

Energy Consumption in the Road Transport Sector

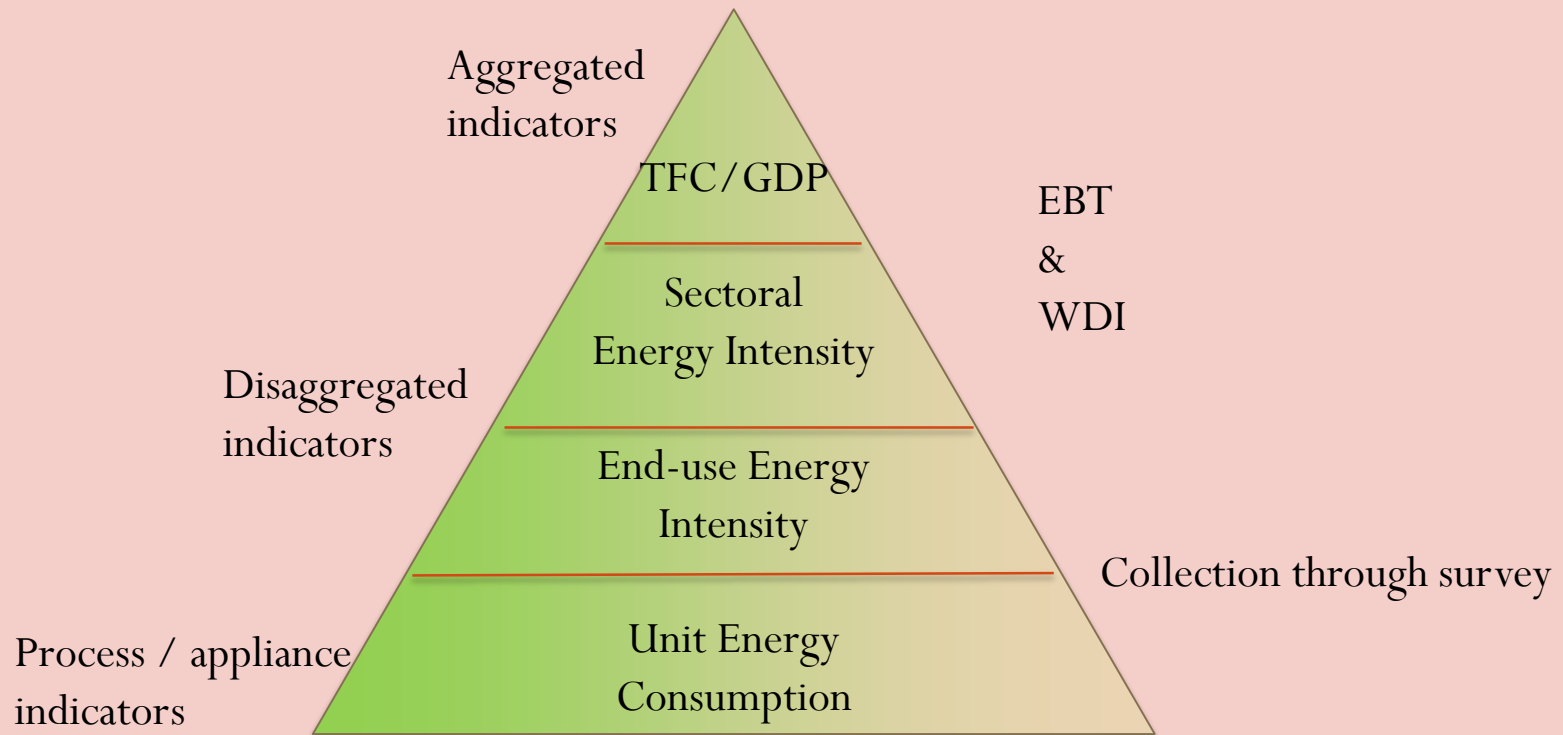
Parking Lot Survey in Cambodia, Lao PDR and
Myanmar

Outline

- ❑ Energy Efficiency Indicator
 - Transport Sector Energy Intensity
 - End-Use Energy Intensity
 - Unit Energy Intensity
- ❑ Energy Data in Cambodia, Lao PDR and Myanmar(CLM)
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- ❑ Parking Lot Survey
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Definition

- Formula of Energy Efficiency Indicators (EEI)
 - $EEI = \text{Energy consumption} / \text{activity}$



