Assessment of Transport Poverty and Its Social-Economic Impacts on Communities (Case of Bekasi Barat, Bekasi City)

S N Iman¹ and Y Herwangi¹
¹Urban and Regional Planning Program, Department of Architecture and Planning, Universitas Gadjah Mada, Yogyakarta, Indonesia

E-mail: shafira.nurul.iman@mail.ugm.ac.id

Abstract. Transport poverty is a paradigm where such conditions cause limitations in using transportation facilities that affects the marginalized. The poor is most often affected by the lack of vehicles both private and public transportation services in terms of choice and quality of service, thus causing social exclusion and shuts people from economic, social, and political participation due to lack of access to transportation. Transport poverty have bearings on the travel patterns of the affected groups. The study aims to identify and analyze the impact of transport poverty on the travel patterns of affected groups and compare them with unaffected groups. Bekasi City has a vital role as a satellite city of DKI Jakarta which also has high poverty rates and numbers of poor people. Home-based school and work travel pattern are chosen given these trips are the most frequent done in a household. This research method is a deductive method using a mixed method and collecting data using questionnaires, in-depth interviews and observation results. The conclusion of this research is the phenomenon of poverty occurs in Bekasi Barat, Bekasi City, influencing communities travel patterns with indicators of affordability, mobility, and accessibility, as well as having impact on their social exclusion.

Keywords: Low-income Households, Transport Poverty, Travel Pattern

1. Introduction
The Right to the City is a comprehensive approach to improve the daily quality of life in the city. The right to city means that all individuals and groups within the city have the right to access, occupy and use public facilities within the city. One of the principles of the right to cities are inclusiveness and sustainability by ensuring equality of rights and opportunities, including the right to movement of transportation [1]. The right to transportation movement is the ability to access movement. The condition of the spatial structure of a city affects the rights obtained by its people [2]. Placement and location of transportation infrastructure in a city can change the pattern of movement related to community activities and needs.

Transportation is a derived demand caused by other activities, so that the benefits of transportation become diverse, such as economic benefits, social benefits, political benefits, and regional benefits [3]. Transport Poverty is a paradigm in which there are conditions that cause limitations in using transportation facilities [4]. The relationship between transport poverty with the transportation system is the presence of four indicators that are used as parameters, namely Transport Affordability, Transport Mobility, Transport Accessibility, and Exposure to Transport Negative Externalities.
Transport affordability emphasizes the costs involved in traveling and accessing transportation system options [5]. Mobility poverty is defined as the lack of a transportation system that causes difficulty in movement [6]. Accessibility poverty considers how a person can utilize the transportation system in a reasonable time, easy access and costs that are comparable to income [6]. Lastly, negative exposure to transport externalities explains how there are exposure to negative impacts indirectly arising from transportation activities, such as vehicle pollution and risk of accidents [6].

Transport Poverty affects the social exclusion caused by transportation [7]. Social exclusion caused by transportation is a process in which people are prevented from economic, social or political participation due to lack of access to opportunities, services, social networks due to inadequate mobility. The ability to travel is a basic need, providing access and the creation of social networks, so that the existence of transport poverty can hinder the rights of an individual or group in traveling [8]. The focus of this study is the impact of transport poverty on low-income households, or the poor. Indonesia has a high poverty rates where it has been and currently still a big problem in Indonesia [9].

In this study, the chosen travel destination is a trip from home to school and work location (Home-based School and Work). These trips are chosen because the trip to school location and work location are the trips with the most frequency in a household. The control group and the experimental group here are intended as a research group and a comparison group. Transport Poverty generally targets the marginal group, in this study the low-income household is the experimental group, while the control group which is the community group outside the marginal group, serves as a comparison. By comparing the travel patterns between the two groups, a comparison of travel patterns of people exposed to transport poverty and people not exposed to it can be seen.

