1.5 times as many as of 2002 (see Figure 4-9).

Figure 4-9: The change in number of Commuters to DKI Jakarta



Source: SITRAMP, JUTPI Commuter Survey Report (2012).

3.2 Existing condition of Road Infrastructure

According to the DKI Jakarta Province Transportation Agency, the growth of motorized vehicles over the last five years is approximately 10 % annually in average, with the growth in passenger car type vehicles per day around 240 vehicles, while for the type of motorcycle as much as 890 vehicles. Meanwhile, the growth of road development in DKI Jakarta Province is very low at 0.01 % per year. In other words we can say that the growth rate of motor vehicles in Jakarta cannot be balanced with the available space for motorized vehicles movement. The length of road in DKI Jakarta Province is amounted 6,543,997.43 meter with the status of road as follows.

Table 4-5: The length and areas of road by status in DKI Jakarta Province (2008)

Road Type	Length (m)	Areas (m2)	Road Status
Toll roads	112,960.00	2,472,680.00	National
Primary Arteri roads	112,149.00	2,140,090.00	National
Primary Collector roads	51,630.75	671,384.50	National
Secondary Arteri roads	506,415.00	8,406,014.00	Province
Secondary Collector roads	823,913.91	6,970,938.77	Province
Urban roads	4,936,928.77	20,988,103.81	Municipality
Total	**6,543,997.43**	**41,649,211.08**	

Source: Public Works Agency of DKI Jakarta Province

3.3 Congestion and Transport Energy Consumption

Traffic demand in the JABODETABEK area will be rapidly increasing from 66 million trips in 2010 to 74 million trips in 2020[7]. If there is no action taken (do-nothing), the share of public transport will be declining and the traffic situation becomes worse. Below is the illustration of Volume – Capacity ratio of daily traffic in JABODETABEK area in two scenarios: (1) do-nothing and (2) do-something/Masterplan.

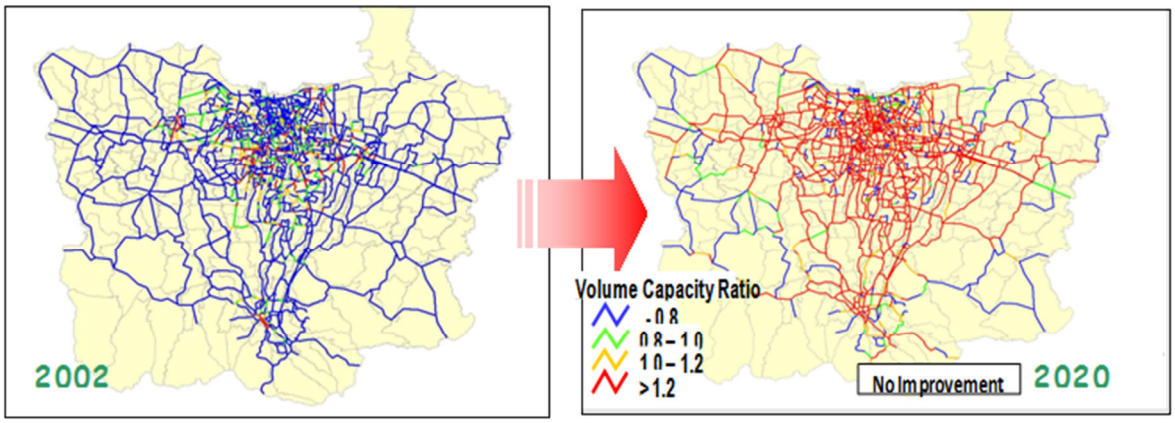
Table 4-6: The road based transportation performance in DKI Jakarta Province

Indicators		2010 (Existing)	2020 (do-nothing)	2020 (master plan /do-something)
Total travel demand (trips)		66 mio	74 mio	74 mio
Share mode	Cars	20%	28%	24%
	Motorcycles	53%	50%	42%
	Public transp	27%	22%	34%
Traffic Load	PCU-km	150 mio	210 mio	179 mio
	PCU-hours	10 mio	27 mio	15 mio
Traffic performance	V/C (daily)	0.85	1.15	0.87
	Travel speed	23.6 km/hour	15.2 km/hour	24.3 km/hour
Public transportation	Pax-km/trip	9.3 km	9.2 km	9.2 km
	Pax-hour/trip	0.41 hour	0.45 hour	0.4 hour

Source: JAPTraPis Report (2012); not included the non-motorized public transport.

The result of SITRAMP project indicates that if there is no action taken, the number of V/C ratio in JABODETABEK area is increasing becomes more that 1.2 in 2020. In this situation, the road traffic will be congested in everywhere.

