The Opportunity for Railway Development in Two Connected Urban Areas

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ABSTRACT

Jakarta is the capital city of and the largest city in Indonesia. Bandung City, the nearest major city to Jakarta, was developed as a tourist and industrial city to facilitate the transportation of passengers and goods to Jakarta. Ten years ago, Bandung City was supported by road, rail and air transport; however, a new road link has significantly lowered the demand for air transport and has caused its decline. An existing toll road has had a similar effect on railway. As part of our exploration of possibilities for increasing railway demand, we focused on finding factors relevant to train service satisfaction and identifying potential activities for the development of urban areas and improved traffic generation. The results highlight the principal strengths and weaknesses of railway as they relate to the modal competition for transportation between Jakarta and Bandung City. We found two principal variables that need to be improved for increased railway competition; accessibility and security.

Keywords: railway, competition, interurban, transport, modal choice, accessibility

Introduction

Railway is currently facing open competition with other transportation modes such as the mini bus and private car. The new toll road between Jakarta and Bandung was build between 2000-2005 and open to traffic gradually by
segments. It provokes important changes on the transports modal split. In fact, the flight of Merpati Airline from Jakarta to Bandung was curtailed in 2006 due to a decline in the number of passengers wishing to use air transport; toll road access created a change in their commuting preferences [1]. Unfortunately, it seems that this drastically diminution of demand will occur for the railway in the same way. The growths for use of private car and mini bus have risen significantly, but the use of passenger trains has decreased.

Each mode has its own modal characteristics that to some degree increase its attractiveness and competitiveness. We use a statistical analysis that is based on data obtained from questionnaires distributed railway line of rail and mini bus as well as car drivers on the Jakarta-Bandung corridor. This preferences analysis considers 12 variables linked with the transports factors which influent passenger modal choice. The results show the importance level of each factor on the modal choice for 3 kinds of population: “General population”, “Workers with middle-low expenditure”, and “Regular passengers”. We chose this 3 population segments to understand the possible nuances of modal choice. The “General population” is represented by total sample. The “Workers with middle-low expenditure” are represented by passenger with expense under IDR 5 million/month (US$ 525). The minimum wage in Jakarta is IDR 1,290,000 (US$ 136) and IDR 1,188,435 (US$ 125) for Bandung in year 2011. The expenditure indicator reflect the income level in indirectly way. The “Regular passengers” are represented by “students” who have purposes to go to school or University and “travelers” who have purposes to go to work from their home.

The train has the possibility to transport large volumes of passengers and provide a better capacity adjustment to absorb the peaks of demand. The railway has real opportunities to maintain an important level of demand and even to develop it, especially for the line Jakarta-Bandung. We could say on the base of this analysis that there are 2 principal variables which need to be improving in order to increase the railway competitively. These aspects are the accessibility of rail stations and the security on trains.

Today, there are two possibilities to increase the demand of rail transport on the corridor. The first may result from the construction of the new economic centre will provide a new destination, generating trips and a new demand for all modes of transportation. The second is to profit as well as possible of the improvement in service to increase its attractiveness at competitiveness among the other modes.

The objective of this study is to propose any possibilities in increasing railway demand. Firstly, railway could have its demand by developing a new economic centre. In the Transportation Master plan of Bandung City 2010 – 2030 is a potential industrial and housing area called “Gedebage Multipurpose Terminal” [2]. But to profit of this opportunity, railway transport has to improve its service and adapt offers of this destination. It needs to be planned in order to positioning the rail as the best or one of the best transport alternatives to attending the new centre. The master plan will be embodied in
a regulation by the mayor of Bandung City (as a legal umbrella and policy directive) to achieve Bandung’s city transportation objectives. According to the master plan, the “Gedebage” area will be developed with an integrated terminal for road and railway transportation as its focal point. Today, the site is in an area of 32 hectares (ha) in “Cisaranten Kidul” and “Rancabolang” sub districts with 10% residential area and 90% productive rice field.

Secondly, railway could improve its current services by identification of significant “variables of satisfaction” linked with different factors of transport modes to can compare between modes and to place the rail transport into the modal competition in objective way. We define the principal advantages and disadvantages of rail service in comparison with the private car and mini bus to understand better the modal competition. This analysis let us to understand the motives of the currently modal choice tendencies in order to find solutions to improve the rail transport competitiveness.

