

ASSESSING THE FLEET REQUIREMENT PUBLIC TRANSPORT IN MEDIUM SIZED INDONESIAN CITIES

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Abstract: In many Indonesian cities urban transport services are provided by small independent operators using small vehicles (seat capacity 10-16) and are operated by drivers as independent contractors. Public transport operation is highly regulated, including route designation, fleet size and fares. Typically, ceilings for the fleet size are set too high and are met almost in each route, resulting in drivers unable to generate sufficient revenues to cover the operating costs. This condition encourages drivers to demand fare increase, which could be avoided should the fleet size is set properly. A survey on mikrolet operation was conducted in Bandar Lampung during August-October 1999. The result suggests that the number of operating mikrolet is excessive, resulting in low vehicle utilization and limited driver's income. The investigation shows that the fleet size in each route could be reduced without sacrificing the service frequencies or the need to increase fares.

Key Words: Indonesia, public transport, fleet

1. INTRODUCTION

In Indonesia, the types of vehicle used for urban transport services range from full-sized (conventional) bus either single- or double-decker (seat capacity 40-110); minibus (24-27 seats); 'mikrolet' (10-16 seats); taxi (4 seats); 'bajaj' (motorized tricycle, 2 seats); 'ojek' (private-hire motor-cycle, 1 seat); two- or four-wheeled horse-drawn-cart (4-6 seats); and 'becak' (human-powered tricycle, 2 seats). In the national capital of Jakarta and other large provincial capital cities having population of well over 1 million (e.g. Surabaya, Medan, Bandung, etc.), public transport services are characterized by the use of motorized vehicles (conventional bus, minibus, mikrolet, taxi and bajaj), while the non-motorized public transport vehicles are prohibited (they are allowed to operate only in limited areas of the cities). At the other end of the scale, in the small district and sub-district capital cities with population of up to 100,000 (e.g. Bima, Purworejo, Metro) mikrolet and non-motorized vehicles play significant role, with no bus or taxi services. Between these two extremes, in the medium-sized cities (Bandar Lampung, Yogyakarta, Mataram), public transport services are provided by a combination of (mainly) mikrolet, minibus, and taxi. Like in the larger cities, in the medium-sized cities, the availability of non-motorized public transport is limited to certain areas of the cities. In all cities, irrespective of the size, operating ojek is illegal but tolerated. Other than in the national capital there is no form of urban rail service.

Bandar Lampung is the capital city of Lampung Province, situated 200 km west of Jakarta, with an area of 192 km². Having a population of 670,000 in 1997, and a growth rate of 1.7% per annum (BPS, 1999), it falls within the 'medium-sized' category. In this municipality, public transport services are provided by DAMRI (a state-owned public transport company specializing in road transport), small private companies and independent operators, utilizing minibuses and mikrolets. In addition there are ojek and becaks, which are limited in number and in service coverage and therefore play less important role. There is only a single type of service: regular (non-express, non-air-conditioned), the fares are flat per passenger per trip irrespective of the distance travelled, uniform for all routes (minibus is slightly cheaper than mikrolet) throughout the whole day (no difference between peak- and off-peak-times), and there is no subsidy in public transport operations.

Indonesia has been suffering from economic, political and social crises during the last 3 years, and there is no clear sign of significant recovery, until to date. The rupiah currency (Rp) has become seriously undervalued against the United States Dollar (USD) and other foreign currencies, from an exchange rate of Rp2,500.00/USD in July 1997, it fell to over Rp15,000.00/USD in June 1998 (Sjahrir, 1998), and is currently stabilizing at a level of around Rp10,000.00/USD since March 2001. All over the country, prices of goods and services rose substantially. In the transport sector, fares for urban transport services rose by around 50 % following the crisis.

The author is conducting research on the impacts of the crisis on transport markets, focusing on Bandar Lampung. The reasons to select this municipality are mainly the time and budget constraints, which prevent him from conducting a large public transport survey in the national capital (Jakarta). The size of the city and the dominance of mikrolets in Bandar Lampung enable him to concentrate the survey and data analysis on mikrolet operation, within the available time and budget constraints. The study is dealing with operator response (changes in service levels), government response (regulation and its implementation), and public response (changes in household travel behaviour). This paper discusses the influence of fleet size and fares on costs and revenues in mikrolet operation.

