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Urban Public Transport Reformation in Bali, Indonesia

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ABSTRACT

Bali is the first tourist destination in Indonesia. Unfortunately, the urban public transport network in Bali is poor. Therefore, traffic congestion has existed in many areas, especially in tourist destination objects and city centre. Public transport reform is, therefore, very important to increase the use of public transport mode and to maintain the sustainability. Traffic surveys were carried out in Bali by counting public transport vehicles and occupancies, interviewing the public transport passengers and non public transport users, drivers and institutional staffs, who involve in public transport management This paper then analyses the plan to reform the urban public transport system in Bali, i.e. The Bali City Bus Reformation in the Sarbagita areas (Denpasar, Badung, Gianyar and Tabanan) as the urban areas of Bali.The problems for implementing the new public transport system were analyzed. Recommendations have been given to reduce the negative impacts in implementing this new public transport system.

Key words: urban public transport, traffic congestion, Bali, tourist

1. BACK GROUND

Sarbagita area consists of Denpasar, Badung, Gianyar and Tabanan regencies. These areas are in Bali island (see figure1) and famous as the first tourist destination in Indonesia. Denpasar itself, as the capital of Bali Province, has the population of 572,000.Therefore, a reliable transportation system is really necessary to support the mobility of the people. However, the existing urban public transport system is very poor.

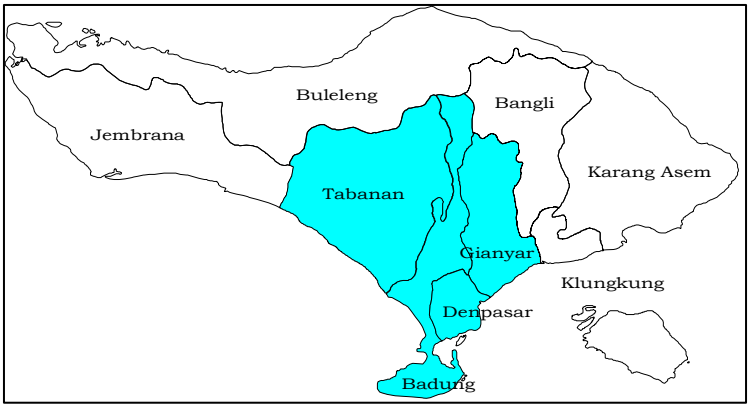

Figure 1. Sarbagita Area

Only a few people, i.e. 2.5 percent of the population, use it. There are about 459,000 private cars and 360,000 motorcycles and some tourist buses in Denpasar. The lack of public transport facility, therefore, has a major impact on the economic growth.

The main problems related to urban public transport in Sarbagita, as well as in other cities in Indonesia (Munawar 2008), can be expressed as follows:

- Urban society tends to use private vehicles due to the poor quality of public transport services,
- Urban public transport services can only attract captive passengers, who have no alternative other than public transport,

- Licenses are required by every organization that operates public transport services. However, it is important to note that the existing licensing structure aims to regulate the *quantity* of transport provision, but it is little concerned with *quality*.
- The route network has not been based on a comprehensive study. The local government does not actively plan the public transport routes.
- The bus can stop anywhere. Therefore, the time headway between buses is not fixed.
- The limited ability of human resources and the responsible institutions in the field of monitoring and control of urban public transport.
- Insufficient funds to renew the existing public transport vehicles.

It is, therefore, necessary to reform the urban public transport in this area to be more reliable, comfortable, efficient, faster and safer. However, because of the poor existing urban public transport system in Bali, as well as in other Indonesian or East Asian cities, the reform should be carried out carefully, step by step, due to social and financial problems (Morichi 2007).