**Characteristic Demand on the Jakarta-Bandung City Link**

**A new center as a potential demand**

The populations of Jakarta and Bandung continue to grow. Potential passenger movement is expected for Jakarta-Bandung based on a large extent of population growth [3][4][5]. This growth would modestly affect frequency of service, but it would not lead to a substantial change in the predicted competition effect [6]. In fact, we can appreciate that mobility of population represented by “Pax/Year” growth faster than the cities populations.

The parts of modal split take by private car and mini bus increase higher than train. Thus, it would be difficult for the train to run properly based on proportionate demand without any improvement in service, (e.g. new rolling materials; better connectivity with urban transports; fast train). The rail is typically considered as the best transport mode for medium distance trips because it can shorten travel time between cities; additionally, the comparative advantages over other competing modes include quality of service, reduced access time to principal economic centers, potential to transport large passenger volumes, and ability to adjust to shocks or peaks in demand [7].

The Law No.22 (2009) regarding traffic and road transport requires that major cities with populations over 500,000 inhabitants should develop a master plan that includes a mass transport system with its infrastructure [8]. This policy encourages railway development between inner and outer cities; especially large metropolitan areas like Jakarta-Bandung.

The proposed “Gedebage Multipurpose Terminal” (economic centre) in Bandung could increase demand for movement of passengers and goods by railway and/or road transportation between Jakarta and Bandung. The dominant market place for goods of dry port “Gedebage Multipurpose Terminal” is Jakarta and others countries which will serve through “Tanjung Priok Seaport” in Jakarta. Improvement of transportation networks would reduce operation costs, increase the overall competitiveness of the system and allow as well as
the economies of scale [9]. The “Gedebage Multipurpose Terminal” development is part of the larger plan for the “Gedebage Primary Centre Areas” in Bandung City as wide as 32.58 ha out of the whole 712.3 ha. The existing activities are principally rice field areas, industrial areas, housing areas and government office area.

Development of the “Gedebage Multipurpose Terminal” will increase the number of commuters in and out of this area. Base on the total area “Bandung Metropolitan Area” (BMA) for 2010 and its proportional persons trips demand for this area, we able to forecast trip demand and predict passengers’ transportation needs until in 2030. It appears that road transportation can satisfy trip demands until then, but expected traffic needs will complicate adequate transportation in and out of BMA from that point forward. There will be several road congestions and mobility into the city will be paralized.

In the near future conditions of population increase in both cities, mass rapid transportation is needed for intercity passenger’s movement. Independently of passengers’ growth, there is another expected increase of goods/freight transportation. It is also forecast base on plans that designate the “Gedebage Multipurpose Terminal” as a dry port with a container yard measuring 14,322 m². Railway would handle the container cargo at Gedebage Multipurpose Terminal in Bandung and at “Cibungur Terminal” in “Cikampek” in the line of Jakarta-Bandung. Another dry port is planned in “Cikarang” near Cikampek. Consequently, congestions due to intensive commuter traffic and road transportation of goods/freight would result. Fortunately, the railway has the potential to solve this problem. There-fore, it is expected that transport of container cargo by rail will grow in proportion to the total demand for containers. Based on GDRP growth, a 4 % would be projected for containers growth for the period 2010-2020.

Modal competition
There are several factors which are related to modal choice, such as cost, time and different transport service factors in function of mode. Ten years ago, commuting between Jakarta and Bandung was supported by air transport, but the new road link has taken away much of the demand and air travel has fault. The cost of air transportation and travelling times were critical in the competition, where airlines offered a travelling time of just 30 min of flight, less than 3h from city centre to city centre [10]. In 2005, it seems that cost factor was an important, is shown in Figure 1. Travel time among modes in this link from “door to door” would rather similar, is shown in Figur 2.
Figure 1. Cost of simple transport among modes from “door to door” in 2005 and 2010

Figure 2. Travel time “door to door” among modes in 2005 and 2010
Even though total passenger per year in this link tends to increase, is shown in Figure 3 and Figure 4 and the cost of rail transportation lower than road transportation, it is still insufficient for railway. People prefer to choose road than rail transport. The railway transport is underway.

Source: Direktorat Jenderal Perkeretaapian
Note: Passengers in year 2015 are Prediction
Figure 3. Passenger per year among modes
4. Methodology

Knowing the potential demand by developing a new center, we need secondary data from Ministry of Communication, Central Bureau of Statistics, Capital Market Supervisory Agency, and the provincial government of the City of Bandung. Based on our findings from these sources, we were able to describe the potential demand for railway in the future conditions.