This paper consists of 5 sections. Section 1 is an introduction, giving a brief description of the public transport services available in the Indonesian cities and the state of crisis experienced since mid 1997. Section 2 is a further description of the public transport operating characteristics in the study area of Bandar Lampung, covering the types of vehicles used, the existing fleet size, fare structure, service frequency, etc. Sections 3 deals with data collection method, consisting of the surveys on service frequency and passenger counting on mikrolet routes. In section 4 the findings from the surveys are discussed, trying to assess the appropriateness of the existing fleet size and fares, offering a better solution and the policy implication of the proposed solution. And Section 5 is the conclusion from the discussions in the previous sections.

2. MIKROLET OPERATING CHARACTERISTICS

The vehicles used as mikrolet are pick-ups converted to minibuses to carry 10-16 passengers, with engine capacities of 1000-1800cc. All of the vehicles are assembled in Indonesia under licensing from the Japanese principals (Daihatsu, Mitsubishi, Suzuki and Toyota). Most of the vehicles are owned by private individuals as independent operators, and are operated by drivers as independent contractors.

Presently, there are 2510 registered mikrolets for 13 routes in Bandar Lampung. More than 90% (2315 mikrolets) are registered in 7 major routes. The vehicles are colour coded according to the assigned routes, and every single vehicle has a route licence, which is only valid for a particular vehicle and for a particular route. The services are available mainly during the day until late evening (06.00-21.00). But on the main route of Tanjung Karang-Rajabasa mikrolets provide almost 24-hour coverage.

Mikrolets operate between two terminals. However, there is no scheduled departure or queuing system in its operation. They usually depart when the vehicles are full or when they have reasonable number of passengers onboard. The service frequencies are high. On the main route of Tanjung Karang-Rajabasa for example, during daytime, there are more than 200 passages per hour (nearly 4 mikrolets per minute) in one direction. As there are no fixed stops, mikrolets can be hailed and passengers get in and off at any point along the route.

The fare is Rp500.00 (USD0.05) per adult passenger per ride between two terminals, students pay less (Rp400.00 = USD0.04). Passengers may bargain for very short distance trips. As little as Rp100.00 (USD0.01) is still acceptable, especially for school pupils. The fare has increased by around 40-60% compared to before the crisis (Rp350.00 for adults and Rp250.00 for students).

As independent contractors, drivers pay a lump-sum amount to the vehicle owners, bear the fuel cost for the day's operation, and keep the rest of the day's revenues to share with their 'assistant' (who gives help in looking for passengers and collecting fares), if any. The majority of mikrolet drivers (70%) work without assistants. In addition to the fuel cost, mikrolet drivers pay terminal fee (Rp800.00 = USD0.08 per terminal per day) and 'unofficial fee' to a certain type of individuals who occupy locations where there are many potential passengers. The average unofficial fee is Rp100-200.00 (USD0.01-0.02) per stop depending on the number of passengers boarding from that point. In total a driver could pay more than Rp5,000.00 per day.

In general there is no serious traffic congestion in Bandar Lampung. Minor congestion occurs in the city centre streets. In addition, mikrolets frequently and suddenly stop and go at any points along the roads. Other road users need to be extra alert to be safe.

3. DATA COLLECTION

A survey on mikrolet operations was conducted during the month of August 1999, consisting of a roadside survey on service frequency on 7 major routes, an onboard survey for passenger counts on 2 major routes, and driver and owner interviews covering the operating characteristics. Additional information was obtained from Dispenda (Economic Division of the Municipality Office, the route licensing authority) and LLAJ (Road Transport and Traffic Agency, the issuing authority of the road worthiness certificate for public transport vehicles).