Figure 4-10: The predicted V/C ratio in JABODETABEK area in 2020 (do-nothing situation)

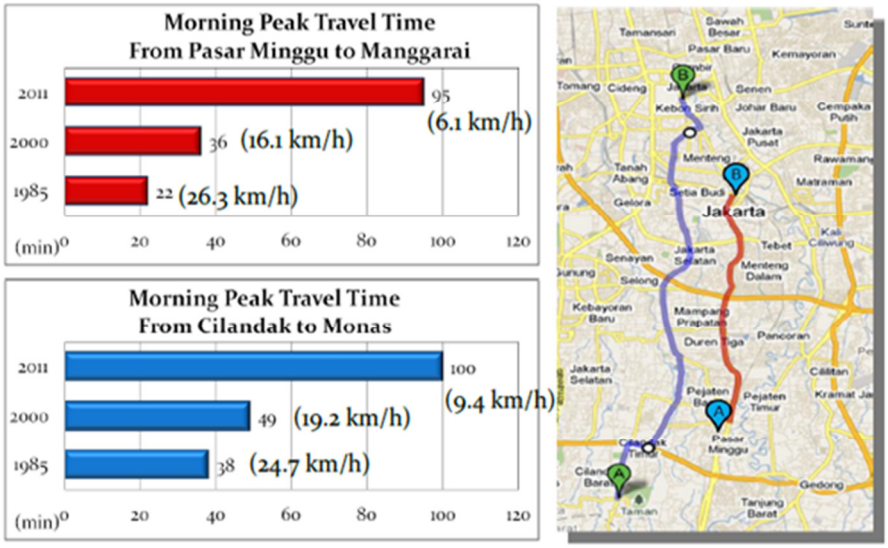


Source: SITRAMP Report.

[7] JAPTraPIS report, 2012

According to the travel speed survey conducted during the SITRAMP and JUTPI projects has indicated that in some road segments in Jakarta City area, such as Pasar Minggu – Manggarai segment showed to decrease from 16.1 km/hour (in 2000) to 6.1 km/hour (in 2011). This situation has also been experienced within Cilandak - Monas segment with the travel speed decrease from 19.2 km/hour to 9.4 km/hour (see Figure 4-11).

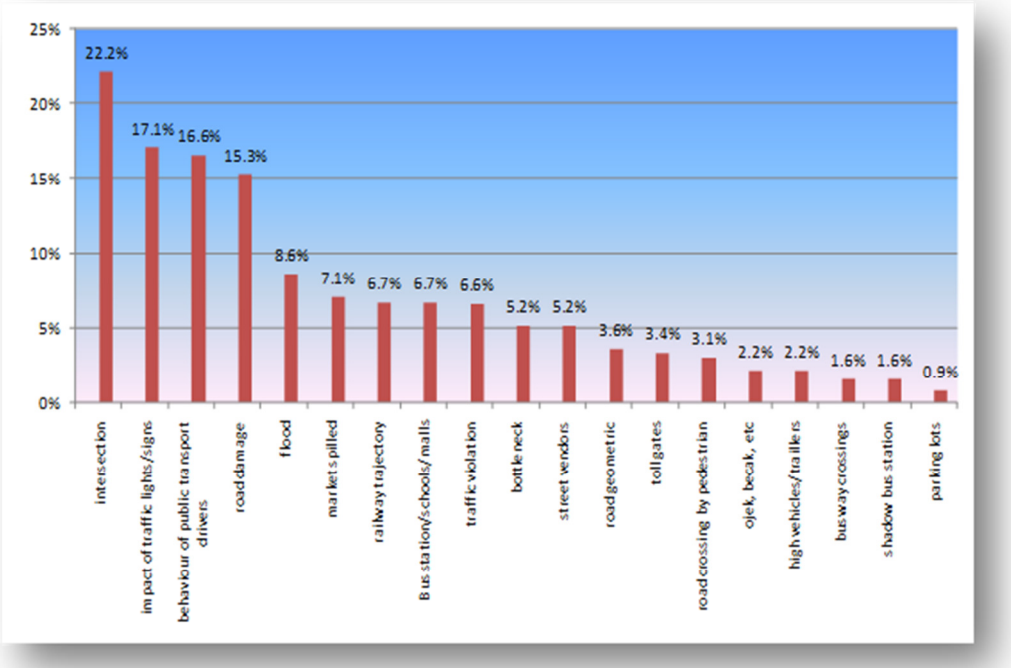
Figure 4-11: The morning peak travel time and speed in Pasar Minggu-Manggarai segment and Cilandak-Monas segment



Source: SITRAMP-travel speed survey (2000), JUTPI –travel speed survey (2011).