Source : IEA

Transport Sector Energy Intensity

- Transport mode: Rail, air, road and inland waterways
 - Energy consumption
 - Coal: rail
 - Petroleum products:
 - Gasoline: road
 - Diesel oil: rail, road, inland waterways
 - LPG: road
 - Jet fuel: air
 - Fuel oil: inland waterways
 - Electricity: rail, EV
 - Activity
 - Ton kilometer, passenger kilometer
 - Fuel economy (liter/km or km/liter)

Transport Sector

End-use Energy Intensity

- **Transport mode:** rail, air, road and inland waterways
 - Passengers and freight
 - Activity
 - Ton kilometer, passenger kilometer

Unit Energy Consumption

- Road transport mode
 - Types of vehicle
 - Sedan
 - SUV
 - Pick-up
 - Truck: small, middle and large
 - Bus: small, middle and large
 - Engine capacity
 - Necessary data from a survey
 - Fuel economy (km/liter or liter/km) by vehicle type
 - Mileage (km/week, km/month, km/year) by vehicle type

Energy Data in CLM (Cambodia, Lao PDR and Myanmar)

- ❑ Accurate and reliable energy statistics are needed to design appropriate energy policies and planning of a country
- ❑ Energy Ministry in Cambodia, Lao PDR and Myanmar has no official, historical, and consistent energy statistics.
- ❑ Each CLM energy ministries started to prepare official energy statistic with support from the Economic Research Institute of ASEAN and East Asia (ERIA)
- ❑ ERIA team enhance the capacity of the CLM energy planning team in:
 - Energy data collection (primary data)
 - Developing Energy Balance Table (EBT) using Joint Questionnaires
 - Pilot energy consumption survey (industry, transport, Residential and commercial sector)
 - Capacity building trainings such as basic understanding of energy statistics

ERIA support in Development of CLM Energy Statistic

- ❑ Cambodia (GDE-General Department of Petroleum and GDE-General Department of Energy)
 - Petroleum Statistic : 2013
 - Cambodia National Energy Statistic : 2015 (published 2016)
 - Updating Energy Statistic with 2016 Data
- ❑ Lao PDR (DEPP-Department of Energy Policy and Planning)
 - Lao PDR National Energy Statistic : 2017 (published 2018)
 - Internship in Updating Energy Statistic : 2018 (Mid-August)
- ❑ Myanmar(OGPD-Oil and Gas Planning Department)
 - Myanmar National Energy Statistic: 2017-2018 (to be published October 2018)

Parking Lot Survey

- ❑ The main objective of the survey was to collect the necessary energy consumption data of the road transport sector.
- ❑ The survey outcome:
 - Understanding the energy consumption in the road transport sectors
 - Fuel Economy
 - Distance travelled
 - Basis for estimating national energy consumption of the road transport sector by fuel and by type of vehicles
- ❑ Scope of Survey : pilot survey – limited samples size and area
- ❑ National energy planning team:
 - Select national consultant to conduct survey
 - Supervise and manage implementation of Survey
 - Liaison between consultant and ERIA team

Methodology

- Preparation of Questionnaire
 - ERIA expert team prepared the questionnaire in close consultation with the team members of the energy planning divisions under the energy ministries in Cambodia, Lao PDR and Myanmar
- Sampling and sample size
 - Random in several parking lot locations around Phnom Penh (Cambodia), Vientianne(Lao PDR) and Ynagoon (Myanmar)
 - Total vehicles 200 by different type of vehicles
- Distribution and Collection of Survey Questionnaire
- Analysis of Survey Result
 - Fuel Economy
 - Distance travelled
- Inflation of survey results to national number
- Comparison with national energy statistics

Survey Questionnaire

General Information

- Survey Date
- Parking Lot Location

Parking Lot Survey								
Location :								
Seq.	Plate Number	Vehicle Type*)	Vehicle Ownership**)	Engine Capacity (cc)	Fuel Purchased weekly		Distance travelled weekly (km)	
					Fuel Type ***)	Amount	Unit ****)	
1								
2								
3								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

Vehicle Description

- Plate No.
- Vehicle Type
- Vehicle Ownership
- Engine Capacity
- Fuel Type

Weekly Data

- Fuel Purchased
- Distance Travelled

Note: Cross-check consistency between amount of fuel and distance travelled

Sedan/ car



Bus

Detailed Options

*) Type of Vehicle

1	Sedan
2	SUV
3	Pick-up
4	Truck
5	Bus
6	Motorcycle
7	Tuktuk
8a	Others



Pick-up



SUV



Van



Truck



TukTuk



Motorcycle

**)Ownership Type

1	Personal
2	Office/Company
3	Diplomatic
4	Taxi
5	Others (specify)

***) Fuel Type

1	Gasoline
2	Diesel
3	LPG
4	CNG
5	Others (specify)

****) Unit

liter
Kg
Other (specify)