Identifying significant variables services for improving railway competitiveness from its current condition, we need primary data. The data were collected in a direct field survey and distributed questionnaire. Data collection was intended to identify passenger preferences. We used preferences and opinions for the multinomial Logit Model which applies a behavior-oriented approach. We consider too the different preferences in function of socioeconomic factors by population group and the attributes of transportation mode alternatives (via an utility function) [11][12]:

To define the strengthness and weaknesses of rail into the modal competition we based our analysis on data from questionnaires applied to users of transports in corridor in 2010. This survey consisted in 100 questionnaires applied to users of each mode and our total sample is integrated by 300. For the rail passengers the questionnaires were applied in Jakarta rail stations. The questionnaires for mini bus were applied at pole of mini bus at Jakarta and the questionnaires for car drivers were applied in the rest area at the entry of Jakarta. The data was use to compared the different modal choice factors between transport modes through the application of a multinomial Logit Model.

\[ U = f(V_1, V_2, V_3, ..., V_n) \]  

where:

\( U \) = value of traveler’s satisfaction with mode of transportation

\( f \) = functional relationship

\( V_1-V_n \) = variables affecting the satisfaction score using a particular mode of transportation.

This approach is represented by error element that is random or stochastic, so the model becomes as follows [12]:

\[ U_m = \beta_0 + \beta_1 V_{1m} + \beta_2 V_{2m} + \beta_n V_{nm} + e_n. \]  

where:

\( U_m \) = utility function satisfaction using the mode “m”, such as train

\( V_{nm} \) = variable “n” of mode “m”

\( \beta_1, \beta_2, \beta_n \) = parameter function of satisfaction for each of these variables

\( \beta_0 \) = constant

\( e_n \) = error factor, for example the random variables that follow a particular distribution form
5. Analysis of significant variables

Utility function was used to measure the degree of satisfaction obtained by a person choosing one mode of transport. Disutility function represents a generalized cost associated with each transportation option. Utility function depends on individual factors of each transport service. In this study, a representative consumer was assumed for each traveler class (business, student, worker, leisure, etc) to choose the mode alternative to travel yielding the highest utility [13]. Utility function is usually expressed as a linear number of independent variables affected by β factors.

Modal choice analysis can be performed at different stages in the process of planning and transportation modeling. Approach of modal choice models vary widely; it is depending on the purpose of transportation planning. This approach assumes that the socio-economic factors greatly affect the modal choice process [14].

Independent variables that we observed were amenities (V₁), punctuality (V₂), operator’s reliability (V₃), facilities (V₄), frequencies (V₅), services (V₆), price/fares (V₇), accessibility from home (V₈), accessibility to destination (V₉), security (V₁₀), natural scenery (V₁₁), cleanliness (V₁₂), image (V₁₃) and travel time (V₁₄). Amenities variable was a comfortable feeling of passenger when transporting by certain mode. Service variable was identified as promotional service which was given by the operator’s, such as food, drink, and gift promotions. Facilities variable was identified by the availability of toilets, air condition, television, and comfortable seats. Image variable was identified by passengers’ perception about modal service and its prestige.

During the analyzing, we found that it was difficult to explain amenities variable to some passengers. Amenities in passengers’ perception were a situation that was caused by operator’s service and the given facilities. When we tested the results, there was a high correlation between “amenities” variable and “service” variable. We decided to choose “service” variable and reduced “amenities” variable. In consequence V₁ = 0, we assume that “amenities” are not really an independent variable because their effect on passenger preferences are include into the “service” variable (V₆).

The “travel time” variable was voluntary exclude of analysis because travel time is almost de same for the 3 modes. Then this variable has not important impact to discriminate between modes and reduce the discrimination values of the rest of variables. For car, travel time have a mean of 190 min for “door to door” travel between places in cities. In the case of mini-bus, the travel time have a mean of 200 min including: “origin to minibus site” by any local transport in one city, “mini-bus travel” between Jakarta-Bandung, and “minibus site to destination” by any local transport in the other city. For train, the travel time have a mean of 206 min including: “origin to rail station” by any local transport in one city, “travel by train” between Jakarta –Bandung, and “rail station to destination” by any local transport in the other city. Thus V₁₄ = 0, we assume that “travel time” is a factor which do not have influence on the modal choice in the specific case of Jakarta-Bandung displacements.
The passenger factor that we surveyed were classified by domicile, gender, age, occupation, education background, monthly expenses, vehicle ownership, number of people within group (if travelers group), purpose of travel, and displacement mode to achieve the main mode. The results show the utility of improves for each factor of modes to gain in competitiveness in function of preferences. The analysis was done in considering 3 kinds of population: “General population”[15], “Workers with middle-low expenditure”[16], and “Regular passengers”[16] in order to understand the possible nuances of modal choice.