3.1. Service Frequency Survey

In the service frequency survey, surveyors were located on the roadsides to record the number of passing mikrolets from 07.00 – 22.00 on the main routes of Tanjung Karang-Rajabasa and Tanjung Karang-Sukaraja, and from 07.00 – 17.00 on the other routes (Sukaraja-Panjang,

Tanjung Karang-Way Halim, Tanjung Karang-Sukarame, Tanjung Karang-Pahoman, and Tanjung Karang-Langkapura). One surveyor observed traffic in both directions, except for the first 2 routes where, due to the high frequency of mikrolet services, 2 surveyors were required for each route.

Mikrolets are colour coded by the routes they serve. They also have three-digit identification numbers posted on the front doors and on the rear windscreen. The surveyors were instructed to record these numbers. In cases where there are no identification numbers (this means the mikrolets are not registered and is therefore illegal), they should record the police registration numbers (plate numbers).

The plate numbers are typically four-digit numbers followed by 2 letters. Due to the high frequency of the mikrolet services, it is not possible to record the plate numbers in full. Instead, only the four-digit numbers were recorded. However, there is little probability that 2 or more mikrolets having the same four-digit numbers (but different following 2 letters) serve the same route, and both are not registered. Using these records, it is possible to identify the number of trips made per day by every single mikrolet operating on these routes.

3.2. Passenger Counts

The passenger counts were conducted on 2 major routes, Tanjung Karang-Rajabasa and Tanjung Karang-Langkapura, on a Sunday and a weekday (Tuesday). The reasons for selecting these 2 routes were based on the facts that: (a) the routes are straight forward between 2 terminals (the other routes, for example Tanjung Karang-Pahoman, are circling, and there are sections of the routes where mikrolets may deviate to any roads between the specified entrance and exit points), and (b) there are clear points along the routes where usually many passengers boarding or alighting.

The routes between the 2 terminals were divided into sections of 0.5-2.0 km long, the selection of which is based on the previous observation where many passengers boarding or alighting. To count the number of passengers on mikrolet trips, one surveyor is required per mikrolet. This surveyor boards the mikrolet from the starting point in a terminal, taking a seat in the right rear corner of the vehicle, facing the doors to enable him/her to observe passenger's movements. While the vehicle is in motion, he/she counts the number of boarding and alighting passengers along each section of the route, but he/she does not need to count him/herself as a passengers. At the end terminal he/she gets off the mikrolet and takes another one to start the passenger count in the other direction. The surveyors do this task repeatedly from 07.00 in the morning until 17.00 or later. Ten surveyors conducted the survey simultaneously on the 2 routes for 2 days, making 216 and 197 trips on the routes of Tanjung Karang-Rajabasa and Tanjung Karang-Langkapura, respectively.

4. DATA ANALYSIS

Following the crisis, to meet the operator's demand, the government increased fares on public transport services. However, in fact, public transport operation in Bandar Lampung is far from being efficient. This section discusses the influence of fleet size and fares on costs and revenues in mikrolet operation.

4.1. Fleet Size

Table 1 shows numbers of mikrolets (ceiling, registered and operating) in each of the 7 major routes and their service frequencies from the survey. It can be seen that the ceilings are already met for the routes of Tanjung Karang-Rajabasa and Tanjung Karang-Langkapura, while on the other routes they are nearly met, except on Tanjung Karang-Pahoman. There are large discrepancies between the numbers of operating and registered mikrolets almost in every route except on Tanjung Karang-Sukarame. This happens because many of the mikrolets are out of service due to some maintenance problems as prices of spare parts increased by at least 100% (money-term) following the crisis (Arintono, 2000).

