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PUBLIC TRANSPORT PLANNING (Tariff, Subsidy, and Energy)

Introduction of Transportation Planning

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Tariff and Subsidy

INTRODUCTION

- Public transport tariff is influenced by:
  1. ATP (*Ability to pay)*
  2. WTP (*Willingness to* pay)

Ability to pay **(ATP)**

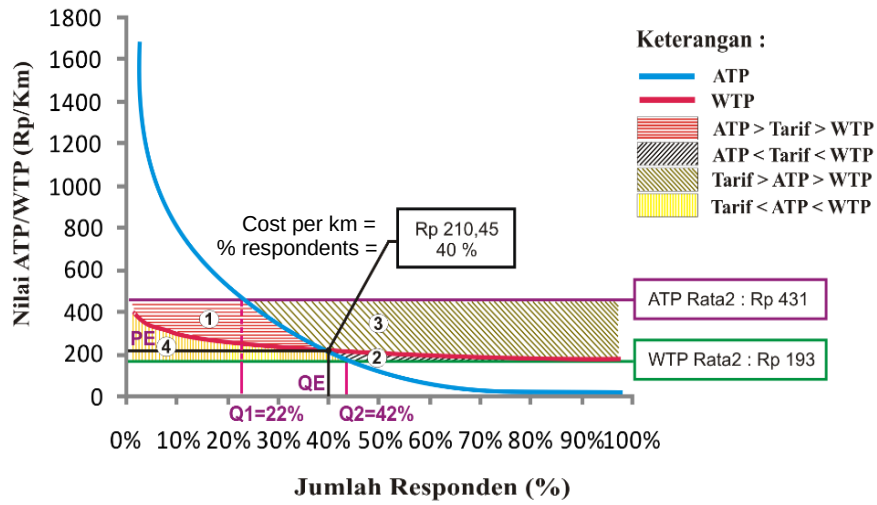
- ATP : Paying ability of society to a services or goods based on the percentage of expenditure from income, where the percentage of income must be determined.
- The factors which give affect on ATP: family income per month, allocation of transport costs, intensity of trips and number of family members.

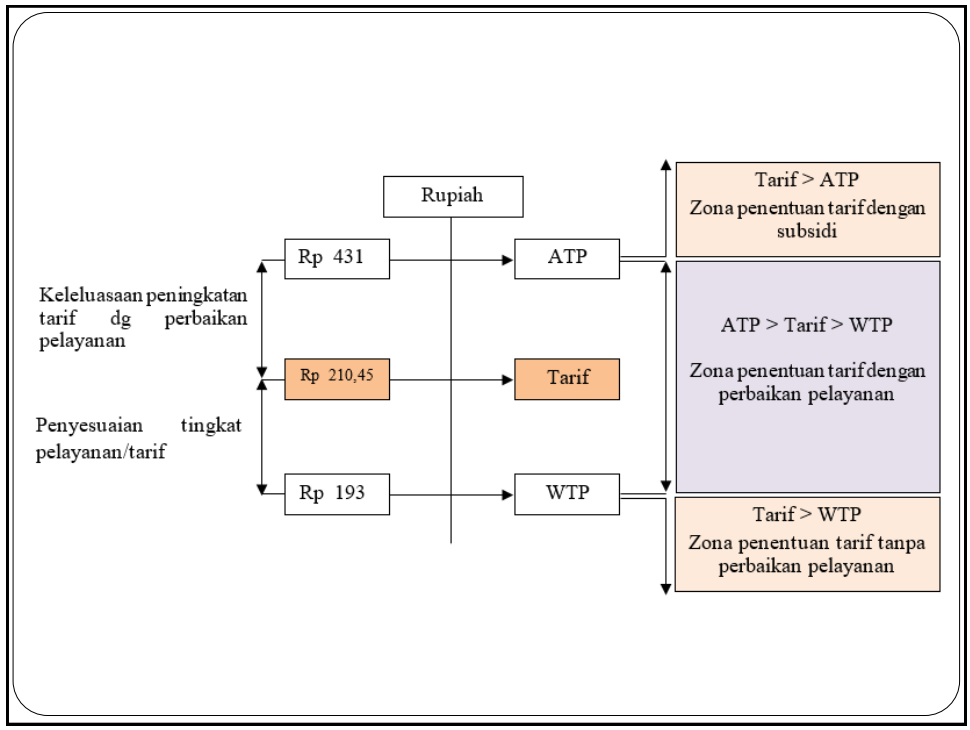
Willingness to pay **(WTP)**

- WTP : Paying ability of society to a services or goods directly based on the desire to get services that deserves with the money owned.
- WTP is influenced by : products that offered by the operator of transportation services, quality and quantity of services provided, the utility or users intent to transportation and user income

- Public transport costs can be influenced by:
  1. Public Transport Passengers
     - Public
     - Children and Students
     - Eldelery and diffable
  2. Trip Types
     - Single trip
     - One day pass, … , Three days pass , … (or weekly)
     - Monthly ticket
  3. Cost Type
     - Flat tariff
     - Zone based tariff
     - Distance based tariff