Currently, there are approximately 771 locations of road traffic congestion which are spread across the JABODETABEK region. According to the inventory survey conducted by National Development Planning Agency (BAPPENAS), showed that there are 20 factors cause of the congestion, among others i.e.: bottle neck, narrow roads, markets spilled, intersections/junctions, traffic lights/signs/ markers, flood, ramp toll booth, the trajectory of the railway, and the damage of roads infrastructure. The dominant factor causes the congestion is intersection/junctions.

Figure 4-12: Factors causing the congestion in JABODETABEK area



Source: BAPPENAS (2011).

As a result of road traffic congestion especially in Jakarta City, according to economic experts, it has created an inefficient transportation. Each year, the economic loss due to transportation congestion in Jakarta City was estimated approximately 46 trillion IDR, and the inefficient of fuel use was estimated at 10 trillion IDR[8].

4. Existing Policy Measures and Its Challenges

To provide a brief infomation on existing policy measure, two set of policy initiative for urban transport improvement in Jakarta is presented. First is based on the TRL report on the Case study of a transport MRV NAMA: TDM Measures in Jakarta, Indonesia. Second, a policy exercise to generate altenatives of policy option and its priority for program implementation is reported. These set of policies determine the possible consideration for directing the simulation model.

4.1 Case study of a transport MRV NAMA: TDM Measures in Jakarta, Indonesia

The Asian Development Bank (ADB) in 2012 has conducted a study that has been reported by Holger Dalkmann entitled "Applicability of Post 2012 Climate Instruments to the

[8] Online report of Local Transportation Agency of DKI Jakarta Province, 2010.

Transport Sector (CITS)" as a first step to help ensure that the transport sector can benefit from the revised/new climate change mitigation instruments under a post-2012 Climate Change Agreement. This study was conducted in order to ensure that developing cities are placed on a low-carbon growth path, and to realize the full benefits of a sustainable transport system including lower air pollution and less congestion, it is imperative that actions at the local level are fully supported by the Post-2012 climate framework centering upon the notion of Nationally Appropriate Mitigation Actions (NAMAs).

The development of NAMAs has three specific areas thought to be of central concern to the development of NAMAs, namely: (1) Measurable-reportable-verifiable/MRV methodology, (2) institutional structure, and (3) the financial framework. This case study examines all three types of NAMAs and their potential application for TDM in Jakarta through technology and infrastructure intervention as described by the following table.

Table 4-7: Potential transport NAMAs (adapted from Bongardt & Sakamoto, 2009)

	Technology	**Infrastructure/Behaviour**
National level	Energy efficiency policy package	Long distance Avoid and Shift policy package (freight/passenger)
Local level	Vehicle and fuel standards/requirements specific to a city/region	Support programs for local Avoid and Shift policies, e.g. urban transport plants.

In the case of DKI Jakarta, the rapid growth in transport activity is seen most prominently in the urban areas of Indonesia. It is known that the number of motorized vehicles has grown at a pace of roughly 9.5% per annum for the last 5 years, to reach roughly 5.5.million vehicles. This consists of 98% private vehicles serving 44% of all trips, and 2% of public transport vehicles serving 56% of all trips. The consequences of this rapid motorization include for example;

- Chronic congestion, particularly in the peak periods where the total cost of traffic congestion is estimated at Rp12.8 trillion per annum (approximately USD 1.4 billion) (Based on time value, fuel consumption and health costs);
- Degradation of local air quality, with air quality hotspots throughout the city;
- Large levels of noise and vibration;
- Reductions in road safety, particularly for vulnerable street users such as pedestrians and cyclists.

In an attempt to address these issues, stakeholders in the Jakarta capital region have initiated a number of measures under a so-called "Transportation Masterplan", including the

three core aspects of: (i) **public transport development**; (ii) **traffic restraint**; and (iii) **network capacity improvement.**

As noted in above that Jakarta experiences severe traffic-related problems associated with the exponential growth in traffic activity. There is growing recognition by policy makers, academics and civil society alike, of the importance of TDM measures to stem these problems. This is shown by the fact that TDM has already been implemented to some extent in Jakarta, for example: (i) **the development of a network of Bus Rapid Transit/BRT** and (ii) **limiting access to a part of the central business district** (during peak hours).

In this context, a number of additional and/or improved TDM measures are gaining acceptance by local policy makers as options for implementation in the near future. These include; (i) **Electronic road pricing (ERP);** (ii) **parking restraint;** and (iii) **BRT provision.** By reducing the number of trips/distances travelled by private modes, the above three collectively contribute to the reduction of transport emissions.