2. METHODOLOGY

Flowchart of methodology is shown in figure 1 below:

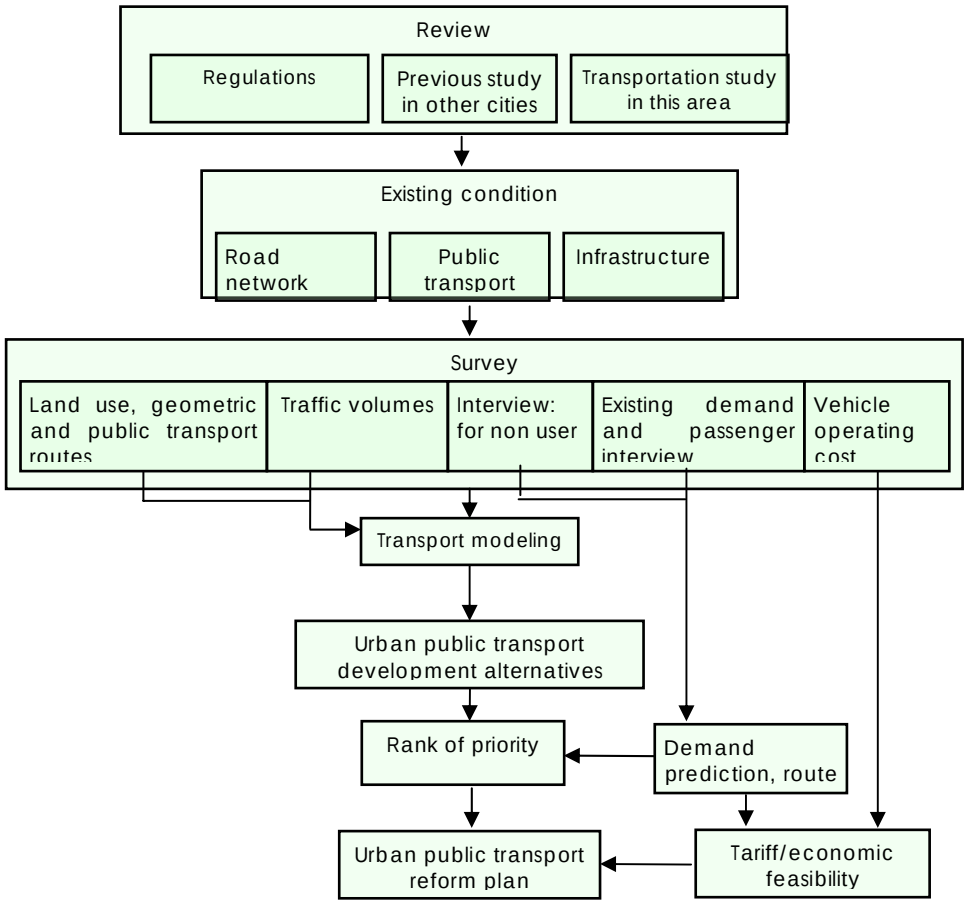

Figure 2. Methodology

3. EXISTING CONDITION

3.1. Road Level of Service

According to the traffic survey, the traffic volumes during peak hours are very high. In some road segments, i.e. in tourist destination areas: Kuta and Nusa Dua, the traffic volumes have exceeded the capacity. Traffic congestions, therefore, have occurred in these areas. Private transport modes dominate the traffic composition, i.e. motorcycles (53.24 % of the traffic volume) and private vehicles (38.91 %). Road widening is impossible due to space constrain. Fly over construction at intersection is either impossible. There is cultural barrier dictating that flyovers do not fit Balinese culture. The Balinese has a kind of rule that every building should not be higher than a coconut tree.

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3.2. Urban Public Transport Performance

The number of public transport vehicles has decreased in the recent years. It is shown in table 1.

Table 1. Number of Public Transport vehicles

Regency	Number of vehicle in the year of:		
	2003	2004	2005
Denpasar	4087	2517	2822
Badung	3.650	3.650	3.650
Gianyar	379	302	335
Tabanan	484	429	429

Source: statistical data of Bali Province

Public transport demand is very low. It is shown in the load factor measurement. Load factor is the comparison between the demand and the available capacity for a trip (in %). The load factor for each route is shown in table 2.