Bekasi City as one of the satellite cities of Jakarta Metropolitan Area was chosen as the locus of research due to its vital role as a satellite city and a buffer city of DKI Jakarta, the National Activity Center and the capital city of Indonesia. In practice, there is still a high level of poverty in Bekasi City, especially in Bekasi Barat Subdistrict located in the center of Bekasi City [9]. This happened in Bekasi City despite the existence of resources from DKI Jakarta as the capital city of Indonesia, also the location of Bekasi Barat Subdistrict is located in the center of Bekasi City with the availability of a public transportation system, therefore it is assumed that this phenomenon also happens in other cities and in areas especially the ones that are not located in the city center.

2. Research Design

2.1. Experimental Group and Control Group
The experimental group and the control group are intended as a research group and a comparison group. Transport Poverty generally targets marginalized groups [10], such as the poor, people who live in rural areas, the disabled, and the elderly, thus the low-income households are likely to experience transport poverty. The low-income household group will be the experimental group as their travel patterns will be examined, while the control group functions as a comparison of the community outside the marginal group. With the existence of an experimental group and a control group, comparison of the travel patterns of people exposed to transport poverty and those not exposed to it will be found. In this study, the low-income households as the experimental group resided in informal settlements and the control group resided in formal settlements.

2.2. Travel Pattern
The pattern of travel itself comes from the generation of trip and attraction of travel. There are important factors influencing the characteristics of the trip, one of which is the purpose of the trip. The purpose of the trip is divided into work trip, school trip, shopping trip, business trip, and social trip. The scope of travel patterns in this study is home-based school and work travel given this trip is the most common and frequent ones in every household [11].

Indicators of transport poverty are Transport Affordability, Transport Mobility, Transport Accessibility, and Exposure to Transport Externalities, so that the travel patterns carried out by the
experimental and control groups are assessed and compared based on affordability, mobility, and accessibility according to the transport poverty indicators. Externalities are excluded in the research indicators because this study only discusses the direct impact of transport poverty.

2.3. Data Collections
The data collection method uses questionnaires that randomly spread using Simple Random Sampling to 180 respondents who live in informal settlements and formal settlements in Bekasi Barat, Bekasi City. The respondents are chosen using stratified Random Sampling whereas in this technique, sample of respondents are taken by considering the level in a population, such as, the income level of respondents. Data of respondents taken will be grouped as two criterion, household income below the minimum wage of Bekasi City, and household income above the minimum wage of Bekasi City. The respondents are selected randomly by giving door to door questionnaires in the case study’s area. There are two locations of informal settlements and two locations of formal settlements. The respondents are grouped by some different characteristics.

Respondents characteristics are used to determine the diversity of respondents based on age, occupation, income, and the number of private vehicle ownership. Characteristics of respondents are expected to provide an overview of the conditions of each respondent, especially the differences in conditions that occur in each group, and whether these differences affect the purpose of this study, especially how the impact of transport poverty affects the travel patterns of each group.

| Location                  | Settlements Form | Respondents’ Age Range | Respondents’ Occupation | Respondents’ Salary | Respondents’ Private Vehicles Ownership |
|---------------------------|------------------|------------------------|-------------------------|---------------------|----------------------------------------|
| Harapan Baru Regency      | Formal           | 15-60                  | Formal sector           | > Minimum Wage      | Majority own private vehicles           |
| Kampung Rawa Bebek        | Informal         | 15-60                  | Informal sector         | < Minimum Wage      | Majority don’t own private vehicles     |
| Perumahan Jakapermai      | Formal           | 15-60                  | Formal sector           | > Minimum Wage      | Majority own private vehicles           |
| Kampung Pulo              | Informal         | 15-60                  | Informal sector         | < Minimum Wage      | Majority don’t own private vehicles     |

2.4. Data Analysis
The Mann Whitney-U Test Analysis is used to compare differences between the control group and the experimental group and to determine the truth of the initial hypothesis made based on the research data obtained [12]. The results of the questionnaire were analyzed using the Mann Whitney-U Test to assess whether there were some differences or average similarities between expenses for transportation, distance traveled, duration of travel, and alternative travel choices made by households in the control group and the experimental group with the purpose of attending school and working.

This study also uses hypothesis, namely:

a. Null hypothesis: The dependent variable between the control group and the experimental group are different based on each characteristic.

b. Alternative hypothesis: The dependent variable between the control group and the experimental group are same or similar based on each characteristic.

