The Impact of Public Transportation on Reducing Transport-related Social Exclusion: an Exploratory Study in the Case of Jakarta

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Abstract: This study attempts to assess the impact of public transport on reducing social exclusion in the sense that low- and middle income people could participate in normal activities equally. Hypothetically, urban dwellers living within the catchment areas of public transportation line will enjoy advantages of the system and have greater access to their places of activities. However, studies confirming such hypothesis, particularly in developing country's context, are still limited. Therefore, this research took Greater Jakarta Commuter Train (KRL Jabodetabek) as the case study. The service has made several breakthrough of service improvement in the last five years since 2009. For that purpose, a framework for assessing social inclusion impact is developed. We carried out a questionnaire survey and developed structural equation modeling to test the analytical framework. Finally, this study explored the role of the system in reducing social exclusion as well as their challenges.

Keywords: public transportation, bus rapid transit, commuter train, transit policy, social inclusion, social exclusion

1. INTRODUCTION

Whilst there is a great deal of research studying the links between transport and social exclusion (Delbosc and Currie, 2011), social inclusion is a relatively new concept for evaluating the benefits of transport policy. A heavier focus on economic benefits may have resulted in negligence to the fact that there are groups of communities being socially marginalized. In such circumstances, the majority of people take the inability of those socially marginalized people to access the opportunities in life (such as barriers to employment, exclusion from services, fear and perceptions of safety, reduced educational attainment, and health service inequalities) for granted (Hine and Mitchell, 2003; Clifton and Lucas, 2004). These conditions are parts of the social exclusion dimensions. The concept of transport disadvantage and social exclusion was originated from UK and US (Estivill, 2003; Stanley and Lucas, 2008). Accordingly, the discussions are in developed countries' context, which might be different from that of developing countries.

KRL Jabodetabek or hereafter, KRL Jabodetabek, is a commuting train network serving Greater Jakarta (consisting of Jakarta and four surrounding districts Bogor, Depok, Tangerang, and Bekasi). The service was established in 1930. By that time, only one line was in operation, the Batavia Line (Jakarta Kota) - Buitenzorg (Bogor) connecting northern part of Jakarta with southern adjacent district in the era of Dutch Indies colonization. By now, the network has expanded and is currently available connecting Jakarta with the four surrounding districts as well as some strategic points within Jakarta area (see Figure 1).

A significant change that led to improved performance of this commuter service was marked by the spin-off of the Indonesian Railway Company (PT KAI)'s division taking in

charge of operating KRL into PT KAI's subsidiary company, PT Kereta Commuter Jakarta or known as KCJ. The reform successfully boosts professionalism in delivering this commuter service. Some policy measures have been placed and some is ongoing, including erasing non-air conditioned economy train, increasing frequency, re-routing, improving train stations' accessibility and condition, purchasing new trains, revamping the signal system, revamping the infrastructure of rail and bridge and telecommunication and electricity.

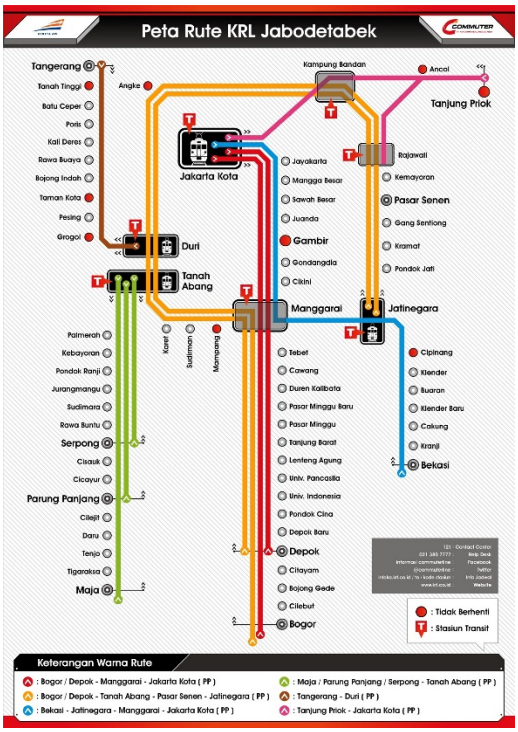

Figure 1. Jabodetabek KRL Service Route
Source: PT. Kereta Commuter Jakarta (KCJ) (www.krl.co.id)

Such positive movements, particularly in terms of reliability, result in increasing public interests in using KRL. It currently contributes 9% of the total revenue of PT KAI. In overall, the passenger flow of Jabodetabek has grown in the last 25 years with the annual average of 7% (Susantono, 2014). The company aims at reaching 1.2 million passengers per day by 2019, doubled from today's daily riderships.

