Importance-Performance Matrix Analysis (IPMA) Of Transport Disadvantage Variables on Social Exclusion in a Rural Context

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Importance-Performance Matrix Analysis (IPMA) Of Transport Disadvantage Variables on Social Exclusion in a Rural Context

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Abstract Transport services are essential to support daily life. A lack of transport supply leads to the existence of transport disadvantaged (TDA) groups who are vulnerable to social exclusion, which happens when a particular group or individual is having difficulties to access certain activities that are considered normal in society. To tackle this phenomenon, the understanding of the influence of TDA variables on social exclusion is needed. The aim of this study is to analyze the influences of TDA variables on social exclusion in a rural context, with Cibeureum Village (Bandung Barat Regency) and Bunikasih Village (Subang Regency) as the study case. Both case studies provide different characteristics of accessibility. Partial Least Squares (PLS) Structural Equation Modeling (SEM) is chosen as the method to analyze the influences of TDA variables on social exclusion. The PLS-SEM model is developed according to the social exclusion variable and four TDA variables, i.e., accessibility, individual characteristics, private vehicle existence, and travel behavior. IPMA is done after the PLS-SEM model is evaluated. The study reveals that among four of the TDA variables, accessibility has the most influence on social exclusion, hence interventions related to improving accessibility are needed to tackle social exclusion. More specifically, the provision of alternative modes is needed in both study areas, while in Bunikasih Village the cost of travel is also an important variable to consider.

1. Introduction
The essential aim of transportation is to provide access for people to goods and activities needed to support their daily lives [1]. Thus, transportation services need to be accessible to everyone. However, in some locations, the demand for transportation cannot be fulfilled by the available transport services. The lack of transport supply causes transport disadvantaged (TDA) groups and makes these groups vulnerable to social exclusion, which is called transport-related social exclusion (TRSE) [2]. People are considered socially excluded when they cannot participate in the activities that are considered normal in society [3].

To prevent someone from being socially excluded, it is important to learn how TDA aspects relate to social exclusion. Studies about the relationship between transportation and social exclusion are
rarely conducted in developing countries [2]. Until now, published research regarding TRSE, especially in Indonesia, has only been conducted in an urban context. In reality, research in a rural context is very important considering the differences in characteristics between urban and rural people, so that social exclusion is more likely to happen to rural people. TDA aspects may influence social exclusion differently in an urban or rural context. Therefore, the study of TDA aspects and their relationship with social exclusion is very important, especially in a rural context. The aim of this study is to identify the relationship between TDA aspects and social exclusion in a rural context. As a result, the effort to reduce the vulnerability to social exclusion of people who lives in rural areas will be effective.

2. TDA and the Concept of Social Exclusion

TDA groups can be defined as having transportation needs that are not fulfilled by the available transportation services [4]. TDA is a multidimensional condition reflected by characteristics such as location, mobility, or individual characteristics [5]. The measurement of TDA based on location usually considers distance or travel time to reach the center of activities (e.g., workplace, healthcare, education, or shopping center). Meanwhile, the measurement of TDA based on mobility considers the level of people’s difficulties to access transport services to support their daily lives (e.g., ownership of private vehicles, availability of public transportation). The other measurement is based on individual or group characteristics (e.g. disability conditions, age, family structure). Studies usually include two or three aspects to achieve a more comprehensive understanding of TDA [5]. Furthermore, TDA is formed by factors influencing immobility, such as the lack of access to private vehicles, demographics, and public transportation availability [6].

There are several reasons why TDA relates to social exclusion [7], e.g., (1) the concept of social exclusion can describe the social consequences of the deprivation of access that leads to a lack of exposure to transport facilities which are important to improve people’s quality of life. (2) This concept can be used to distinguish individual characteristics and the characteristics of transportation services so that the formulated policy will be effective, and (3) study findings on social exclusions can be a valuable input for transport planners and decision-makers in describing social exclusion as a multidimensional concept, deeply related to transportation and is dynamics.