3. Travel Pattern for Home-based School and Work

3.1. Transport Affordability
Affordability in this study is described as a percentage of expenditure for transportation compared to
income. The ideal standard expenditure on transportation ideally not to exceed 10% of household income [5], so if there is transportation expenditure above 10%, the individuals are considered to be affected by transport poverty. If the transportation expenditure exceeds 10% of their income, households may need to spend a large part of their income on transportation but to avoid that, they are forced to limit their trips to ensure other needs are met.

Figure 1 and Figure 2 above show that more than half of experimental groups have transportation expenses exceeding 10% of their income. Significant differences can be seen when compared to the control group, where only a small proportion have transportation expenses exceeding 10% of income. This phenomenon is influenced by the different amount of income received of each group. When the transport affordability scores between the two groups are compared using Mann Whitney U-test, the result shows that there are differences of the amount of transportation expenditure between the control group and the experimental group differed based on income characteristics as shown below:

Table 2. Mann Whitney-U Test for Transport Affordability Indicator

| Transport Affordability | Mann Whitney-U | Wilcoxon W | Z      | Asymp. Sig (2 tailed) |
|-------------------------|----------------|------------|--------|----------------------|
| Near                    | 277,000        | 838,000    | -3.295 | 0.001                |
| Moderate                |                |            |        |                      |
| Far                     |                |            |        |                      |

Mann-Whitney U test results have Asymp. Sig. values <0.05 which means the initial hypothesis is accepted [12]. It can be concluded that the amount of transportation expenditure between the control group and the experimental group is different based on the income characteristics of each group. Asymp. Sig. values <0.05 also proves that this phenomenon also occurs in populations.

3.2. Transport Mobility

Mobility in this study is measured by comparing the travel patterns of the control group and the experimental groups. Mobility is measured using the travel distance variable [13]. The distance traveled is used to measure the mobility of each group. Mobility based on distance is divided into three categories such as Near (<150km), Moderate (150-300km), and Far (> 300km).
Figure 3 and Figure 4 above show that majority of travel distance by both groups are Moderate. Differences can be seen in Near travel distance whereas only a fraction of control group traveled Near compared to half the experimental groups. Differences can also be seen in Far travel distance whereas the control group has more respondents who travel Far when compared to the number of respondents in the experimental group who travel Far. This is influenced by the convenience of traveling for each group. When the transport mobility scores between the two groups are compared using Mann Whitney U-test, the result shows that there are differences of the distance traveled between the control group and the experimental group differed based on travel convenience as shown below:

Table 3. Mann Whitney-U Test for Transport Mobility Indicator

| Transport Mobility Test Statistics | Mann Whitney-U | Wilcoxon W | Z  | Asymp. Sig (2 tailed) |
|-----------------------------------|---------------|------------|----|-----------------------|
|                                   | 277,000       | 838,000    | -3.295 | 0.001                |

Mann-Whitney U test results have Asymp. Sig. values <0.05 which means the initial hypothesis is accepted [12]. It can be concluded that distance traveled between the control group and the experimental group is different based on travel convenience by each group. Asymp. Sig. values <0.05 also proves that this phenomenon also occurs in populations.

3.3. Transport Accessibility
Accessibility in this study is measured by how many numbers of access available, both from private vehicles and public transportation to locations desired, which are the location of education facilities and employment field. Accessibility is divided into three categories such as Deficient (there are no travel alternative available), Adequate (there are travel alternatives both by private vehicles or public transportation), and Good (having both access of private vehicles and public transportation).

Figure 5 and Figure 6 above show that the majority of experimental group have Deficient number of travel alternatives, only less than 10% respondents have Good number of travel alternatives. However, 89% respondents of control groups have Good number of travel alternatives, the rest have Adequate number of travel alternatives, and no respondents of control group have Deficient number of travel alternatives. This is influenced by differences of private vehicle ownership between each group. When the transport mobility scores between the two groups are compared using Mann Whitney U-test, the result shows that there are differences of the number of travel alternatives between the control group and the experimental group differed based on private vehicle ownership as shown below:

Table 4. Mann Whitney-U Test for Transport Accessibility Indicator

| Transport Accessibility Test Statistics | Mann Whitney-U | Wilcoxon W | Z  | Asymp. Sig (2 tailed) |
|-----------------------------------------|---------------|------------|----|-----------------------|
|                                         | 115,000       | 1150,000   | -7.836 | 0.000                |
Mann-Whitney U test results have Asymp. Sig. values <0.05 which means the initial hypothesis is accepted [12]. It can be concluded that accessibility of travel alternatives between the control group and the experimental group is different based on private vehicle ownership by each group. Asymp. Sig. values <0.05 also proves that this phenomenon also occurs in populations.