For general population the model results are:

\[ U_{\text{Rail}} = 16.001 + 1.255 V_2 + 1.186 V_3 + 0.800 V_4 - 0.320 V_5 - 1.427 V_6 \\
+ 0.578 V_7 + 2.212 V_8 + 2.539 V_9 + 2.212 V_{10} - 1.569 V_{11} \\
+ 0.731 V_{12} - 2.926 V_{13} \]  

(3)

\[ U_{\text{Mini bus}} = 19.952 - 0.963 V_2 - 0.029 V_3 - 0.153 V_4 - 0.386 V_5 \\
+ 0.025 V_6 - 1.053 V_7 - 0.850 V_8 - 0.614 V_9 - 1.024 V_{10} + 1.570 V_{11} \\
- 0.803 V_{12} + 4.653 V_{13} \]  

(4)

\[ U_{\text{Car}} \] (as reference)

(Model test of \( \rho^2 = 0.857 \) (Cox and Snell), \( \rho^2 = 0.964 \) (Nagelkerke), and \( \rho^2 = 0.884 \) (McFadden))

where:

- \( U_{\text{Rail}} \) = Utility function for train;
- \( U_{\text{Mini bus}} \) = Utility function for mini bus;
- \( U_{\text{Car}} \) = Utility function for private car;
- \( V_1 \) = Amenities (\( V_1 = 0 \), this factor is indirectly consider by \( V_6 \));
- \( V_2 \) = Punctuality;
- \( V_3 \) = Operator’s Reliability;
- \( V_4 \) = Facilities (Toilet, Air Condition, Television, Comfortable Seat);
- \( V_5 \) = Frequencies;
- \( V_6 \) = Services (Food, Drink, Gift Promotion);
- \( V_7 \) = Price/fares;
- \( V_8 \) = Accessibility from home;
- \( V_9 \) = Accessibility to destination;
- \( V_{10} \) = Security and Safety;
- \( V_{11} \) = Natural scenery;
- \( V_{12} \) = Cleanliness;
\[ V_{13} = \text{Image (Prestige, Modal Service Perception)} ; \]

\[ V_{14} = \text{Travel time (} V_{14} = 0, \text{we exclude this factor of analysis because the travel time is almost the same for the 3 modes of transport and provoke a diminution of the discrimination for the rest of variables)} \]

The comparative reference value is 0, it represents the “private car” mode preferences. Positive coefficients for “minibus” and “train” mean that the correspondent variables are the most important factors to improve their own competitiveness. In other words, when factors are positive for “minibus” or “rail”, the current preferences of users are for “car”. The negative coefficients mean that correspondent variables are factors preferred by passengers over car. So, negative coefficients for “minibus” and “rail” mean that the correspondent variables do not need to be improved. Negative coefficients mean strength factors for the correspondent mode.

In the first case of general population, the strengths of railway in modal competition are image, natural scenery, and service, is shown in Figure 5.

Note: Strengths for railway in modal competition are \( V_{13}, V_{11}, \) and \( V_6 \)

Figure 5. Utility function coefficient for general population

The utility value could be increased by improving accessibility to destination (2.539), accessibility from home (2.212), security (2.212), punctuality (1.255), operator’s reliability (1.186), facilities (0.800), cleanliness (0.731) and price/fares (0.578). For mini bus, its strengths in modal competition are punctuality, price/fares, security, accessibility from home, cleanliness, accessibility to destination, and frequencies. Its utility value could
be increased by improving image (4.653), natural scenery (1.570) and services (0.025).

In the second case, we took a sample of passengers of train Jakarta-Bandung, in function of the consumption expenditure indicator who have general expenditure mostly under IDR 5,000,000. We observed the consumption expenditure indicator as a representative of their affordability to pay for the cost of transportation, because in some cases, it was found that cost was the most important variables in choice of mode, is show in Figure 6.