Questionnaire for Transport Companies

Interview Date :

Name of Comp :

Address: :

Vehicle Description

1	Bus
2	Truck
3	Taxi

Vehicle Size

1	Large
2	Medium
3	Sedan

Please fill the monthly consumption or purchasing amount in 2016-2

Month		Numbers of Operating Vehicles	Monthly Consumption *) (liter)	Mileage (km)
Jun-16				
Jul-16				
Aug-16				
Sep-16				
Oct-16				
Nov-16				
Dec-16				
Jan-17				
Feb-17				
Mar-17				
Apr-17				
May-17				

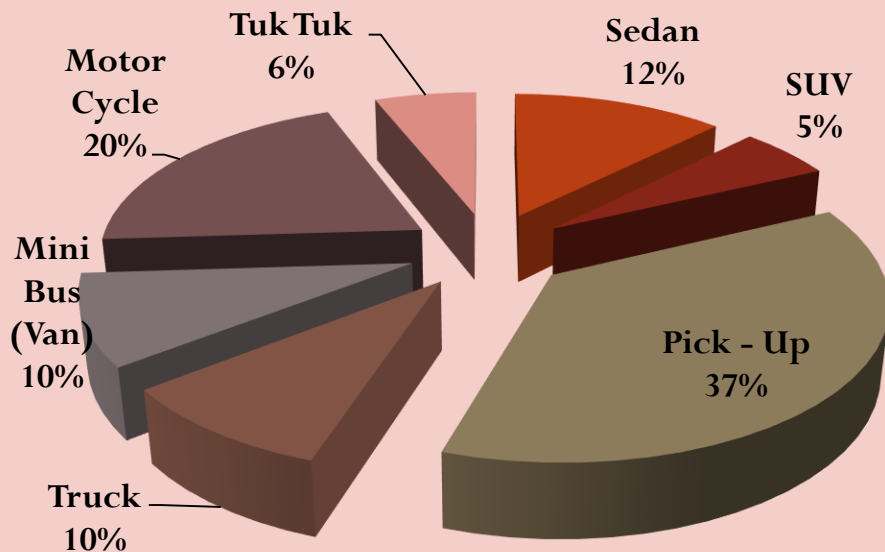
*) Fuel Type

1	Gasoline
2	Diesel
3	thers (specify)

Example of Parking Lot Survey

Lao PDR

- 1 Anou Park
- 2 Aussie market
- 3 ITEC Shoping Mall
- 4 Khet Market
- 5 Kuadin market
- 6 Nong Nieu market
- 7 Sikhay Market
- 8 Victory Monument
- 9 View Mall
- 10 VTE Center



SAMPLES

No	Vehicle Type	Amount
1	Sedan	24
2	SUV	11
3	Pick - Up	74
4	Truck	19
5	Bus	19
6	Motor Cycle	40
7	Tuk Tuk	11
TOTAL		200

Vehicle Share

TYPE OF VEHICLES	TOTAL SHARE	GASOLINE SHARE	DIESEL SHARE
Sedan/Car	100%	76.2%	23.8%
SUV	100%	45.5%	54.5%
Bus (minibus)	100%		100.0%
Pick-Up	100%		100.0%
Truck	100%	40.0%	60.0%
Motorcycle	100%	100.0%	
Tuk Tuk	100%	100.0%	

Source: Calculation

Fuel Economy and Distance Travelled

TYPE OF VEHICLES	AVERAGE KM/LITER		AVERAGE KM/YEAR	
	GASOLINE	DIESEL	GASOLINE	DIESEL
Sedan/Car	9.6	9.5	15,236	16,276
SUV	9.9	9.3	16,006	16,995
Minibus/Van		9.2	0	18,206
Pick-Up		9.1	0	16,712
Truck	9.8	9.8	31,633	15,327
Motorcycle	20.5		5,104	0
Tuk Tuk	10		15,974	0
Bus*)		3.40		4981

Inflation of Survey Result to National Level

$$\text{Total Consumption} = \text{Consumption/Vehicle} * \text{Total Vehicle}$$

$$\text{Consumption/Vehicle} = \text{liter/km} * \text{km/Vehicle}$$

The diagram illustrates the components of the 'Consumption/Vehicle' term. It shows the equation $\text{Consumption/Vehicle} = \text{liter/km} * \text{km/Vehicle}$. Below the 'liter/km' term, a large orange arrow points down to the text 'Fuel Economy'. Similarly, below the 'km/Vehicle' term, a large orange arrow points down to the text 'Distance Travel'.