3.4. Impacts of Transport Poverty

Identification and analysis of the impact of transport poverty on travel patterns of individuals and groups affected by transport poverty are measured and analyzed using the Approval Level of the Likert Scale. Meanwhile, details of the results of the Likert scale approval level can be seen in the following table:

Table 5. Likert Scale of Respondents in Experimental Group.

| Questions                                                                 | Total Respondents | Strongly Agree (%) | Agree (%) | Neutral (%) | Disagree (%) | Strongly Disagree (%) | Total (%) |
|---------------------------------------------------------------------------|-------------------|--------------------|-----------|-------------|--------------|-----------------------|-----------|
| School/Work Location are Within Reach                                     | 83                | 8%                 | 48%       | 10%         | 29%          | 5%                    | 100%      |
| Good Public Transport Service                                             | 83                | 12%                | 54%       | 19%         | 12%          | 3%                    | 100%      |
| Strategic Location of Public Transportation Stop/Station                  | 83                | 11%                | 51%       | 17%         | 18%          | 3%                    | 100%      |
| Alternative Modes Available                                               | 83                | 5%                 | 31%       | 3%          | 52%          | 9%                    | 100%      |
| Alternative Routes Available                                              | 83                | 9%                 | 25%       | 4%          | 50%          | 12%                   | 100%      |
| Road in Good Condition                                                     | 83                | 21%                | 51%       | 18%         | 7%           | 3%                    | 100%      |
| Efficient Public Transport Route Available                                 | 83                | 9%                 | 41%       | 9%          | 26%          | 15%                   | 100%      |
| Frequent Mode Shift/Transit to the Location                                | 83                | 15%                | 34%       | 13%         | 24%          | 14%                   | 100%      |
| Efficient Traveling Time to Location                                      | 83                | 9%                 | 37%       | 10%         | 28%          | 16%                   | 100%      |
| Proportional Transport Expenditures to Income                              | 83                | 8%                 | 37%       | 18%         | 31%          | 6%                    | 100%      |
| Safety and Comfortability                                                  | 83                | 9%                 | 50%       | 22%         | 15%          | 4%                    | 100%      |
| Respondents Got Education/Job They Want                                   | 83                | 5%                 | 40%       | 17%         | 35%          | 3%                    | 100%      |
| Respondents Have Difficulties to Access Education/Employment Facilities   | 83                | 8%                 | 40%       | 28%         | 20%          | 4%                    | 100%      |
| Transportation as an Important Factor Choosing of Location of School/Work  | 83                | 20%                | 51%       | 17%         | 8%           | 4%                    | 100%      |
| If Better Transportation Access Available, Respondents Would Choose to Go | 83                | 9%                 | 37%       | 23%         | 27%          | 4%                    | 100%      |

Based on the Table 5 above, it can be seen that generally the access to the location is good enough with adequate public transportation, but the convenience towards the location can be improved and there are not many choices of modes or routes that serve it, so there is a deficient number of travel alternatives. The delay in reaching the location felt by the respondents in the experimental group is that there is often a mode shift or transit and travel time to the location so it becomes a less efficient journey. Better
opportunities to get a better education or job felt by respondents in the experimental group in example transportation influences the choice of school location and work and they choose to go to school or work elsewhere if there is better access, so it can be concluded that respondents in the experimental group feel that they can get a better education or job if they are not obstructed by existing transportation access.