Table 2. Public Transport Performance in Sarbagita Area

Route/Line	Load factor (%)	Journey time (minutes)	Average headway (minutes)
Kereneng-Batu Bulan	48	14,58	5,84
Ubung-Tabanan	44	38,13	31,21
Nusa Dua-Batu Bulan	73	64,14	60,00
Tegal-Sanur	45	58,99	33,96
Ubung-Kereneng	60	12,64	24,08
Kereneng-A.Yani	13	16,24	57,5
Tegal-Tuban	20	55,11	23,80
Batu Bulan-Ubung	28	21,35	34,14
Tegal-Bualu	32	65,70	9,35
Ubung-Sanglah	29	45,70	34,32

Source: analysis of primary data in the year 2007

4. ANALYSIS

4.1. Preference Survey

Passenger interview has been carried out to get the passenger preference. Journey purpose for public transport user is shown in figure 3. More than 50 % of respondents use the public transport to work and to school.

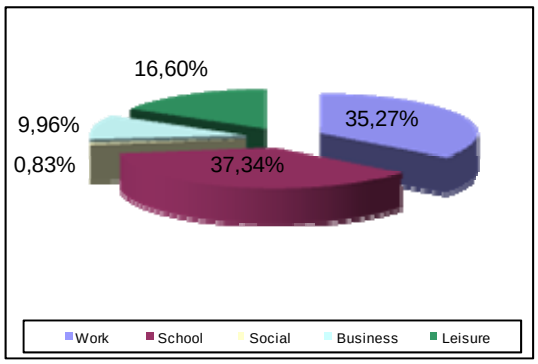

Figure 3. Journey Purpose for Public Transport Users

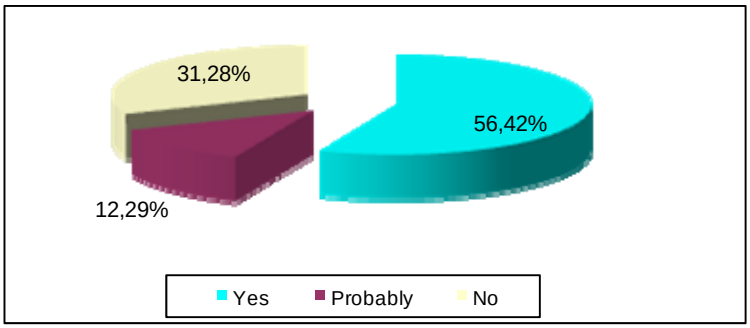

Figure 4. Percentage of Using Public Transport if the Quality is Better

Survey has also carried for the whole society (public transport users and non public transport users) to ask them about the willingness to use public transport if better quality public transport is provided, although the ticket should also be increased. The result is shown in figure 4.

4.2. Potential Demand

Potential demand analysis is important to predict the number of passengers in the future. Home interview survey has been carried out along the potential corridor of planned public transport routes. It has then been concluded:

1. During the first year operation of the new urban public transport system, the potential demand would be 10% of the total trips.
2. The demand growth is equal to the population growth.

4.3. Route Selection

The main criteria for route selection are as follows:

a) Within potential demand area
b) With best route directness
c) Avoid route overlapping
d) Avoid using narrow roads
e) Good accessibility

4.4. Service Area Identification

The main factor to be considered is the potential travel demand. It has, therefore, been selected six potential corridors as follows:

1. Ngurah Rai Airport - City - Batu Bulan
2. Ngurah Rai Airport - Kuta - Kerobokan
3. Kuta - Gajah Mada - Hang Tuah - Sanur
4. Mengwi - City – Benoa
5. Darmasaba - A. Yani – Sanglah
6. Nusa Dua - Sanur (Jl. By Pass Ngurah Rai)