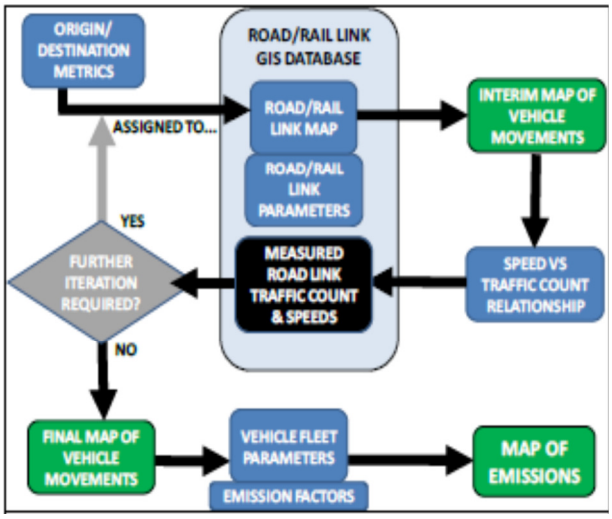
The MRV as a TDM model for Jakarta has been exercised by the University of Bandung in order to assess the impact of TDM measures in the city of Jakarta. The approach utilizes an "equilibrium flow" model which assesses the demand for travel by collating origin and destination information, and then distributing these journeys across the existing network.

The model operates with passenger kms (and tonne kms), rather than vehicle kms. Therefore, parameters such as occupancy levels, or vehicle fleet parameters (which determine fuel consumption, and therefore carbon emissions) are extremely important in subsequently calculating accurate emissions to air. The model incorporates the road transport network (with a mode resolution of cars, motorbikes, buses, and lorries). Inclusion of trams or monorail types systems are considered under the different scenarios, but may be achieved by simply adding links to the network with the appropriate properties (such as flows across the relevant network links).

Whilst the model is best suited to transport management and assessing congestion, it can also be used for estimating vehicle kilometers and emissions of both carbon and air quality pollutants (such as CO and NOx). The output of the model is provided by road link, giving a very high spatial resolution.

An overview of the model and its inputs/outputs are shown in the Figure 4-13.

Figure 4-13: A schematic Diagram of Jakarta Transport Model



Source: ADB (2012).

The key messages of MRV for Jakarta are the followings.

- MRV is crucial in ensuring the transparency of mitigation actions, to allow an accurate estimation of mitigation efforts in meeting domestic (voluntary) targets, as well as to ensure accountability of the impacts of international support received.
- The TDM NAMA could be seen as an element of a city-wide approach to measuring mitigation actions, which would enable the contribution of TDM to the meeting of mitigation targets at the city level to be explicitly made (in the case of Jakarta, 30% below BAU by 2030).
- The challenge of creating robust MRV methodology, which was seen as a barrier for transport CDM projects, remains for the design of a transport NAMA.
- The measurement of CO2 mitigation and associated co-benefits would be made possible by utilizing a bottom up methodology that combines a transport demand model (equilibrium flow model) with data on the vehicle fleet (e.g. emission factors).
- The measurement of carbon could be cross-checked using top-down methods utilizing (regional) fuel sales data, to improve the robustness.
- The lack of and poor quality of data is a major constraint in the accurate measurement of the mitigation potential (and co-benefits) of the TDM NAMA. For example, assigning traffic flows to the entire road network in Jakarta requires very extensive and detailed traffic count information, supplemented by origin and destination data.
- Capacity building in the area of data collection, database development and management is seen as a key priority in ensuring MRV of mitigation actions in the future, particularly in allowing TDM to be implemented as a tradable NAMA. Such capacity building efforts could be conducted as part of a supported NAMA, or through other means of (international) support such as Official Development Assistance.

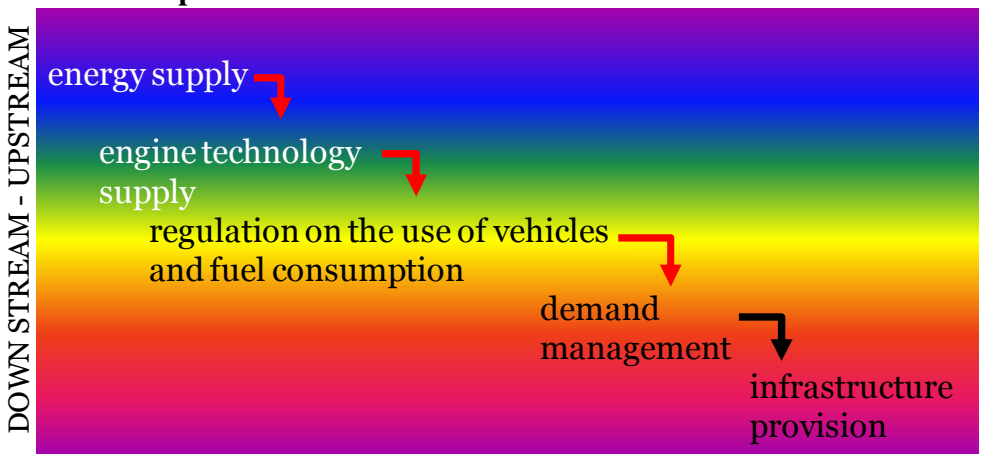
4.2. Policy exercise for transport sectors efficiency