Example : Cost Analysis Result





Example : Determine the Average of ATP and WTP

Penghasilan per bulan	: Rp 2.500.000,-
Alokasi untuk transportasi per bulan	: Rp 250.000,-
Persentase transportasi per bulan	: $\frac{Rp\ 250.000}{Rp\ 2.500.000} x\ 100\ \% = 10\%$
Alokasi untuk kendaraan pribadi per bulan	: Rp 200.000,-
Persentase kendaraan pribadi per bulan	: $\frac{Rp\ 200.000}{Rp\ 250.000} x\ 100\ \% = 80\%$,-
Frekuensi perjalanan per bulan	: 40 kali sebulan
Panjang perjalanan per hari	: 4,2 km
Panjang perjalanan per bulan	: 40 x 4,2 km = 168 km
Kemauan membayar bus	: Rp 5.000
Panjang jalur bus (rencana)	: 20 km

$$ATP = \frac{2.500.000 \times 10\% \times 80\%}{168} = \text{Rp } 1.190 \text{ rp/km}$$

$$WTP = \frac{5.000}{20} = \text{Rp } 250 \text{ rp/km}$$

Subsidy

- After knowing the cost per km (as income), then calculate the expense (e.g: BOK, etc) per km. The difference between them is subsidy which should be given.
- If the income not only come from passenger tickets, it can minimize the subsidy.

Payment Types

Type	Information	Advantage	Disadvantage
On-Board Payment (Fare box)	Passengers pay in the bus	• Cheapest	• Boarding time and Alighting longer become longer
Hybrid Fare box/Ticket Machines	In the place which has many passengers, payment occurs in the bus stop. In the place which has fewer passengers, payment occurs in the bus.	• Cheaper than POP • Boarding time dan alighting become quicker	• More expensive, because it needs costs for ticket machines in station
Proof-of-Payment (POP)	Buy a ticket in the counter/online/store, then there is an inspector who check the ticket in the bus (such as in train)	• Minimum Dwell time and delay time	• Expensive
Closed Fare System	Pay in the bus stop	• Minimum Dwell time and delay time	• Very expensive

Example

There are 3 policies for Trans Jogja bus operations:

A. Increase the ticket from 0.75 to 1 USD, to rise the income

B. Decrease the service frequency from 4 times per hours to 2 times per hours, to decrease the bus operating costs.

C. Increase the service frequency from 4 times to 6 times per hours, to increase the number of passengers (many passengers move from private transport to bus)

Question: which is the most effective policy?

The result of the utility function logit models are:

$U_{bus} = -(0.41*OPC) + (0.24*FREQ) - (0.68*TTT)$
$U_{private\ transport} = a_0 - (0.47*OPC) - (1.22*TTT)$

FREQ = Frequency per hour
OPC = Total trip cost
TTT = Total trip time

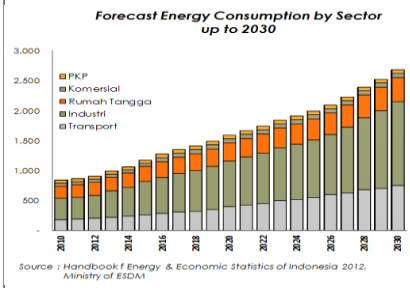
Data :

- TTT bus = 18 minutes
- TTT private transport = 10.5 minutes
- OPC private transport (Assumption) = 0
- Constant private transport = 0.73
- Number of traveler (total) = 1000
- BOK bus = 40 USD

Kondisi Eksisting		Skenario 1	2	3
TTb	18	18	18	18
TTm	10.5	10.5	10.5	10.5
s0s	0.73	0.73	0.73	0.73
s0b	0	0	0	0
OPCb	0.75	1	0.75	0.75
OPCm	0	0	0	0
FREQb	4	4	2	6
FREQm	0	0	0	0
Konstanta				
OPCb	-0.41	-0.41	-0.41	-0.41
TTb	-0.68	-0.68	-0.68	-0.68
FREQb	0.24	0.24	0.24	0.24
OPCm	-0.47	-0.47	-0.47	-0.47
TTm	-1.22	-1.22	-1.22	-1.22
FREQm	0	0	0	0
Ub	-11.59	-11.69	-12.07	-11.11
Um	-12.08	-12.08	-12.08	-12.08
Pr b	62	60	50	73
Pr m	38	40	50	27
Pndptn	466	596	377	544
BOK	160	160	80	240
Selisih	306	436	297	304

Energy

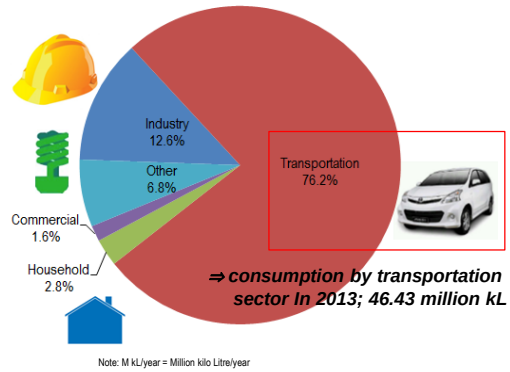
INTRODUCTION



Transportation sector contribute **ca.27% of total energy demand**.

Total oil consumption In 2013, 60.93 million kL

Indonesia Oil Consumption by Sector



⇒ consumption by transportation sector In 2013; 46.43 million kL

Note: M kL/year = Million kilo Litre/year

Transportation sector use **76.2% of total oil consumption**. Among the transportation sector, **consumption by road transportation is ca.88% (40.86 million kL in 2013)**

⇒ "Road transportation" consumes 67% of oil as petroleum products (= fuel)

FUEL TYPES

- Determine the fuel of public transport appropriately
- Fuel types:
  1. Diesel bus
  2. Trolley bus (use electricity)
  3. Dual mode bus (use electricity and diesel)
  4. Hybrid bus (use diesel, electricity and battery as fuel storage which can be used
  5. LPG and CNG bus