Social exclusion can be defined as an accumulation of processes containing various aspects that make an individual feel inferior to their surroundings [8]. In other words, social exclusion happens when an individual or group forcefully cannot participate in normal activities in society [6] [9]. Those activities consist of [3] (1) consumption activities, which is the ability to purchase goods and services at the minimum level that is considered normal in society; (2) savings activities, for example savings, pension rights, and properties; (3) production activities, which is an involvement in social and economic activities, such as paid work, education, training, having a family; (4) political activities, which is an involvement in order to improve or protect the social or physical environment; and (5) social activities, which is an involvement in social interactions on the household or society, or community level.

3. Study Areas

In order to analyze the relationship between social exclusion and transportation, in this case, transport disadvantage, it is needed to compare two contrasting study areas in terms of required accessibility (i.e., one study area must be a TDA and the other study area must be a non-TDA). In this study, study areas were chosen mainly based on their locations. The main considerations for choosing the study areas are its easiness to reach basic and transportation facilities.

Based on those considerations, two study areas were chosen. First, Bunikasih Village which is located in Subang Regency, as a TDA, and second, Cibeureum Village, which is located in West Bandung Regency, as a non-TDA. The difference between the two study areas is especially seen from their accessibility to/from the nearest major city. The access to Cibeureum Village mostly in moderate condition (56.13%), several segments are in slightly bad condition (43.87%), and no segments are in
poor condition. Whereas the road condition to Bunikasih Village are mostly in poor condition covered with slippery dirt or stones (41.53%), slightly bad condition (32.82%), while only a few segments are in moderate condition (25.65%). The comparison of accessibility characteristics can be seen in Table 1.

For both areas, public transportations are no option since they are unreliable. In Bunikasih Village, only informal modes exist, usually used to go to the market. However, the residents rarely use them because the fare is extremely expensive. One trip to the market costs them IDR 75,000, with travel time around 2 hours. Considering their job only earns them IDR 30,000 to IDR 50,000 per day, that fare is way beyond their ability to pay. Meanwhile, in Cibeureum Village, public transportation does exist, but the operational hours are short, only from around 4 AM to 10 AM. Hence, they cannot fulfill the respondents’ demand.

| Characteristics            | Bunikasih Village               | Cibeureum Village              |
|----------------------------|---------------------------------|--------------------------------|
| Public transportation availability | None                            | Limited                        |
| Road condition             | Mostly in poor condition        | Mostly in moderate condition, several segments are slightly bad |
| Basic facility distribution | Located outside of walking distance range | Spread out within walking distance range |

Although both study areas have different accessibility characteristics, it turns out that the characteristics of the residents are similar. Most of the movements are internal, meaning that the respondents perform daily activities inside the village. This makes sense considering the majority of respondents are casual workers (63.3%) and most of them are farm workers. For both areas, walking remains the main mode of transportation (71.2%) to perform the daily activities. Due to this habit, unusual perceptions exist, especially in Bunikasih Village. The residents of Bunikasih Village are used to walking long distances to reach basic facilities which are located in neighboring villages (approximately 4 km), so walking for such distance is not a problem in their perception. Despite motorcycle ownership, it turns out that the motorcycles are not used regularly because many destinations are impossible to be reached by motorcycle.

Regarding the basic activities, the residents in Cibeureum Village stated that it is not very difficult to fulfill their basic needs due to the availability of many local shops providing basic needs for a reasonable price. Conversely, the residents of Cibeureum Village stated that it is hard to access the bank in the district capital. A bank is one of the most important places for them because they have to access it regularly (once every three months) to collect grants from the government. The existing public transportation cannot fulfill this demand due to its short operational hours. Specifically in Bunikasih Village, the residents claim to have much difficulty in doing shopping for their basic needs. They rarely go to the central market (only once or twice per year) and rely hardly on the only local small stall owned by one of the residents to buy groceries.

4. Research Methodology
This study is explorative with a quantitative approach. Partial Least Squares Structural Equation Modeling (PLS-SEM) was chosen as a method of analysis. SEM is one of the multivariate statistical methods that combines factor analysis and path analysis to analyze the relationship between several dependent and independent variables simultaneously [10]. PLS-SEM is effective in explorative studies with undeveloped basic theory [11]. In this study, PLS-SEM modeling was done by using SmartPLS software version 3.