This exercise consist of two sections, first is the introduced new framework based on a supply chain of energy to generate policy alternatives. Second the priority setting for policy and program implementation.

4.2.1. Policy framework with supply chain of energy and its relationship with transport development

One big issue on energy sectors is how transport sector respond to the changes in fuel consumption. One option to look at a variety of possible responses is to define the supply chain of energy use for transport. By knowing the supply chain, the energy efficiency efforts can be pursued. The following scheme is supply chain of energy related to the transport sector development.

Figure 4-14: The supply chain of energy and its relationship with transport development



Source: modified from Monitoring and Evaluation Team on National Transportation Policy, Coordinating Ministry of Economic Affairs (2008)

Knowledge of the each part within the supply chain of energy is used to see the cost effectiveness or value for money from a variety of policy and program interventions as described in the Table 4-8.

Table 4-8: Policy options and related programs

	Policy options	Programs
UPSTREAM	Energy supply	• Fuel security • Fuel technology
	Engine technology supply	• Fuel efficiency • Engine technology
DOWNSTREAM	Regulation on the use of vehicles and fuel consumption	• Driving behaviour • Mode change • Private vehicle use
	Demand management	• Travel needs • Rational pricing • Land and space use
	Infrastructure provision	• Infrastructure improvement • New construction

The Coordinating Ministry of Economic Affairs has formulated the policy, strategy and program for energy efficiency on transport sector that needs to further exercise based on policy option formulation as indicated in Table 4-9.

Table 4-9: Policy, Strategy and Program for Energy Efficiency on Transport Sector

OBJECTIVE	POLICY	STRATEGY	PROGRAM	TARGET
The provision of national transport that will be enabling the energy efficiency	1. Energy supply	1. Domestic energy security	1. to identify/explore new oil resources 2. to increase the strategic reservation of crude oil and its product processing 3. to increase oil production 4. to improve the access to energy 5. to improve the refinery technical capacity on oil and gas fuel supply	Short-term Mid-term Long-term Short-term Mid-term
		2. Improving the unconventional fuel technology	1. renewable energy infrastructure development 2. renewable energy use prioritizing 3. to improve the supporting renewable energy business 4. encouraging the national energy conservation and diversification 5. to formulate the priority for renewable energy development based on potential and technology, financial and social feasibility 6. to develop the alternative fuel technology (such as bio diesel, bio ethanol, gas fuel, LPG, liquid coal, hydrogen, electricity, etc.)	Mid-term Mid-term Mid-term Short-term Short-term Long-term
	2. Engine technology supply	1. Improving technology which can support engine and emission efficiency	1. to develop the motorized vehicle technology supported by alternative fuel use 2. to develop the lower capacity engine on motorized vehicle	Long-term Mid-term
		2. Environmentally-friendly engine technology supply	1. to develop the environmentally-friendly engine technology 2. to encourage the catalytic converter use	Mid-term Short-term
	3. Travel demand and fuel consumption management	1. Encouraging the driving behavior to support energy efficiency	1. to train the public transport drivers to support the energy efficiency program 2. to improve the motorized vehicle driving license	Short-term Short-term

OBJECTIVE	POLICY	STRATEGY	PROGRAM	TARGET
			standard	
		2. Providing the environmentally-friendly modal	1. to realize the emission standard for EURO 4; EURO 5 2. to encourage the Clean Development Mechanism implementation 3. to improve the motorized vehicle evaluator competency 4. to implement the private motorized vehicle test 5. to improve the number of certified and accredited public motorized service stations 6. to develop the emission test facility 7. to encourage non-motorized vehicle use	Long-term Long-term Mid-term Mid-term Short-term Mid-term Long-term
		3. Private vehicle use restriction	1. to implement the progressif tax for private vehicle 2. to implement the parking progressif charge 3. to decrease the fuel subsidy for private vehicle	Mid-term Short-tem Mid-term
		4. Motorized vehicle operational life-time restriction	1. Progressive tax for based on vehicle age	Mid-term
	4. Travel demand management	1. Encouraging the efficient travel management	1. Travel Demand Management implementation 2. public transport route integration 3. to develop integrated ticketing of urban public transport	Short-term Short-term Mid-term
		2. Encouraging rational vehicle use (rational pricing)	1. road pricing implementation 2. bus priority lane development 3. mass public transport development 4. to increase modal share of the public transport	Mid-term Mid-term Mid-term Short-term
		3. Land and space use management to create the finest build environment and to improve transport	1. Transit oriented development in big cities. 2. to create the compact and effective urban space	Long-term Long-term