Fuel Economy

Distance Travel

Formula

$$OIL_i = \sum_{i=vehicle}^n (FE_i * DIS_i * VEHi)$$

where:

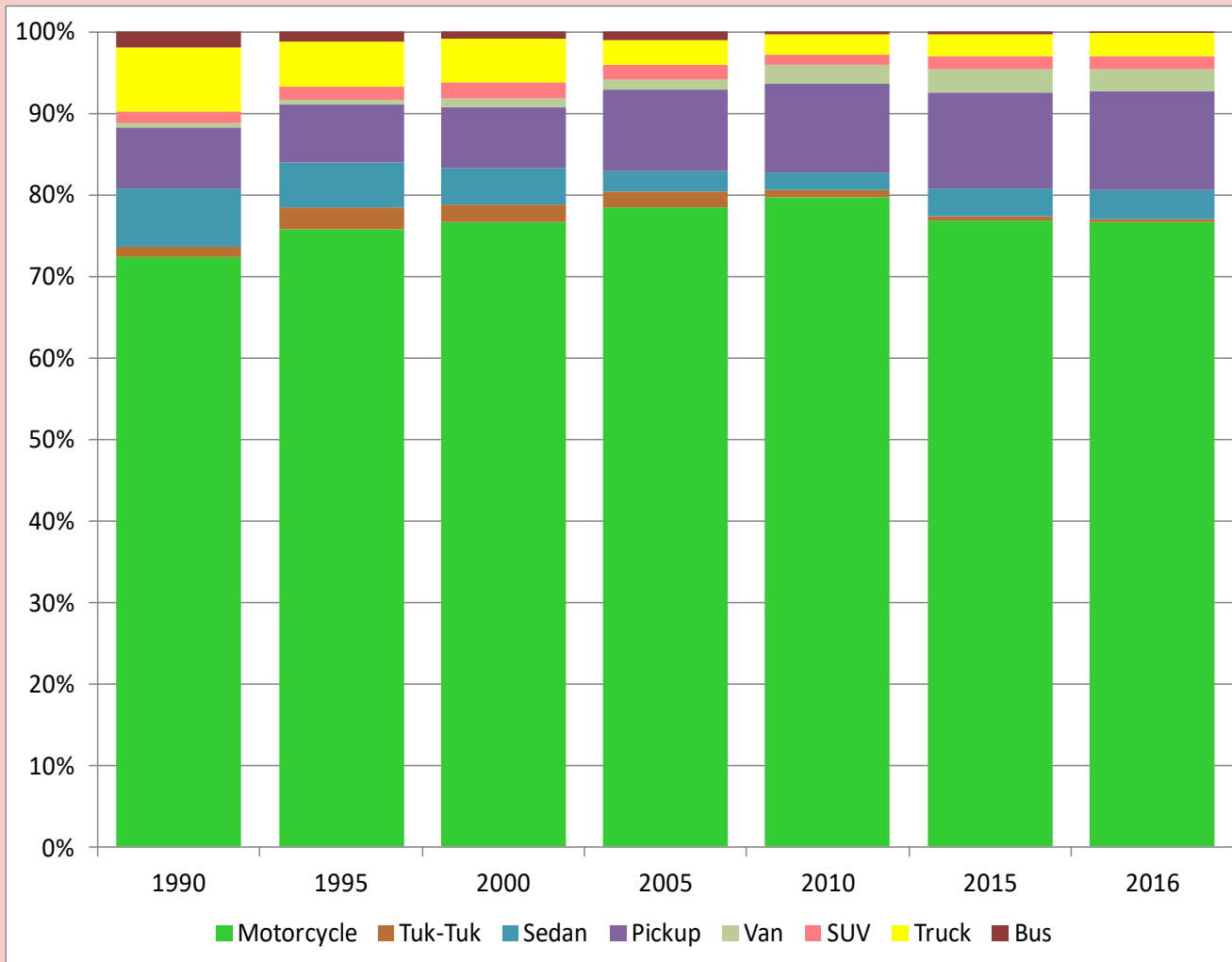
OIL_i is the total gasoline/diesel consumption for vehicle type i ;

FE_i is the fuel economy of vehicle type i ;

DIS_i is the distance travelled of vehicle type i ; and

$VEHi$ is the total number of gasoline/diesel vehicles for type i .