The question is whether the increase of ridership also reflects the reduction of social exclusion due to transportation disadvantage particularly of the low- and middle- income group living along the KRL corridors or not. Therefore, the aim of this study is to explore the role of KRL Jabodetabek as an effort to improve the quality of mass transportation in Jakarta Metropolitan Area in facilitating the need of the middle-low income group mobility. In broader perspective, this study is expected to give advantage in understanding the social inclusion dimension of the mass transportation system existence in urban area of developing countries, especially in Indonesia.

The objectives of this paper are three-fold. First, it developed a conceptual framework to provide operational definitions and measurement methods of the impact of public transport system on social inclusion in Indonesia. Second, it applied the framework to assess the impact of public transportation system in Indonesia on reducing social exclusion. The study took Greater Jakarta Commuter Line or, hereafter, *KRL Jabodetabek* as the case studies. Finally, it

formulated recommendation of transit policy to promote the role of mass transits in contributing to reducing social exclusion.

2. TRANSPORT-RELATED SOCIAL EXCLUSION

Social exclusion was first introduced by Rene Lenoir of France who anticipated the existence of marginalized group in the ongoing economy development such as the group of people with the disabilities of physical, mental or social state (Estivill, 2003). Some literatures explained that social exclusion is strongly related with the terminology of poverty. The difference between those two is that poverty refers to the distribution issue where social exclusion refers to relational issue (Spicker, 1997 in Department of Transport, 1999). Later, the terminology of social exclusion is more frequently used rather than the terminology of poverty to explain the problems related to the issue of deprivation in an individual or community level. The reason is that the concept of social inclusion explains more than deprivation, destitution and penury which are suitable with the current situation and not too stigmatic with the terminology of poverty (Estivill, 2003).

Some previous studies had proposed the definitions of social exclusion. Based on those definitions, it can be concluded that there was one similarity between them, which was the incapability to participate in every opportunity or activity in general (Foley, 1999; Kenyon et al., 2000; Knapp-Philo, 2000). The most practical definition was given by the SEU Report (2001) where it stated that social exclusion happened when an individual had one or more problems which related to unemployment, low capacity, low quality housing and health care, and family separation (SEU, 2001).

The key of participation in the common activates that most people made the concept of social inclusion become a relative concept. In the west countries where the concept of social inclusion was first emerged, the concept emerged from heterogeneous value and image which caused the difficulties in finding the main core to meet the need of self-identification (Estivill, 2003). In the southern countries which have different political, social, and economy situations, this concept has to be enriched and adjusted. In those countries, where amily relation, neighborhood, or the entity community along with its symbols strongly related to one each other, social exclusion tended to be implied into the lacking of access to various basic need materials such as social services, education, health care; and the community participation in every decisions which affected their life (Estivill, 2003). This concept was also supported by Lucas (2012) which explained that social exclusion, especially transport-related social exclusion, was a universal concept and operational yet the experiences can be different for countries, social groups and location.

In Indonesia context, there are few literatures discussed about this concept. To that extent, there has been no study conducted in defining the concept of social inclusion which suited the Indonesian typical characteristics. Therefore, defining social exclusion was first defined by using the terminology of normal activity as area of threshold for a person being socially excluded or included.

An analysis conducted by Burchardt (1999) showed that normal activity was the most complete and usable in other studies (Wixey, 2005). According to Burchardt, normal activity is categorized into 5 aspects: (1) consumption activity, (2) saving activity, (3) production activity, (4) political activity and (5) social activity. Based on the categories, social exclusion happens when an individual cannot follow those activities. The main focus on social exclusion study is the phenomenon when an individual does not involve in such activities due to the lack of resources not because of his or her own voluntary choices.

Delbosch and Currie (2011) explained that there are 5 dimensions where social exclusion

can be defined: (1) income rate, (2) unemployment status, (3) involvement in political activities, (4) participation and (5) social support. Moreover, social exclusion can also be derived from the capability approach, where an individual normal activity can be identified through the function of economy, social, and political such as (1) the ability to fulfill the basic needs, (2) the achievement of a certain quality of life, (3) the ability to have a fine house, (4) the ability to have social relationship, (5) the ability to be healthy, (6) the ability to live in a safe environment and (7) the ability to do working activates and have social status.