4.5. Route priority

Three out of six corridors will be chosen to be implemented first. There are six parameters to be considered to choose the route priority, i.e.:

1. Route length
2. Route directness
3. Potential travel demand
4. Accessibility
5. Overlapping
6. Connectivity

There are three alternatives:

1. Alternative 1: corridor 1 - 3 – 6
2. Alternative 2:corridor 1 - 4 - 6
3. Alternative 3: corridor 1 - 2 - 5

It has been concluded, that the best alternative for the first implementation is alternative 2, i.e. corridor 1 (Ngurah Rai Airport - Denpasar City - Terminal Batu Bulan), corridor 4 (Mengwi, City, Benoa), and corridor 6 (Nusa Dua - Sanur).

4.6. Bus and Infrastructure Designs

The bus is much more comfortable than the existing one. It is air conditioned bus. There is no exclusive lane for buses, because of the limited space available for traffic (see figure 5). Bus lanes are constructed near the bus shelters and in some places to reduce the journey time (see figure 6). However, the bus can only stop at a shelter, because the bus floor is 80 centimeters higher than the road pavement (see figure 7). The passengers, therefore, can only enter the bus at the bus shelter. The drivers and the crews will be paid monthly by this new organization, but they have to follow the regulations, i.e. bus time table, safety and security

Figure 5. Typical Cross Section

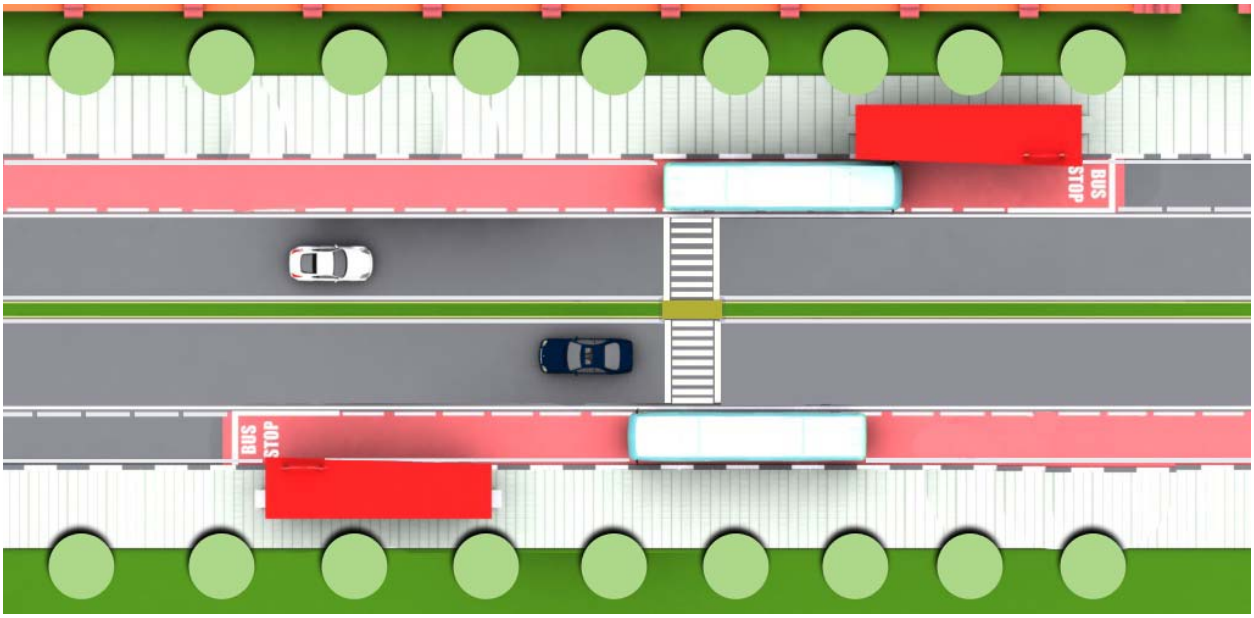

Figure 6. Lay out

Figure 7. Bus shelter

Smartcard has been employed for the ticketing system. Smartcard based electronic ticketing has been a common one in many countries. For rapid commuters, it is required a type of device to control and also to collect the ticket automatically. There are some types of gate available in the market, but the price and also the cost for buying the device will be very expensive. It has been decided to build the gate locally, using local components for the mechanical parts and some of the electrical parts (Munawar et al 2007). This approach also gives benefits to the local home and small industry by promoting their products to higher level. In the figure 8 below, it is shown the design of the *Gate Access* turnstile device.