Table 1: Fleet Size and Frequency on Mikrolet Services

Route Description	Number of mikrolets			Trips (2 directs)	Observed time (hrs)	Trips/hour (2 directions)	
	Ceiling	Registered	Operating			Average	Maximum
Tkarang-Rbasa	485	485	394	5,972	15	398	526
Tkarang-Sraja	450	423	334	4,865	15	324	396
Sraja-Panjang	275	248	178	2,352	10	235	276
Tkarang-Whalim	350	338	242	3,286	10	329	372
Tkarang-Srame	250	248	245	2,493	10	249	291
Tkarang-Pahoman	350	223	164	1,919	10	192	331
Tkarang-Lpura	350	350	308	3,413	10	341	385
Total	2,510	2,315	1,865	24,300			

Source: Dispenda, LLAJ, own survey

Under the current regulation the maximum age of vehicle for mikrolet operation is 8 years, after which it should be replaced with a new one. Table 2 shows the distribution of mikrolets by vehicle age in 1999, which shows that the regulation concerning vehicle age is not strictly followed, evidenced by the existence of few mikrolets over 8 years old. As the crisis struck in mid 1997, the number of mikrolet registration reduced substantially compared to the previous years. Especially during 1998-1999 there were limited numbers of new entry to the mikrolet fleet. This is a reflection of the high interest rates on bank loans that mikrolet operators are unable to purchase new vehicles to replace the aging ones.

Using Table 2, it is possible to estimate the future availability of mikrolets under the current crisis conditions. Assuming the worst scenario that there is no new entry after 1999, the maximum age of the operating mikrolets remains 8 years, and the crisis conditions continue with no significant recovery in the Indonesian economy, Table 3 shows the estimated number of surviving mikrolets in the coming years. Note that there is some difference in the number of operating mikrolet between Table 1 (1,865) and Table 3 (1,790). This is because some of the mikrolets observed during the survey are not registered (illegal).

It could be that, for the first years, the existing service frequency could be maintained even with the reduced number of mikrolets, by increased efficiency. However, by 2004 it is hard to believe that the remaining mikrolets will be sufficient to balance the demand. So, year 2004 will be a critical period in mikrolet operation. Whether this worst scenario will materialize or not, depends on the assessment of how many mikrolets are actually required to provide the

current level of service, should the existing fleet could be operated more efficiently. An example of the assessment is given for the main route of Tanjung Karang-Rajabasa.

Table 2: Distribution of Mikrolets by Vehicle Age

Year Registered	Age (Year)	Number of Mikrolets
1999	0-1	11
1998	1-2	25
1997	2-3	245
1996	3-4	445
1995	4-5	368
1994	5-6	347
1993	6-7	178
1992	7-8	121
1991	8-9	47
1990	9-10	1
1989	10-11	2

Source: data supplied by LLAJ

Table 3: Estimated Number of Surviving Mikrolets

Year	Number
1999	1,790
2000	1,740
2001	1,619
2002	1,441
2003	1,094
2004	726

The maximum frequency of mikrolet service on the route of Tanjung Karang-Rajabasa is 526 one-way trips per hour in 2 directions (Table 1), or 263 one-way trips per hour in 1 direction, an average headway of 14-seconds between 2 passing mikrolets. A mikrolet requires 15 minutes to travel from one terminal to the other. Supposed that for every round-trip a driver has a 5-minute break, this makes the cycle time 35 minutes. In order to maintain the existing service frequency on this route, the required number of mikrolets is $(35 \times 60) / 14 = 150$ units. A similar calculation based on the average frequency of 398 passages per hour (2 directions) gives a result of 116 units. Considering the need of a spare fleet for repair, maintenance and breakdown of, say 10%, 165 units will suffice. This number is well below the existing fleet size of either 485 (registered) or 394 (operating).

4.2. Passengers Carried

Table 4 shows the result of passenger counts on the routes of Tanjung Karang-Rajabasa and Tanjung Karang-Langkapura. The load factor, nearly 80% on Tanjung Karang-Rajabasa is a

reasonable level, which means that the existing service frequency on this route could be maintained for a number of years before it is required to increase the frequency to avoid overloading. The lower load factor on Tanjung Karang-Langkapura suggests that the existing service frequency on this route could be reduced slightly to improve the load factor.

Table 4: Mikrolet Passenger Counts

Description	Tkarang-Rbasa	Tkarang-Lpura
Total number of trips	216	197
Total number of passengers	2,799	3,101
Passengers per trip	13.0	15.7
Load Factor (%)	79.6	67.3
Distance per passenger (km)	4.64	4.48

4.3. Revenue and Cost Analysis

The following analysis in revenue and cost in mikrolet operation is intended to show that, if the fares had remained fixed at pre-crisis levels, provided that the fleet size was set properly, the driver's income may exceed the existing conditions with increased fare but excessive number of mikrolets.