![Figure 6. Proportion of railway passengers as a function of percentage expenditure levels (IDR)](image)

Their preference can be formulated with the utility function as follows:

\[ U_{\text{Rail}} = 15.302 + 0.933 V_2 + 1.124 V_3 + 0.411 V_4 - 0.235 V_5 - 0.993 V_6 + 0.651 V_7 + 2.4 V_8 + 2.459 V_9 + 2.476 V_{10} - 1.03 V_{11} + 0.319 V_{12} - 2.551 V_{13} \]  

(5)

\[ U_{\text{Mini bus}} = 1.26 - 0.707 V_2 - 0.217 V_3 + 0.308 V_4 - 0.288 V_5 + 0.232 V_6 - 1.323 V_7 - 0.952 V_8 - 0.852 V_9 - 1.784 V_{10} + 1.314 V_{11} - 0.74 V_{12} + 3.907 V_{13} \]  

(6)

\[ U_{\text{Car}} \] (as reference)

(Model test of \( \rho^2 = 0.855 \) (Cox and Snell), \( \rho^2 = 0.962 \) (Nagelkerke), and \( \rho^2 = 0.881 \) (McFadden)

The strengths of railway in modal competition are the same with the general population’s condition, in Figure 10. The utility value could be increased by improving security (2.476), accessibility to destination (2.459), accessibility from home (2.4), operator’s reliability (1.124), price/fares (0.651), punctuality (0.933), facilities (0.411) and cleanliness (0.319). For mini bus, its strengths in modal competition are security, price/fares, accessibility from home, and accessibility to destination, cleanliness, and punctuality. The utility value could
be increased by improving image (3.907), natural scenery (1.314), facilities (0.308), and services (0.232).

In the third case, we took a sample in function of education, personal travelling motives.

We distinguish the travel purpose because students and personal traveler represent an important proportion (62%) of train passengers, in Figure 8.

Note: Strengths for railway in modal competition are $V_{13}$, $V_{11}$, and $V_{6}$

Figure 7. Utility function coefficient for the population with general consumption expenditures under IDR 5,000,000

Figure 8. Proportion of railway passengers as a function of percentage travel purposes
The utility function is calculated as follows:

\[ U_{\text{Rail}} = 0.486 + 4.318 V_2 + 4.133 V_3 + 0.817 V_4 - 0.464 V_5 \\
+ 0.864 V_6 + 1.139 V_7 + 3.877 V_8 + 19.651 V_9 + 2.365 V_{10} - 7.89 V_{11} \\
+ 1.141 V_{12} - 7.932 V_{13} \] .......... (7)

\[ U_{\text{Mini bus}} = 25.716 - 1.437 V_2 - 0.75 V_3 - 0.478 V_4 + 0.422 V_5 \\
- 0.283 V_6 - 0.3 V_7 - 0.91 V_8 - 3.156 V_9 - 0.542 V_{10} - 1.527 V_{11} \\
- 0.601 V_{12} + 5.371 V_{13} \] .......... (8)

\[ U_{\text{Car}} \text{ (as reference)} \]

(Model test of \( \rho^2 = 0.856 \) (Cox and Snell), \( \rho^2 = 0.968 \) (Nagelkerke), and \( \rho^2 = 0.897 \) (McFadden)

The strengths of railway in modal competition are image and natural scenery, is shown in Figure 9. The utility value could be increased by improving accessibility to destination (19.651), punctuality (4.318), operator’s reliability (4.133), accessibility from home (3.877), security (2.365), price/fares (1.139), services (0.864) and facilities (0.817). For mini bus, its strengths in modal competition are accessibility to destination and punctuality. The utility value could be increased by improving image (5.371) and frequencies (0.422).

![Utility Function Diagram](image)

Note: Strengths for railway in modal competition are \( V_{13} \) and \( V_{11} \)

Figure 9. Utility function coefficient for students and personal travel motives
6. Interpretation of Results

Analyses of preferences demonstrate the importance of each modal factor for the passenger’s preference. The individual variables have a strong impact in function of quantity of people with the same preference and their own preference level.

For the three cases, such as general condition, middle-low expenditure preferences, and regular passenger’s preferences “students and personal travel motives” who choose rail in Table 1, we can say that people consider as high priorities to improve accessibility to destination, accessibility from home and security.