The sampling method was based on a literature review on the minimum sample required for PLS-SEM. The rule of thumb regarding the minimum sample required in PLS-SEM is the ten times rule which means that the minimum sample required is ten times the largest number of formative variables.
in particular of the latent variable [11]. According to the model developed in this study, the minimum sample required is 5 times 10, which equals to 50 samples. The survey that was done in both study areas resulted in 139 data set, 57 data set were taken in Bunikasih Village and the rest in Cibeureum Village. Due to its small populations (34 families in total), the data in Bunikasih Village is based on population, not sample. Meanwhile, the data from Cibeureum Village is based on a sample using the random sampling method.

The data were acquired in February 2017 by doing a primary survey in the form of questionnaires. The questionnaires were filled in by the head of the family and other family members who are actively mobile, so that the questionnaires were filled in by a minimum of two family members in one house, usually the husband and wife. Table 2 lists the indicators that were used in this study. The questions were formulated based on the indicators used to describe TDA and social exclusion and were answered by a Likert scale ranging from 1 to 4 where 1 means strongly disagree and 4 means strongly agree. Accordingly, all variables included in the model were in ordinal scales.

Table 2. Variables and Indicators Used in PLS-SEM Modeling

| Variable                | Code    | Indicators         | Statements                                                                 |
|-------------------------|---------|--------------------|----------------------------------------------------------------------------|
| Accessibility           | Aks_Jalan | Road condition     | The roads to/from where I live are in good condition                       |
|                         | Aks_PT   | Public transportation availability | My area is served well by public transportation                          |
|                         | Aks_AltModa | Alternative modes availability | There are options/alternatives of transportation modes to support my daily activities |
|                         | Aks_Biaya | Travel cost to basic facilities | The costs to reach basic facilities is low                                 |
|                         | Aks_Jarak | Distance to basic facilities | The distance to basic facilities is short                                  |
|                         | Aks_Waktu | Travel time to basic facilities | The travel time to basic facilities is short                               |
| Travel Behavior         | Per_Biaya | Average travel cost for daily movement | I only spend a little amount of money in my daily movements             |
|                         | Per_Ekst  | Frequency of external movement | I rarely do external movements                                              |
|                         | Per_Jarak | Average distance for daily movement | I only travel short distances in my daily movements                       |
|                         | Per_Waktu | Average travel time for daily movement | I only spend short travel time in my daily movements                     |
| Individual Characteristics | Ind_Wajib | Role in family | I do not have any obligation related to my family that inhibit my daily movement |
|                         | Ind_Sulit | Difficulty of movement due to physical condition | I do not have any physical difficulties that trouble me to walk or use public transport |
|                         | Ind_Penyakit | Illness | I do not suffer specific illness that hinders me from doing movement |
|                         | Ind_Kel   | Family structure   | I have big families                                                       |
|                         | Ind_Difab | Disabilities       | I do not have disabilities and/or mental illness that inhibit me from doing movement |
| Motorcycle Availability | Motor_Mampu | Ability to use motorcycle | I have a license to ride a motorcycle                                      |
|                         | Motor_Milik | Motorcycle | I own a motorcycle that can be used in my                                   |
| Variable     | Code         | Indicators          | Statements                                      |
|--------------|--------------|---------------------|-------------------------------------------------|
| Motor_Frek   | Frequency of | ownership           | I often use a motorcycle (either self-owned or   |
| Motor_Guna   | motorcycle usage | Usage of motorcycle | I use a motorcycle daily                       |
| Social Exclusion | Eks_Prod | Production activity | I am able to do production activities easily     |
|               | Eks_Kons    | Consumption activity | I am able to reach shopping facilities         |
|               | Eks_Invest  | Investment activity | I am able to do saving activities               |
|               | Eks_Politik | Political activity  | I am able to participate in political activities|
|               | Eks_Sosial  | Social activity     | I am able to visit my relatives whenever I need  |

Each variable has its own functions and is formed by indicators used to describe intangible variables. The main aim of the model is to identify the influence of each TDA variable on social exclusion. Hence, the TDA variables act as independent variables while social exclusion is the dependent variable. One thing to be noted is the motorcycle availability variable, which can be seen as a mediator variable. In other words, the variable of motorcycle availability can act as an independent or dependent variable. This is based on theoretical studies that explain that motorcycle availability is affected by other TDA variables but also affects the variable of social exclusion.