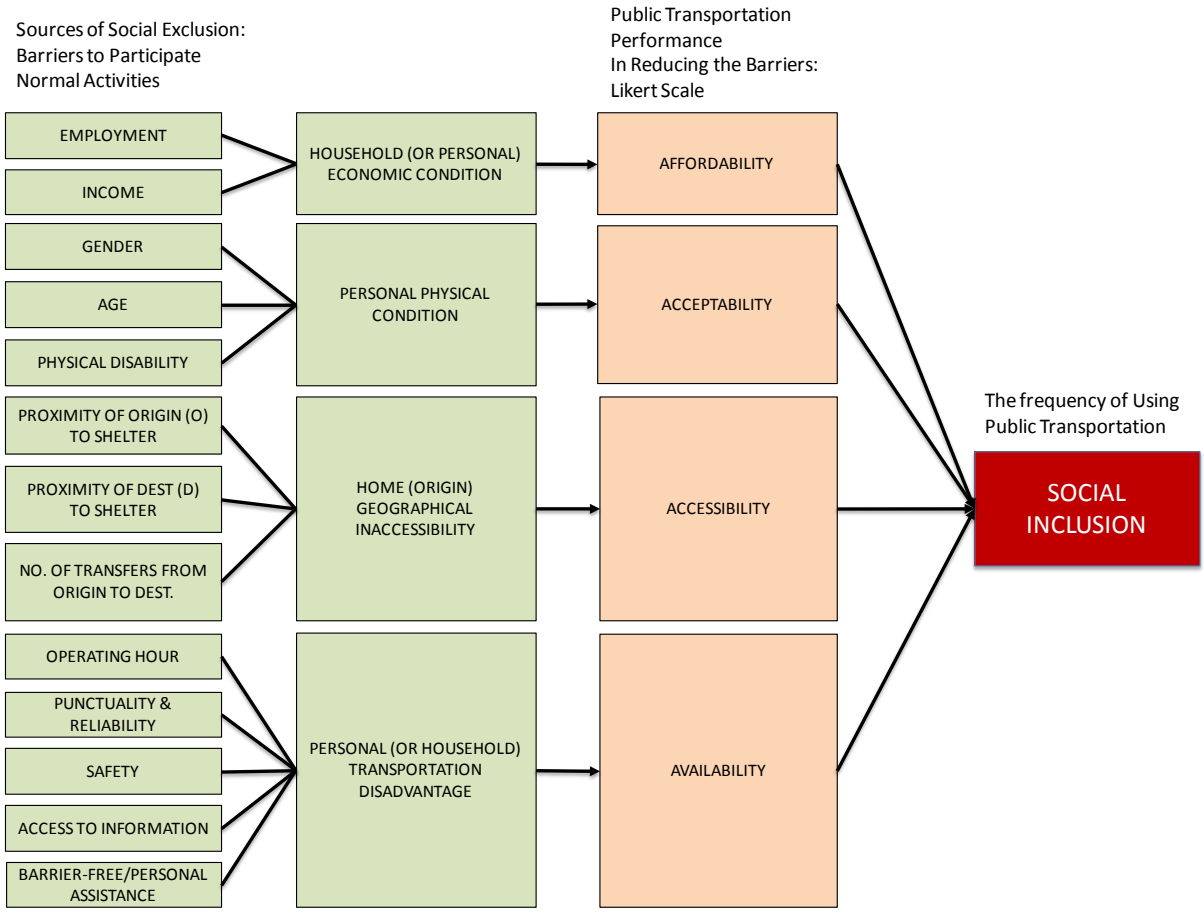

Figure 2. Indicators of Barriers to Participate in Normal Activities and the Relation to Social Inclusion (The Frequency of Using Public Transportation to Meet Basic Needs)
Source: Modified from Delbosc and Currie (2011) and other literatures

The sample approach was used by Preston and Raje (2007) where they used the postulate derived from theory of entitlement from Sen (1981) which explained that social exclusion was not caused by the lack of social opportunity but rather by the lack of access to reach the opportunity.