As discussed in Section 4.1, from the total number of 150 mikrolets required during the peak period (on Tanjung Karang-Rajabasa), an average of 116 mikrolets will be operating at a time for the rest of the day. Therefore, every single mikrolet has the opportunity to make $5972/150 = 39.8$ one-way trips or 20 round-trips per day (at least, since the duration of the survey is 07.00-22.00, so there are more trips could be made beyond this period). Given the cycle time of 35 minutes per round-trip, it needs $20 \times 35 = 700$ minutes or 11.7 (say 12) hours to complete. If an average driver works 8 hours per day, there are places available for $(150 \times 12)/8 = 225$ drivers for 150 mikrolets.

During 8-hour working time this driver makes $(8 \times 60)/35 = 13.7$ round-trips (rounded down, equal to 27 one-way trips), carrying $27 \times 13 = 351$ passengers. Before the crisis, the fares were Rp350.- and Rp250 per passenger per trip for adult and student, respectively. In Yogyakarta, which is well known as the main 'student city' of Indonesia, 60% of urban public transport passengers are students, while in other cities the proportion of non-students is greater than student passengers (DGLT-MC, 1994). Taking a moderate assumption that the proportion between adult and student passengers is 50:50 in Bandar Lampung, the average fare becomes Rp300.- per passenger per ride. Therefore, the total revenue generated within 8 hours is $351 \times 300 = \text{Rp}105,300.-$.

Most drivers are independent contractors. The average amount paid to the vehicle owners is Rp3,500.- per hour or Rp28,000.- per day. Most mikrolets have engine capacity of 1,000-1,300 cc, with an average fuel consumption of 8-16 kilometres per litre (HFA, 1993). As the distance between the terminals of Tanjung Karang and Rajabasa is 6.3 kilometres, the driver spends $(27 \times 6.3)/10 = 17$ litres of fuel at Rp1,000.- per litre, which costs Rp17,000.-. In addition he also has to pay the terminal fee of Rp800.- per day, the 'unofficial fee' of (say) Rp300.- per trip and some spending on food and drink, totally around Rp15,000.- per day. So

the total operating cost is estimated at about $(28,000 + 17,000 + 15,000) = \text{Rp}60,000.-$. Given the total revenue of $\text{Rp}105,300.-$, he has $\text{Rp}45,300.-$ per day to take home.

At present, fares have increased to $\text{Rp}500.-$ and $\text{Rp}400.-$ for adult and student, respectively. However, as there are 394 operating mikrolets, one mikrolet can only make an average of 15 trips per day, though the average working hours is 8 hours per driver. This means most drivers spend much time for cruising and soliciting of passengers due to the high competition, which shows a low efficiency. At this operating condition, the average driver's earning is $\text{Rp}39,000.-$ per day, still below the proposed condition with limited number of mikrolets. Table 5 shows breakdown calculation in both conditions.

Table 5: Revenue & Costs per Driver, Tanjung Karang-Rajabasa

Variable description	Operating Conditions	
	Existing	Proposed
Total number of one-way trips	5,972	5,972
Total number of mikrolets	394	150
Driver's working hours per day	8	8
Cycle time (minute)	35	35
One-way trips per mikrolet per day	15	27
Revenue per passenger (Rp)	450	300
Passengers per one-way trip	13	13
Passengers per day	195	351
Total revenue per day (Rp)	87,750	105,300
Rental cost per hour (Rp)	3,500	3,500
Rental cost per day (Rp)	28,000	28,000
Fuel cost (Rp)	9,450	17,000
Fees & other costs (Rp)	11,300	15,000
Total costs (Rp)	48,750	60,000
Driver's earning per day (Rp)	39,000	45,300

To give an idea of how good the present level of driver's income is, the following comparison may explain. In Indonesia, a state university lecturer who holds a second degree in (say) Civil Engineering, earns between $\text{Rp}750,000.-$ and $\text{Rp}1,250,000.-$ per month depending on the number of dependents, tenure as government employee and number of subjects taught per week. A mikrolet driver with an average education of high school, who works 8 hours per day for 25 days a month could earn $\text{Rp}1,000,000.-$ per month, comparable to the salary of a highly educated university lecturer. If this driver is also owner of the mikrolet he drives, he may be superior.