Obviously, railway service is not door-to-door service, so connection between other modes of transport and train are necessary for its passengers. Accessibility to destination is more important than accessibility from home because people are generally quite familiar with their immediate surroundings and transportation option.

Table 1. Preferences Coefficients for Rail

<table>
<thead>
<tr>
<th>Variables</th>
<th>Notation</th>
<th>General Condition</th>
<th>Middle to Low Expenditure</th>
<th>Students and Personal Traveller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punctuality</td>
<td>V2</td>
<td>1.26</td>
<td>0.93</td>
<td>4.32</td>
</tr>
<tr>
<td>Operator’s Reliability</td>
<td>V3</td>
<td>1.19</td>
<td>1.12</td>
<td>4.13</td>
</tr>
<tr>
<td>Facilities</td>
<td>V4</td>
<td>0.80</td>
<td>0.41</td>
<td>0.82</td>
</tr>
<tr>
<td>Frequencies</td>
<td>V5</td>
<td>-0.32</td>
<td>-0.24</td>
<td>-0.46</td>
</tr>
<tr>
<td>Services</td>
<td>V6</td>
<td>-1.43</td>
<td>-0.99</td>
<td>0.86</td>
</tr>
<tr>
<td>Price/Fares</td>
<td>V7</td>
<td>0.58</td>
<td>0.65</td>
<td>1.14</td>
</tr>
<tr>
<td>Accessibility from Home</td>
<td>V8</td>
<td>2.21</td>
<td>2.40</td>
<td>3.88</td>
</tr>
<tr>
<td>Accessibility to Destination</td>
<td>V9</td>
<td>2.54</td>
<td>2.46</td>
<td>19.65</td>
</tr>
<tr>
<td>Security</td>
<td>V10</td>
<td>2.21</td>
<td>2.48</td>
<td>2.37</td>
</tr>
<tr>
<td>Natural Scenery</td>
<td>V11</td>
<td>-1.57</td>
<td>-1.03</td>
<td>-7.89</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>V12</td>
<td>0.73</td>
<td>0.32</td>
<td>1.14</td>
</tr>
<tr>
<td>Image (Prestige)</td>
<td>V13</td>
<td>-2.93</td>
<td>-2.55</td>
<td>-7.93</td>
</tr>
</tbody>
</table>

Note: Modal Transports factors linked with population preferences:
- High
- Medium
- Low

It would be difficult to take any risk if they didn’t know the environment around their destination. Thus, if accessibility to the station is not adequate and involve some uncertainty in transferring from one transport mode to another, people will not feel safe to travel to the desire location. Nevertheless, we can say that accessibility, security, punctuality, operator’s reliability, facilities, and cleanliness are the main weaknesses of train in the modal
competition. The main strengths of railway are image (prestige), natural scenery and services. So the development of railway depends strongly of the improvement of its weaknesses. These conditions are the same for middle-low expenditure preferences, for this kind of population.

A little bit different results to students and personal travelling motives, the priorities also include punctuality and operator’s reliability. Students who are travelling from home to school or university and personal travelling motives who are travelling from home to office, however, identified additional important variables as punctuality and operator’s reliability. Clearly, students and personal traveler must rely on precision in scheduling to ensure that they arrive on time to study at their schools or universities or offices. Likewise, operator’s reliability as a variable guarantees that they will arrive on time to the appropriate institution.

For the three cases, such as general condition, middle-low expenditure preferences and regular passenger’s preferences “students and personal travel motives” that choose mini bus in Table 2 proved that general population, middle-low expenditure and students and personal traveling motives’ preference have different priorities.