Some reports regarding the social exclusion stated that there were some dimensions needed to be identified, such as employment, education, housing, health care, consumption goods, delinquencies, access to public services, justice, recreation and the socio-cultural integration (Estivill, 2003). From all the reports, the housing dimension seemed to be constantly emerged. Otherwise, owning the access to sufficient housing is an important dimension to identify the occurrence of social exclusion. Based on several dimensions and indicators used to measure social exclusion, it seemed that the only similarity was that social exclusion can happened if an individual or a group of people cannot participate voluntarily in

one or more aspects of economy, social, cultural and politic.

3. METHODOLOGY

This study applies quantitative approach. A questionnaire survey was conducted to collect trip

Table 1. Component of the Indicator of Social Inclusion of KRL Jabodetabek

Indicators	Component
Affordability	(f1) the affordability of the price, (f2) the perception of the cheapness of the price, (f3) the decrease of transportation spending as the result of using the KRL, and (f4) the ability to save money from the transportation expenses.
Acceptability	(c1) The availability of special-need facilities, (c2) the availability of female carriage, and (c3) the helpful staff of the KRL service
Accessibility	(s1) the broadly scope of route service, (s2) the easiness to reach the station, (s3) the ability of the KRL to carry passengers directly to the destination, (s4) the availability of feeder from home to station, and (s5) the availability of feeder from station to destination.
Availability	(v1) the length of the operation time, (v2) the frequency of the operation, (v3) the clarity of schedule, (v4) the speed of KRL, (v5) the informative service, (v6) safety reason, (v7) practical ticketing system, (v8) convenience station environment, (v9) easiness to transfer to other mode, (v10) convenience KRL environment

characteristics of households' living alongside KRL Jabodetabek's routes. The survey aimed to acquire the information about existing commuting characteristics such as transportation modes, transportation costs, etc in order to explore factors that might cause transport-related social exclusion to the family members. Furthermore, the questionnaire also included likert scale statements to capture respondent's perception on existing KRL Jabodetabek service quality in relation to their choice of using KRL Jabodetabek as their main transportation modes. The statements were, in principle, categorized into four indicators: affordability, acceptability, accessibility, and availability. Each indicator was broken down into several components as described in Table 1.

In obtaining respondents, we used cluster sampling technique. We focused on households residing within the area of 400 meter radius from train stations of Jakarta-Bogor Line. This line was selected because it was the busiest line compared to other KRL Jabodetabek line. It covered 64% of KRL Jabodetabek's passengers based on 2010 data. Meanwhile, 400 meter radius was assumed as the standard walkable distance for Indonesian context.

The sample size was determined by using the following formula:

$$x = Z\left(\frac{c}{100}\right)^2 r(100-r). \quad (1)$$

$$n = \frac{Nx}{((N-1)E^2+x)} \quad (2)$$

$$E = Sqrt\left(\frac{(N-n)x}{n(N-1)}\right) \quad (3)$$

Where n is the sample size, E is margin of error, N is the population size, r is the fraction of

responses and $Z(\frac{c}{100})$ is the critical value for the confidence level *c*. With

The population size was approached from the number of population residing in the village (*kelurahan*) where the station is located in. In total, based on 2012 data, there were about 582,482 people residing within the target area. By using 93.25% confidence level and 10% margin error, the survey was arranged to obtain 202 respondents. As there are 25 train stations exist in Jakarta-Bogor Line, we dispersed the targeted number of respondents for each station area proportionally to the number of population. The survey was conducted in 5 consecutive days from 27 – 22 June 2014, assisted by 6 surveyors. Each surveyor had to choose randomly and visit houses located within the red circle line identified in a reference map provided for each station area. Two of the station areas are illustrated in Figure 3 and Figure 4. The houses they visited were only those that physically appeared as low- and middle-income class houses.

Figure 3. Location of respondent distribution around Bogor Station (southern end station)

Figure 4. Location of respondent distribution around Jakarta Station (northern end station)

For the analysis, we used statistical descriptive analysis and multi-criteria evaluation approach to identify the impact of those indicators of KRL Jabodetabek service on social inclusion. The questionnaire data was analyzed by using Structural Equation Modeling (SEM). SEM is a statistical method used to measure the causal effect relation of an exogenous variable to endogenous variable and the causal effect between the endogenous variable (Bollen, K.A., 1989; Golob, 2003).