Vehicle Population in the Lao PDR, 1990–2016



- Total vehicle increased by 13% per year, from around 80,000 in 1990 to 1.8 million in 2016.
- Majority is motor-cycle
- No breakdown of vehicles by type of fuel consumed

Source: Total Vehicle from Department of Transport, Ministry of Public Works and Transport, Lao PDR

Total Road Fuel Consumption (KI)

VEHICLE TYPES	NUMBER OF VEHICLE			FUEL USE (Ltr)/CAR		TOTAL CONSUMPTION (KL)		
	TOTAL	Gasoline-Fuelled	Diesel Fuelled	Gasoline-Fuelled	Diesel Fuelled	GASOLINE	DIESEL	TOTAL
Sedan/Car	56,461	25,222	31,239	1,587	1,713	40,030	53,524	93,554
SUV	26,665	12,120	14,545	1,617	1,827	19,596	26,579	46,175
Van	47,553		47,553		1,979		94,103	94,103
Pick-Up	204,360		204,360		1,836		375,304	375,304
Truck	48,739	4,874	43,865	3,228	1,564	15,732	68,624	84,357
Motorcycle	1,318,107	1,318,107	-	249		328,176		328,176
Tuk Tuk	8,761	8,761	-	1,597		13,995		13,995
Buses*)	4,448		4,448		1,465	0	6,518	6,518
TOTAL	1,715,094	1,369,084	346,009			417,529	624,651	1,042,180

*) Bus company average (Interview)

**) Vehicle Breakdown by fuel was assumed based on survey result

Source: Total Vehicle from Department of Transport, Ministry of Public Works and Transport, Lao PDR

Comparison with national energy statistics

Gasoline			5. Diesel Oil			
Year	Import	Consumption	Impor	Consumption		
		Transportation		Transportation	Agriculture	Industry
2000	101,675.93	100,475.93	214,461	201,569	323.31	12,569
2001	102,439.00	100,439.00	245,641	236,513	323.31	8,805
2002	108,002.00	107,002.00	247,574	238,059	323.31	9,191
2003	112,200.00	110,200.00	255,769	250,615	323.31	4,830
2004	119,879.07	117,879.07	262,904	257,323	323.31	5,257
2005	129,355.53	124,300.53	271,031	266,825	323.31	3,883
2006	143,473.26	134,653.56	375,295	282,850	323.31	92,122
2007	152,502.03	152,502.03	381,944	307,177	323.31	74,444
2008	159,454.81	159,454.81	457,327	365,013	323.31	91,991
2009	178,296.40	155,117.87	538,769	430,015	323.31	108,431
2010	178,296.40	152,885.10	538,769	436,034	323.31	102,411
2011	166,441.71	144,804.29	550,844	439,805	323.31	110,716
2012	159,626.82	139,559.36	601,588	510,293	323.31	90,971
2013	219,250.60	215,649.61	643,276	533,735	323.31	109,217
2014	212,949.58	210,415.81	688,907	654,122	323.31	34,462
2015	234,198.67	223,318.45	849,151	806,274	323.31	42,554
				1,029,593		

Source: DEPP

Findings

- ❑ Result for total oil consumption was slightly higher than the DEPP data (less than 5%).
- ❑ The breakdown by diesel and gasoline fuel was significantly different:
 - Overestimation of gasoline consumption
 - Lower diesel consumption
- ❑ DEPP energy data:
 - Total transport sector (including air and water). No rail in Lao PDR
 - Gasoline is all assumed for road transport
 - Diesel including water transport
 - Oil company data is not complete (data mainly from Lao State Fuel)
- ❑ Vehicles breakdown by fuel type was only estimation based on the pilot survey result

Future Improvement

- ❑ Parking Lot Survey (Pilot) is the first being conducted in Lao PDR and still need improvement.
- ❑ However, meaningful transport information can be extracted from survey:
 - fuel economy and mileage of selected types of vehicles
- ❑ For Future, DEPP need to strengthen collaboration with:
 - Ministry of transport / motor vehicle registrations to obtain:
 - ❖ vehicle breakdown by type and fuel consumed
 - ❖ Vehicles Operating or not operating
 - ❖ Newly registered vehicles
 - Oil companies in Lao PDR for import and sales data.
 - Statistic office to attach questionnaire for collecting:
 - fuel consumption,
 - fuel economy and
 - mileage by each type of vehicle

THANK YOU