OBJECTIVE	POLICY	STRATEGY	PROGRAM	TARGET
		accessibility and mobility		
	5. Infrastructure management	1. Transport infrastructure quality improvement	1. road infrastructure quality improvement	Mid-term
		2. developing new infrastructure	1. railway infrastructure development	Long-term
	6. Sustainable financing scheme for national energy efficiency program on transport sector	1. Improving the tax and retribution structure and calculation	1. to allocate the revenue from taxes for alternative fuel development and incentives for efficient fuel technology development; 2. road congestion reduction funding through retribution;	Long-term Short-term
		2. Improving the sectoral and special budget allocation	1. to increase budget allocation for research activities in the field of engine technology and alternative energy development; 2. to increase the special budget allocation for regional investment in term of transport sector development to support the energy efficiency program	Short-term Mid-term

Source: Monitoring and Evaluation Team on National Transportation Policy, Coordinating Ministry of Economic Affairs (2008)

4.2.2. Policy exercise on the implementation priority

Referring to the above scheme, the exercise to set-up priority for policy intervention of energy use in transport sector has been conducted to assess the relative important of each program to the IMPACT and CAPACITY for implementation. By this approach, the Government of Indonesia represented by Coordinating Ministry of Economic Affairs together with the other related stakeholders, has formulated the priorities and strategy to implement based on impact on fuel reduction and capacity implementation as can be seen in the following table.

Table 4-10: Priorities and strategy to implement

No	Based on **IMPACT ON Fuel Reduction**
1	Mass public transport utilization
2	Shifting from fossil based fuel to CNG for public transportation vehicles
3	Vehicle retirement strategy
4	Fiscal dis-incentive on motorized vehicle ownership
5	Road pricing
6	The use of "greener" automotive technology and other alternative energy for motorized vehicles
7	Traffic management to improve the road capacity performance
8	Eco-driving implementation

No	Based on **CAPACITY IMPLEMENTATION**
1	Fiscal disincentive on motorized vehicle ownership
2	Mass public transport utilization
3	Vehicle Retirement Strategy
4	Shifting from fossil based fuel to CNG for public transportation vehicles
5	Traffic management to improve the road capacity performance
6	Road pricing
7	The use of "greener" automotive technology and other alternative energy for motorized vehicles
8	Eco-driving implementation

The excercise is successfully generate a priority for the implementation (Table 4-10). Surprisingly, there is no policy intervention for energy supply (BLUE color) and infrastructure provision (RED color) listed. The overlooked policy options indicate that the current initiatives on those option insufficiently result in impacts on fuel reduction. On the other side, the intitutional capacity is also insufficient to implement those policies. Therefore, we learnt that it is important to pay more attention to support

research activities related to the energy security issues and to enchance the capacity for investing in infrastructure program. In addition, the necessity for infrastructure improvement can be indicated from the prioritize policy option of energy technology supply (GREEN color) that actually requires the auxiliary service infrastructure networks (RED color).

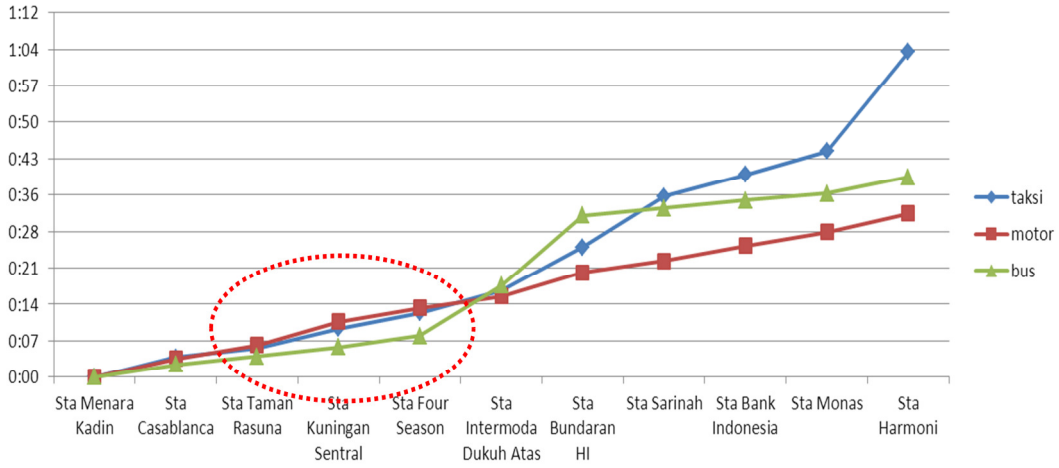
From this policy exercise, we learnt that the result of exercise is in accordance to the case study of a transport MRV NAMA which prioritize TDM program. With similar concern on infrastructure improvement, we can expect that the TDM program would significantly influence the new pattern of traffic flow, hence it needs to be supported by infrastructure improvement programs.