4. RESULTS AND ANALYSIS

4.1 Trip Characteristics of Respondents Residing along the Corridor of Jakarta-Bogor Line

The survey data show that the most of the respondents have the family size of 3 to 5 persons (73.3%). Most of the respondents are the head of family (81.7%) with the age range of 31-50

years old (65.46%). Most of them work at least 35 hours per week (81.21%) and some of them work less than 35 hours per week (11.52%) while the rest do not work. About 36.60% of them work as private employee, 21% work as self-employee, 19.61% work as salesman, 6.54% work as civil servant and the rest have other jobs.

About 26.2% respondents earn between IDR 1.5 million to IDR 2.5 million, 18.8% respondents earn less than IDR 1.5 million, 18.9% respondents earn between IDR 2.5 million to IDR 3.5 million, while 8.9% respondents earn more than IDR 3.5%. Meanwhile, about 43.6% of the respondent have the family income less than IDR 3 million, while 39.1% others have family income between IDR 3 million to IDR 4 million and 17.3% have family income more than IDR 4 million.

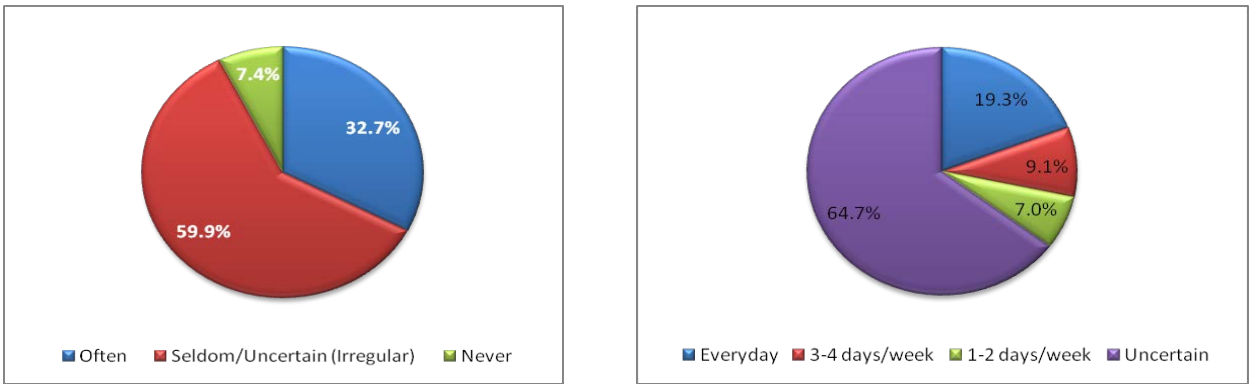

Figure 5. Frequency of Using KRL Jabodetabek

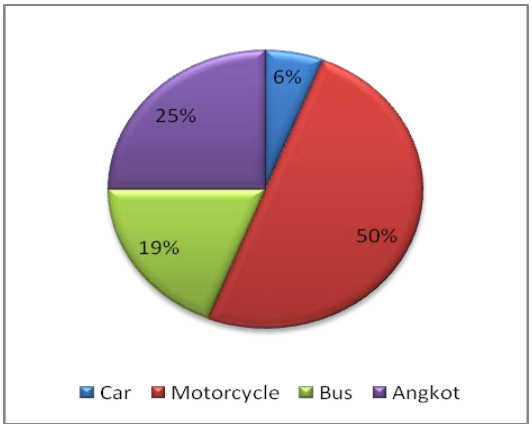

Figure 6. Alternative Transportation Modes Used
Note: *Angkot* is route-based van-type public transportation (as abbreviation of *angkutan kota* or urban transportation)

Regarding their trip characteristics, 59.9% of the respondents use KRL Jabodetabek irregularly. Only 32.7% use it often, while the rest (7.4%) never use it. Similar result is obtained when we try to confirm by asking their weekly frequency of using KRL Jabodetabek. Only 19.3% of the respondents use KRL Jabodetabek everyday. 9.1% use it 3 to 4 days per week and 7% use it 1-2 days per week. It is found that when those commuters do not use KRL Jabodetabek, 50% of them use motorcycle, 19% bus, 25% angkot (route-based van-type public transportation), and 6% use car to do their normal activities.