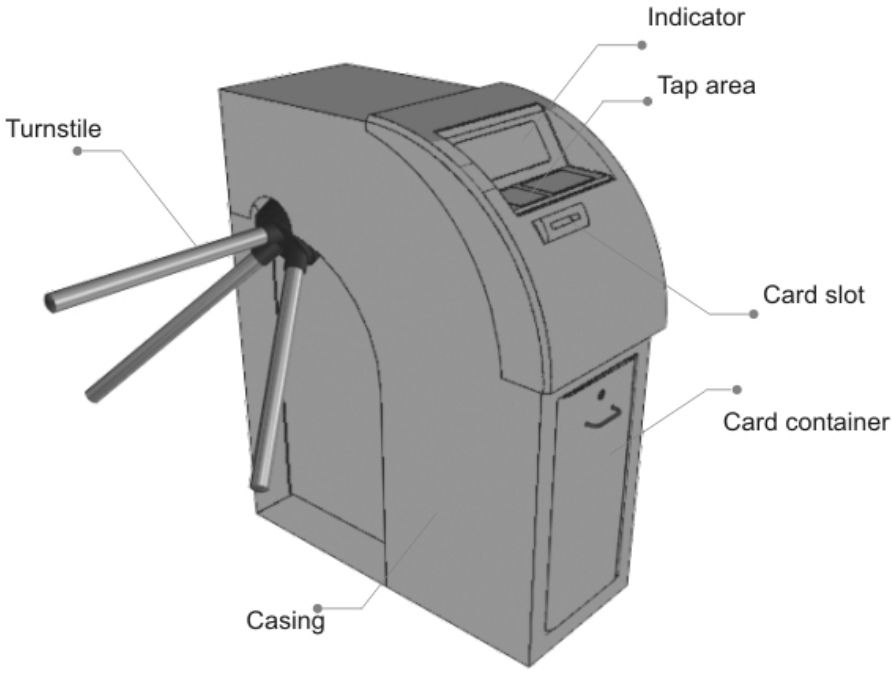

Figure 8. Ticketing Machine and Gate Access

4.7. Tariff

If there is no subsidy, the fare should be higher than the vehicle operating cost (VOC). VOC has been calculated based on the survey analysis, i.e.

VOC bus/km = Rp. 3,105
VOC per passenger per km = Rp. 208 (load factor 40 %)

- Average route length = 21 km
- Fare per passenger = Rp. 208 x 21 km = Rp. 4,368

It has been calculated to give 10% profit to the operator.

- Profit 10% = 10% x Rp. 4,368= Rp. 437
- Fare per passenger with 10 % profit = Rp. 4,368 + Rp 437 = Rp. 4,805

However, if the fare less than Rp. 4,368, it should be subsidized by the government.

5. ORGANIZATION REFORM

The organization reform will reform the existing regulatory policies and operational practices. The bus management system will be changed to the new system, called *buy the service system*. The management will be organized by a joint organization among the government, existing bus cooperatives and bus operators. The existing bus operators will be included in the new system, but they have to improve the service and also bus quality according to the minimum standard.

6. CONCLUSIONS

This reform plan, hopefully, will give more reliable and attractive urban public transport in Bali. However, although this study was completed a year ago, unfortunately, it has not been implemented yet because of the social and financial problems.

7. ACKNOWLEDGEMENTS

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