5. Case for simulation

5.1 Finding a critical spot of urban traffic congestion

To find the proper case study for simulation an observation on one of the main commuter corridor to the city center of Jakarta (Monas and Harmoni) has been conducted. The observation involve travel time of three types of transport mode (bus, taxi and motorcycle). The comparison of travel time, in particular motorcycle, indicate the most congested segment. At the segment where motorcyle travel time is the highest indicates that the congestion is very high and even the motorcycle that commonly easy to navigate in a dense traffic could not move. Figure 4-15 shows that the most congested segment where motorcycle as the highest travel time in comparison to taxi and bus (BRT). Hence a location in Kuningan Area is proposed for conducted simulation.

Figure 4-15: Travel speed mode comparison to find the congestion spot in a commuter corridor



Source: field survey (traffic counting), PUSTRAL-UGM (2012).

Figure 4-16 illustrates a situation in Kuningan Area where the congestion spot will be selected for simulation model. A detailed observation on road traffic situation in Kuningan Area is provided in next section to describe the condition of daily traffic situation and vehicle occupancy level on Central Kuningan, Casablanca Street, Rasuna Park, and West Kuningan .

Figure 4-16: Kuningan area, Jakarta

5.2. Traffic informatin in Kuningan Area, Jakarta

From the daily traffic data, the road traffic situation in Kuningan area can be indicated by volume of motorized vehicle as shown in Table 4-11. The highest volume of road traffic in Kuningan area is separately occurred in Rasuna Park segment with number of vehicle more than 42,500 units for each direction dominated by private motorized vehicles such as motorcycle and passenger cars. In the peak time, the number of vehicle is around 3,800 units for each direction.

Table 4-11: Volume of motorized vehicle in Kuningan area

Segment	Average Daily Traffic		Peak time	
	South-North	North-South	South-North	North-South
Central Kuningan	35,597	30,656	3,204	2,759
Rasuna Park	43,299	42,726	3,897	3,845
Casablanca street	25,332	41,137	2,280	3,702
West Kuningan	7,011	6,545	631	589

Source: field survey (traffic counting), PUSTRAL-UGM (2012).

Based on the field survey (2012), the level of vehicle occupancy that illustrates the amount of movement of passengers that pass through the Kuningan area based on occupancy rate per vehicle mode can be seen in Table 4-12.