It is clear from the above discussion that the existing number of mikrolets operating in Tanjung Karang-Rajabasa is, unnecessarily, excessive. The investigation reveals that, a substantially smaller fleet size can provide the same service frequency at reduced fares, and the drivers are better off in terms of their earning and the level of competition.

4.4. Policy Implication

The decision to increase fares has been implemented, and it is not the intention of this paper to propose a reversal. Rather, to recommend that a false policy like this should not be repeated in the future, since it only benefits the operators but, on the other hand, sacrifices public transport users. The importance is now, how to create an operating environment that will enhance efficiency. Two alternatives are considered: (1) reduction in the number of operating mikrolet through natural selection, and (2) the role of route association in the management of public transport.

The desired number of mikrolets operating in each route can be achieved through natural selection. In this case the government authorities in charge of the management of public transport (Dispenda, LLAJ, Police) should create an operating environment, which could lead to the decreasing number of mikrolets to the desired level naturally by:

1. Introducing no fare increase in the next few coming years
2. Issuing no new route licence for mikrolets in the next few coming years.
3. Conducting regular vehicle inspection and test properly.
4. Those who fail in the second test, after being given sufficient warning to rectify the problems, are to be de-registered from the fleet.

Rather than limiting the maximum age of vehicle for route licence extension, more important is the vehicle conditions. As long as the vehicle is roadworthy, route licence extension could be granted, probably on an annual basis. Once the desired number of mikrolets in each route is achieved, the issuance of new route licences and the decision to set new fares should be based on a proper analysis of the costs and revenues involved in mikrolet operation.

There are good examples of public transport operation being managed by route associations (empresas) in Buenos Aires, Argentina or by association of private bus owners in Daejeon, Korea (Armstrong-Wright and Thiriez, 1987; Armstrong-Wright, 1993). In addition to these, public transport system in Faisalabad (Pakistan) is managed by a Non-Government Organization (NGO), which also works well (Russel and Anjum, 1997). Regarding mikrolet operation in Bandar Lampung, the idea is to establish some associations of mikrolet drivers and owners on a route basis, as will be explained in the following paragraphs.

Given that with the fares remain fixed, by limiting the number of operating mikrolets per day, drivers get sufficient earning, the surplus resulted from the increased fare is to be re-distributed to owners of the non-operating mikrolets and the non-working drivers, for compensations. The associations are responsible for the scheduling of the mikrolets and drivers such that every single mikrolet and driver gets equal opportunity to work and share of the revenue. Table 6 shows the calculation of how this system might work.

On the route of Tanjung Karang-Rajabasa, 24 out of 394 operating mikrolets are illegal. The illegal mikrolet owners and the drivers could be invited to join the association, in order to create a 'friendly atmosphere' within the association. Beyond this, the association should strictly restrict new entry.

From interviews with mikrolet owners and drivers, it was revealed that, on average, a mikrolet is operated for 14 hours per day, and a driver works 8 hours per day. In other words, there are 1.75 drivers per mikrolet, resulting in 690 driver-shifts available per day. Under the

proposed operating environment, where each shift makes 27 one-way trips, 222 shifts are required to produce the total daily output of 5,972 mikrolet trips.