The reasons they use other modes as alternative to KRL Jabodetabek are various. Most of the respondents can state 3-4 reasons. 20.3% of the respondents even come up with other

reasons that were not part of the choices provided in the questionnaire. However, the data show that they tend to use other mode when the trip requires different route from the available KRL Jabodetabek route (17.3%). 14.4% of the respondents could not use KRL Jabodetabek because of the operational hour of KRL Jabodetabek does not fit their need some time (either they have to go very early in the morning or very late in the evening). Another reason is travel time. About 12.9% perceives that the travel time using KRL Jabodetabek is too long and thus they prefer to use other transportation mode to carry out their daily trip. Furthermore, 10.4% perceives that they will find difficulties in transferring from KRL Jabodetabek to other mode and 8.9% perceives that they cannot find egress mode to reach their destinations after they alight from the train service. If we refer to the definition of social inclusion indicators in Table 1, those aforementioned reasons can be categorized mainly into availability (route mismatch, operating hour mismatch, travel time) and accessibility (inter-mode transfer convenience and egress mode).

In proceeding the next phase of analysis, the correlation between the socio-economy characteristics and the four indicators given to measure the inclusiveness of the KRL have to be investigated. As the correlation is measured between the socio-economic characteristics and travel behavior with the indicators, the result shows that not every component gives influence to the perception of society towards the inclusiveness of the KRL.

4.2 Path Model of the Correlation between Social Inclusion Indicators and KRL Jabodetabek Usage

As explained in the previous section, this study proposes four indicators of social inclusion that influences the use of Jabodetabek KRL as the main public transport mode for people residing along the KRL Jabodetabek route. The indicators are (1) level of affordability, (2) level of acceptability, (3) level of accessibility and (4) level of availability. Those indicators are elaborated into several components which construct the idea of the main indicators.

By using the path analysis through the help of LISREL 8.7 there are 4 models depicting the relationship of each as follows:

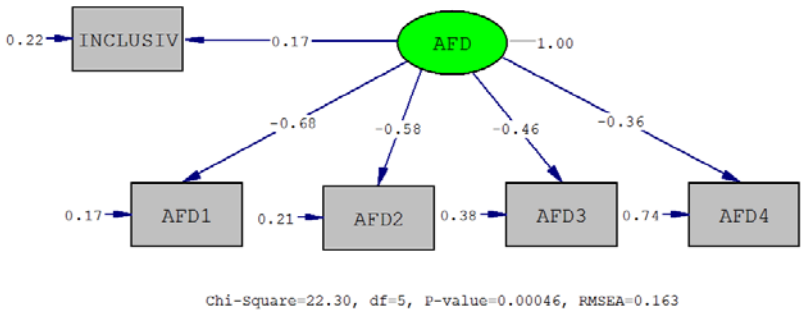

Figure 7. Model of Affordability to Social Inclusion

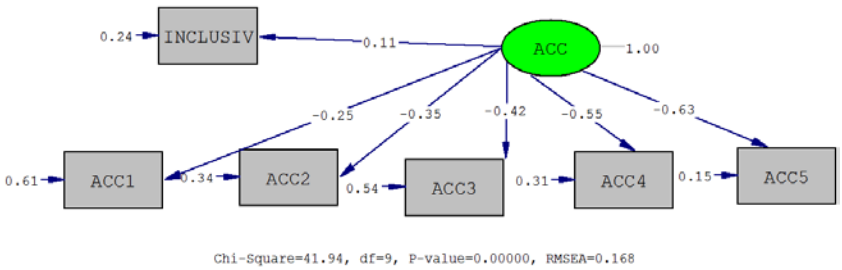

Figure 8. Model of Accessibility to Social Inclusion

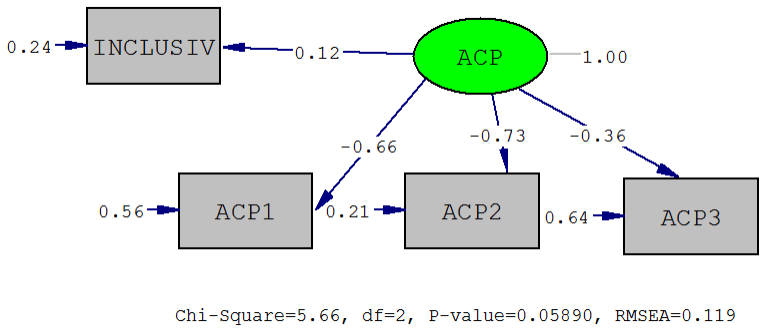

Figure 9 Model of Acceptability to Social Inclusion

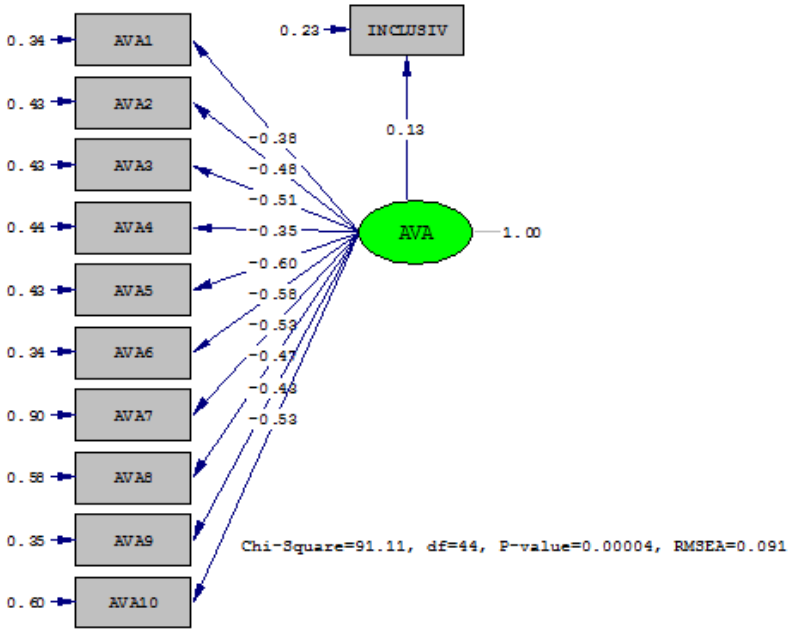

Figure 10. Model of Availability to Social Inclusion

Based on the quantitative output of analysis, it is revealed that except the acceptability mode, all models are significant to social inclusion criteria (INCLUSIV). The t-value gives the significance of each component's contribution to the main indicator. The level of contribution is shown through the loading value of each component. For affordability model, the most reliable component is the AFD1 (affordability of ticket price) with load at -0.680. ACC5 (the availability of feeder to get to the station) is the most reliable component in Acceptability Model with load at -0.631. Finally, the AVA5 (easiness to gain information about Jabodetabek KRL operation) is the most reliable component in the Availability Model with load at -0.599. All three of this model is fit with p-value respectively 0.163 for Affordability Model, 0.168 for Accessibility Model, and 0.091 for Availability Model.

As the next analysis, the correlations between respondent characteristics (covering personal disability, geographical inaccessibility, income constrain, and transport disadvantage) and the criteria of social inclusion are measured as well. Based on crammer's' v-value through

the operation of SPPS, it is then revealed that the group of variable within personal disability have no correlation with the social inclusion criteria. Similar results are also found for the other three groups of characteristics. However, if we look into more detail, within the geographical inaccessibility group, variable of work distance and distance between origin and the station are significant to inclusion criteria. It is again a matter of the level of accessibility KRL Jabodetabek can provide. Type of job and respondent's income are two significant variables within the group of income constrain which are significant to social inclusion criteria. And finally, mode choice for work, mode from origin to station, and non KRL mode used are three variables which are significant to social inclusion criteria in the transportation disadvantage model.

Both considerations to test the social inclusion criteria can be visualized as follow.