Table 4-12: Vehicle occupancy level in Kuningan area

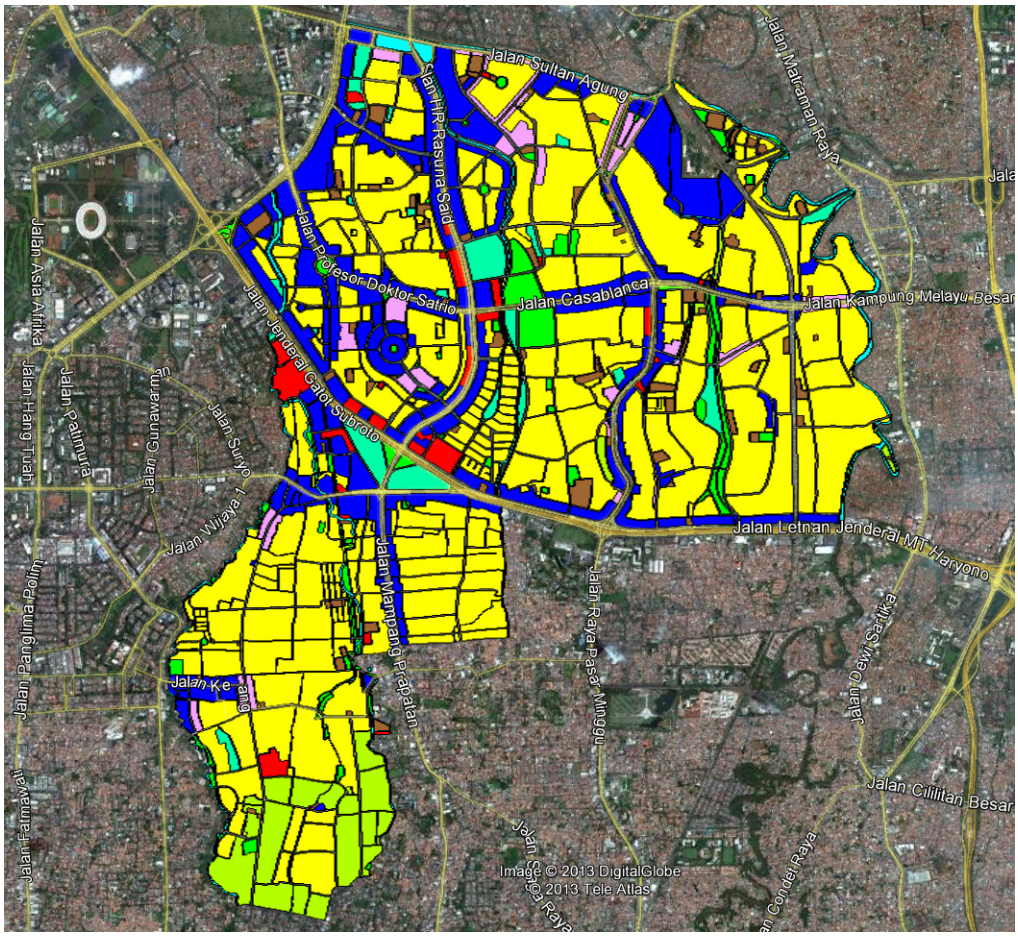
Segment	Occupancy level	
	South to North	North to South
Sta Kuningan Sentral	2,07	2,43
Sta Taman Rasuna	1,17	1,17
Sta Casablanca	1,53	1,47
Sta Kuningan Barat	1,60	1,73
Sta Mega Kuningan	1,13	1,20

Source: field survey (traffic counting), PUSTRAL-UGM (2012).

5.3. Landuse pattern and traffic flow problem in Kuningan Area

The high traffic volume in Kuningan area is caused by the condition of existing land-use system. As it is known that the Kuningan area is a dense region in central Jakarta were filled with commercial, administration, and socio-economic facilities and activities. The future Kuningan area (Figure 4-17) will be developed to establish the current pattern of high density business district development (blue, purple and red colours).

Figure 4-17: Development Plan for Kuningan area 2030 (Draft), Jakarta



Source: The Government of DKI Jakarta Province.

Kuningan as a strategic bussiness district with a highly developed activities on the both sides of the road also worstening traffic situation when the traffic from other side of the road would across the road to access the building or sites on the other side. It

create a U-turn conflicted traffic that slowdown the through traffic on the main street. It is important therefore in the simulation to take into account this traffic situation.

5.4. Estimating scale of investment for the simulation

To set the case of simulation model it is important to assess the system boundary of the model. The determining factor is not only the area but also the scale of investment. For the micro-simulation traffic model, the impementation should consider the available budget of potential implementing agency (i.e Public Work and Transportation Agency). If the implementation will be considered as a pilot project for smart community development as proposed in this study, a reasonable amount of budget should be estimated to ease the introduction of new approach for finding traffic congestion solution. Hence, to get a reasonable amount of investment for piloting, the estimate will not at the level of new road infrastructure, instead for a maintainance level. Learning from the budget allocation for maintain and rehabilation of several road di DKI Jakarta in 2012, the estimate of average cost/km is Mio IDR 9,151 (~ USD 1000,000).

Table 4-13: The estimate for road maintenance cost for Jakarta (2012)

Road Segments	Cost (Mio IDR)	Length (Km)	Average Cost/Km (Mio IDR)	Average Cost/100m (Mio IDR)
S Parman, Gatot Subroto, MT Haryono	30,000	5.400	5,555	555
Cakung Cilincing, DI Panjaitan	24,500	2.439	10,045	1,004
RE Martadinata	42,800	1.930	22,176	2,217
TB Simatupang, Mayjen Sutoyo	7,028	2.618	2,684	268
Jl Link Barat	1,152	0.225	5,120	512
		Average	9,116	911

Source: Directorate General of Highway, Ministry of Public Works (2012).

The micro simulation is intended to provide a solution for certain spot i.e junction, U-turn, hence the estimate of 100 meter lenght is quite reasonable volume for piloting. Therefore, we recommend that USD 100.000 would be the maximum threshold for designing engineering solution in the simulation. With this level of investment, a quick yielding can be obtained and the new approach for addressing traffict congestion and efficient transport sector could be bought-in by the implementing agency.