4. Factors Affecting Travel Pattern and Transport Poverty

Based on this study, there are several factors that influence and have an impact on the occurrence of transport poverty in Bekasi Barat, Bekasi City. Figure 7 below explained how these factors theoretically and practically influence travel patterns and their impact thus influencing on the transport poverty process that occurs [14]:

![Diagram]

**Figure 7. Process Diagram of the Occurrence of Transport Poverty**

There are several factors underlying the process of transport poverty in the West Bekasi District, Bekasi City. These factors are the socio-demographic background of the household, location and environment of the household, as well as policies related to the transportation system. The process of transport poverty originates from the quantity, quality, and cost of transportation as well as the location choice of school and work. These factors have impacts on the affordability, mobility, and accessibility of each individual in the household. Variable indicators of transport affordability, transport mobility, and transport accessibility thus have impacts on travel patterns that cause transport poverty.

5. Discussion

The groups affected by poverty transport are marginalized groups, one of which is low-income households. Groups with low incomes in each country tend to have lower mobility and are most often affected by the absence of vehicles both from private vehicle ownership and public transportation in the number of choices and quality of these facilities.
The occurrence of transport poverty process comes from quantity, quality and cost of transportation also the selection of school and work locations. All of these factors have an impact in transport affordability, transport mobility, and transport accessibility of each individual in the household. These indicators affecting affordability, mobility, and accessibility in which then have an impact to the travel patterns that cause transport poverty.

The control groups and the experimental groups chose their desired locations to go to school and work depending on the distribution of facilities from where they lived. The experimental group as low-income households may be forced to choose existing transportation services that are of lower quality and with higher costs compared to their income to reach their destination. The discussion regarding the process of the occurrence of transport poverty in Bekasi Barat, Bekasi City is a contextual evaluation to measure the impact of transport poverty on various population groups living in adjacent built neighborhoods but with different backgrounds.

The groups affected by transport poverty are the marginalized group, one of which is low-income people. The low-income groups in each country tend to be less mobile and most often affected by the absence of vehicles from both private vehicle ownership and public transportation in the number of choices and quality of these facilities [6]. The existence of people with low income is generally located in suburban areas with low amenities, coupled with a lack of access to transportation options that limit their wider access to employment opportunities and educational facilities. In this study, the mobility and accessibility of the experimental group was lower than the control group, even though the research location chosen between the control group and the experimental group was in the same location close to each other, with roughly the same public transportation facilities between each group. So it can be concluded that even though they are located in the city center, the experimental group with lower income is more exposed to transport poverty than the control group with higher income.

Based on the results of this study, it can be concluded that transport poverty occurs in Bekasi Barat, Bekasi City, where the impacts are shown by comparison of affordability, mobility, and accessibility variable indicators in travel patterns between the two groups, control group and experimental group. Differences in travel patterns between the control group and the experimental group indicate transport poverty happens in the experimental group where the travel costs incurred are getting greater, the distance traveled is not too long but takes a long duration of time, and less modes and routes for travel alternatives. From transport poverty on the communities in Bekasi City, in this case the experimental group respondents, are how accessible the school and work location, obstruction felt in reaching the location, and if there are opportunities for better work or education.

6. Conclusions and Recommendations

Based on the discussion that has been presented, it can be concluded that transport poverty has an impact on communities' travel patterns, both from the indicator variable Transport Affordability, Transport Mobility, and Transport Accessibility. There are factors that influence the travel patterns of the experimental group affected by transport poverty when compared to the travel patterns of control group, those are the costs incurred for transportation versus income, the number of alternative modes and routes to go to school or to work, and the distance traveled daily to the location of school and work. Transport poverty also has an impact on social exclusion felt by communities in Bekasi City, in this study the impact of social exclusion felt by communities affected by transport poverty is access to location, obstruction felt when reaching location, as well as better opportunities to get a better job or education.

Spatial aspects and policy aspects of the area of Urban and Regional Planning expertise become important roles in intervening and making solutions to transportation problems that occur [15]. The problems of spatial aspects that have an impact on the occurrence of transport poverty are public transportation facilities which include the location of public transportation facilities, public transportation routes, public transportation modes, and public transportation costs. With better planning based on the needs of the field conditions and more favoring to the marginalized groups, the factors that affect the occurrence of transport poverty in a community can be minimized.
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