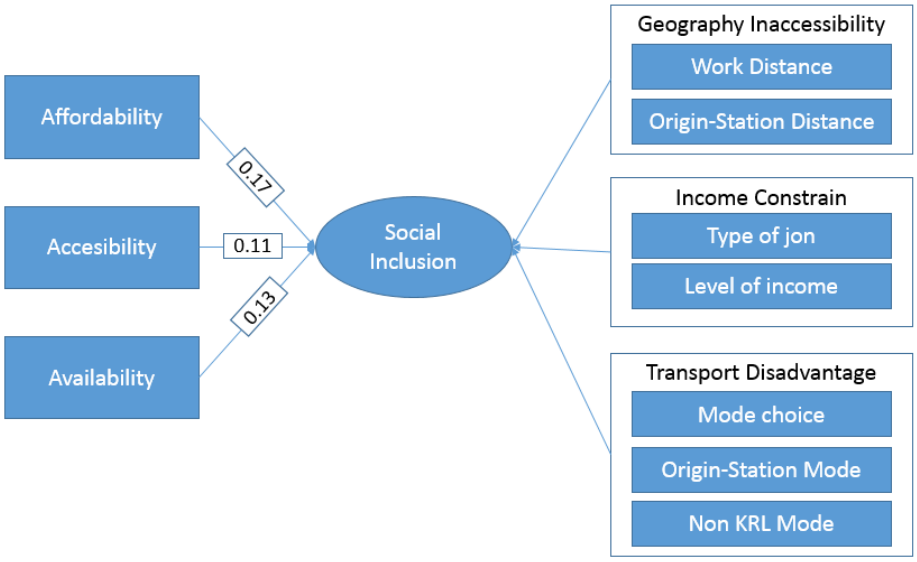

Figure 11. Social Inclusion Criteria

5. CONCLUSION AND RECOMMENDATION

Social inclusion depicts the equality for people to have the same opportunities to carry out their normal activities conveniently. Transport-related social inclusion refers to the degree of how transportation, in this case public transportation, facilitates those opportunities. In this study, the role of KRL Jabodetabek in reducing social exclusion for middle-and-low income people has been investigated by using four indicators: affordability, acceptability, accessibility and availability. However, this study concludes that, in the case of KRL Jabodetabek, social inclusion is a construct of only three indicators: affordability, accessibility, and availability. In terms of affordability, fare level is the main component to consider. Meanwhile the availability of feeder to the station is quite significant in terms of accessibility. Lastly, the easiness of gaining information of KRL Jabodetabek operation is the other component that can promote the service usage. In addition to those, based on statistical descriptive analysis, it is also found that availability (route mismatch, operating hour mismatch, travel time) and accessibility (inter-mode transfer convenience, egress mode availability) are indeed essential and have become the reasons for potential KRL Jabodetabek's passengers to choose other mode of transportation to carry out their normal activities.

Interestingly, acceptability seems to be too advanced for the respondents to comprehend. The concept of acceptability here is reflected by three types of service: the availability of

special-need facilities, the availability of female carriage, and helpful staff of the KRL service. This could indicate that acceptability may not be necessary in this stage yet for low- and middle-income people. It also could indicate that acceptability concept is more of developed country context rather than developing country context. However, it requires further investigation.

Conclusively, the role of KRL Jabodetabek in reducing transport-related social exclusion has not been able to be identified. This is because less middle-and-low income people in Greater Jakarta are using it as their main transportation mode to meet their basic needs. On the other hand, those who use KRL Jabodetabek are not captive users. They tend to use it irregularly since most of them have alternative modes, particularly motorcycle, which can provide solution to the drawbacks of KRL Jabodetabek service in terms of accessibility and availability as mentioned. In other words, transport-related social exclusion does not occur in Greater Jakarta but transit-related social exclusion may occur for captive users. Without more extensive and integrated metropolitan-scale mass rapid transit, the role of public transportation in reducing social exclusion cannot be justified.

The three components of social inclusion indicators: fare affordability, feeder availability, and information clarity can be the basis for policy makers, in this case interregional governments within Greater Jakarta and the railway company (PT KCJ and PT KAI), to facilitate low- and middle-income people need in accessing KRL. Among the three, feeder availability particularly the egress part should be well-integrated with KRL Jabodetabek. This will to some extent increase the service coverage of KRL Jabodetabek itself and reduce the possibility of route mismatch that hinders people from using the service. Another thing that the data show is the fact that even people who resides within walking distance from the station requires feeder service to access the station. Connectivity within 400 meter radius from the neighborhood to the station needs to be paid attention to. The concept of connectivity is not necessarily in form of providing motorized transit services. It can also be solved by providing good quality of pedestrian-way connectivity towards the station with a clear sense of place. This will relate to the implementation of rail-based transit oriented development (TOD). The availability and the integration of feeder and KRL Jabodetabek will eventually reduce the perceived door-to-door transportation cost as an effective approach to reduce the dependency of low- and middle-income people upon motorcycle. Furthermore, the easiness of passengers to gain information will also improve the service reliability. Good information system will also help the users of KRL Jabodetabek to better understand and arrange their daily trip in accordance to the service operations.

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