### Table 2. Preference Coefficient for Mini Bus

<table>
<thead>
<tr>
<th>Variables</th>
<th>Notation</th>
<th>General Condition</th>
<th>Middle to Low Expenditure</th>
<th>Students and Personal Traveller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punctuality</td>
<td>V2</td>
<td>-0.96</td>
<td>-0.71</td>
<td>-1.44</td>
</tr>
<tr>
<td>Operator’s Reliability</td>
<td>V3</td>
<td>-0.03</td>
<td>0.22</td>
<td>-0.75</td>
</tr>
<tr>
<td>Facilities</td>
<td>V4</td>
<td>-0.15</td>
<td>0.31</td>
<td>-0.48</td>
</tr>
<tr>
<td>Frequencies</td>
<td>V5</td>
<td>-0.39</td>
<td>-0.29</td>
<td>0.42</td>
</tr>
<tr>
<td>Services</td>
<td>V6</td>
<td>0.03</td>
<td>0.23</td>
<td>-0.28</td>
</tr>
<tr>
<td>Price/Fares</td>
<td>V7</td>
<td>-1.05</td>
<td>-1.32</td>
<td>-0.30</td>
</tr>
<tr>
<td>Accessibility from Home</td>
<td>V8</td>
<td>-0.85</td>
<td>-0.95</td>
<td>-0.91</td>
</tr>
<tr>
<td>Accessiblity to Destination</td>
<td>V9</td>
<td>-0.61</td>
<td>-0.85</td>
<td>-3.16</td>
</tr>
<tr>
<td>Security</td>
<td>V10</td>
<td>-1.02</td>
<td>-1.78</td>
<td>-0.54</td>
</tr>
<tr>
<td>Natural Scenery</td>
<td>V11</td>
<td>1.57</td>
<td>1.31</td>
<td>-1.53</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>V12</td>
<td>-0.80</td>
<td>-0.74</td>
<td>-0.60</td>
</tr>
<tr>
<td>Image (Prestige)</td>
<td>V13</td>
<td>4.65</td>
<td>3.91</td>
<td>5.37</td>
</tr>
</tbody>
</table>

Note: Modal Transports factors linked with population preferences:
- High
- Medium
- Low

The most important variable for mini bus is image “V13”. Since marketing is accomplished by word of mouth; it is dependent on people sharing their experiences with others. Since fewer people use the mini bus compared to the
train, a good image is necessary to earn the public’s trust as a safe alternative to other form of transportation. People consider it more relevant. The other important variable is natural scenery because of its relaxing effect that eases people’s stress level. They prefer natural scenery for refreshment; it allows them to forget their problems for a while. The other variables that have to be guaranty for general population and middle-low expenditure groups are facilities, operator’s reliability and services. For them, though, the other significant variable is operator’s reliability because it indicates that they can trust mini bus to provide the proper amenities. Facilities and services are important to have more benefits for them. They are not very often to use this mode, so the trust to the operator is necessary to guaranty from any risk.

For students and personal travelling motives, except the image (prestige) and frequencies, the others variables are not high in importance, however. They go regularly in this trip. For them, natural scenery becomes usual and uninteresting. They prefer to arrive on time at their destination; frequency of available shuttles is important since more option ensure greater flexibility. Campus schedules and extracurricular activities vary so frequent departures from schools and universities are necessary. The important number of vehicles (mini-bus) let to offer high frequencies.

7. Conclusion
Urban activities may increase railway transport demand. Increasing demand is necessary to motivate the multipurpose terminal “GedeBag” area. It will serve as a magnet to attract and increase traffic between Jakarta and Bandung City in the near future. This economic center could also generate more trips, especially for cargo containers. The development of railway between Jakarta and Bandung City is necessary for the movement of passengers and goods. It is important to define policies that will strengthen railway development.

Railway demand could be enhanced by increasing the value of commuter satisfaction. For the general population, some services that should be improved are accessibility to destinations, accessibility from home, security, punctuality, operator reliability, facilities, cleanliness and fares. The first three variables are the most important. Insufficient connections between train and other transportation modes currently impact train use. Integration with other modes must improve to attract passengers; if accessibility is suitable, passengers will feel safe. The strengths of railway into modal competition are image, natural scenery, and service.

For a potential market segment, such as that represented by consumption expenditure under IDR 5,000,000, railway services that must be improved are security, accessibility to destination, accessibility from home, operator’s reliability, price/fares, punctuality, natural scenery, facilities and cleanliness. The main variables are the same as those identified for general population, but security is the most important one for this population segment. The strengths of railway in modal competition are the same with the general population’s
condition.

Finally, the market segment that is most interested in transport by train (e.g. students and personal travel) has identified services to be improved as accessibility to destination, punctuality, operator’s reliability, accessibility from home, security, price/fares, services and facilities. The first two variables, such as punctuality and operator’s reliability, are important to convince themselves that they can catch their desire destination on time. The strengths of railway in modal competition for this group are image and natural scenery.

Acknowledgements
The authors would like to thank Ministry of Education and Culture, Government of Indonesia and the French Embassy for funding this research from the International Joint Research funding 2011.

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