Table 6: Revenue and Costs of All Mikrolets, Tanjung Karang-Rajabasa

Variable Description	Value
Total mikrolet trips (one-way) per day	5,972
Passengers per one-way trip	13
Total passengers per day	77,636
Revenue per passenger (Rp)	450
Total revenue per day (Rp)	34,936,200
One-way trips per shift (8 hours)	27
Total shifts per day	222
Operating costs per shift (Rp)	60,000
Total operating costs per day (Rp)	13,320,000
Driver's wage per shift (Rp)	40,000
Total driver's wage per day (Rp)	8,880,000
Total number of mikrolets	394
Drivers per mikrolet	1.75
Total number of drivers	690
Non-working drivers per day	468
Compensation per driver (Rp)	10,000
Total compensation for drivers per day (Rp)	4,680,000
Non-used mikrolet shifts	468
Compensation for owner per shift (Rp)	14,000
Total Compensation for owner per day (Rp)	6,552,000
Total costs per day (Rp)	33,432,000
Surplus for the association (Rp)	1,504,200

The association selects mikrolets and drivers to be operating on a particular day from the available members, on a rotation basis. Owners of the non-operating mikrolets receive (for example) 50% of the rate applicable to the operating mikrolets (equal to Rp14,000.- per non-used shift), and non-working drivers are paid (say) 25% of the amount payable to the working drivers (equal to Rp10,000.- per non-worked shift). In this way, both mikrolet owners and drivers get regular secured income. Since the average number of drivers required per day is 222, while there are 690 drivers, on average, a driver works 10 days and has 20 off-days per month, which gives him a Rp600,000.- monthly income. Under the existing operating condition, drivers get Rp1,000,000.- per month, but they have to work 25 days a month. Therefore, drivers are benefited from the substantial reduction in their working hours, and thus increased spare time, which could be spent to seek and do a second job. It is expected that this high level of income will encourage drivers to show good conduct (including when driving) and obey the rules of the association or, otherwise, they shall be expelled from membership of the association.

Similarly, mikrolet owners get Rp1,000,000.- per month under the new system, compared to Rp1,250,000.- per month under the existing operating conditions. The advantage is that mikrolets are operated for only 10 days per month, that they will sustain much longer. This

means year 2004 is no longer critical in the availability of mikrolet, even without new entries due to the problems in the national economy. In addition, during the non-operating days, mikrolets can be used to provide hire services, for example to bring young children to school, which will increase both owner's and driver's incomes.

After making deductions for paying the rental costs of the operating mikrolets and wages of the working drivers, giving compensation to owners of the non-operating mikrolets and non-working drivers, there is still some money left (Rp1.5 million per day) for the association for running the organization, and possibly to assist members in purchasing spare-parts. The success of the proposed system however, depends on the commitment of the organizers to implement the regulations with greater enforcement to put the members within the control of the association.

Some problems may arise in the implementation of the system, i.e. (a) unwillingness of mikrolet owners and drivers to join the association if they want to remain independent; (b) monitoring of the mikrolets to ensure that only those eligible are operating on a particular day; and (c) the ability of the authorities involved to enforce the regulations. The experience of the NGO Model in Pakistan demonstrates that private operators are willing to work in an effectively regulated environment (Russel and Anjum, 1997), indicating that similar system may also be implemented in Indonesia.

5. CONCLUSIONS

The existing number of mikrolets operating in the Bandar Lampung Municipality is excessive, while the crisis condition has driven prices of spare-parts and consumables for vehicle maintenance up substantially, resulting in public transport operators demanding fare increase. However, the investigation shows that, on the route of Tanjung Karang-Rajabasa, if the fleet size was set low enough from the beginning, the fare increase may not be necessary. It is evidenced through the discussion that a substantially lower fleet size (165 as opposed to 394) is sufficient to provide the same service frequency, without increased fare, and still keep the drivers better off.

There are two proposed solution, reducing the fleet size to the desired level through natural selection, and establishing route associations to enhance efficiency and longer sustainability of mikrolet services during the long period of economic crisis. The first option is not good enough, since too many mikrolet owners and drivers are sacrificed due to the substantial reduction in the number of operating mikrolets. Option two is more acceptable, as the existing mikrolet owners and drivers still get sufficient income, while the non-used resources (vehicles and driver's time) are not wasted and are still available for other purposes. This method of assessment could be applied to the other routes within Bandar Lampung and to public transport operation in other cities.

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