At the early stage of model formulation in the software, several indicators were deleted before the evaluation, such as disability (Ind_Difab) due to zero variance. In addition, the variance of every indicator in both study areas needs to be checked before IPMA is conducted. There were two indicators with zero variance in latent accessibility variables in both study areas, i.e., road condition (Aks_Jalan), and public transport availability (Aks_PT). The indicators were deleted from the beginning so that the evaluation can be done without making any changes before the IPMA step.

According to the previous explanation, Figure 1 shows the model created in SmartPLS software.

![Figure 1. PLS-SEM Model](image-url)
5. PLS-SEM Model Evaluation

In PLS-SEM, the model is evaluated step-by-step starting from the outer model for each latent variable either reflective or formative. Then the inner model is evaluated to identify the relationship between the latent variables. A reflective indicator is a tangible variable that can be seen as an effect of a latent variable, whereas a formative indicator is a tangible variable that can be the cause of a latent variable. Model evaluation in PLS-SEM is done systematically with a two-step approach of measurement model evaluation and structural model evaluation [11].

5.1. Measurement Model Evaluation

Reflective measurement model evaluation assesses its reliability and validity. Composite reliability (CR) is a common parameter used to explain them in PLS-SEM whereas convergent validity can be seen from each indicator loading and AVE (average variance extracted). Additionally, discriminant validity, which can be seen from each indicator cross-loading, also needs to be assessed. The result of the reflective measurement model evaluation is presented in Table 3.

The deleted indicators are the number of family members (Ind_Kel) and individual role in the family (Ind_Wajib) due to the low loading in every latent variable. In other words, those two indicators did not belong in any latent variable. The deletion improved the validity and reliability.

| Latent Variable       | Indicators | Accessibility | Individual Characteristics | Motorcycle Availability | Travel Behavior |
|-----------------------|------------|---------------|-----------------------------|-------------------------|-----------------|
| Accessibility         | Aks_AltModa| 0.861         | 0.457                       | 0.456                   | -0.234          |
|                       | Aks_Biaya | 0.906         | 0.237                       | 0.312                   | -0.197          |
|                       | Aks_Jarak | 0.969         | 0.245                       | 0.245                   | -0.144          |
|                       | Aks_Waktu | 0.962         | 0.284                       | 0.258                   | -0.152          |
| Individual Characteristics | Ind_Penyakit | 0.187       | 0.886                       | 0.310                   | -0.206          |
| Motorcycle Availability | Motor_Frek | 0.313         | 0.340                       | 0.948                   | -0.512          |
|                       | Motor_Guna | 0.361         | 0.348                       | 0.948                   | -0.496          |
|                       | Motor_Mampu | 0.308        | 0.400                       | 0.888                   | -0.584          |
|                       | Motor_Milik | 0.221        | 0.333                       | 0.818                   | -0.318          |
| Travel Behavior       | Per_Biaya | -0.131        | -0.095                      | -0.300                  | 0.716           |
|                       | Per_Ekst  | -0.238        | -0.373                      | -0.663                  | 0.913           |
|                       | Per_Jarak | -0.087        | -0.057                      | -0.269                  | 0.823           |
|                       | Per_Waktu | -0.021        | 0.156                       | -0.166                  | 0.730           |
| Convergent Validity   | CR         | 0.960         | 0.910                       | 0.946                   | 0.875           |
| Discriminant Validity?| Yes        | Yes           | Yes                         | Yes                     | Yes             |

Formative measurement model evaluation is similar to reflective measurement model evaluation, which is to assess its validity and reliability. Firstly, convergent validity was assessed by correlating the formative and reflective indicators from the same latent variable. This analysis is called redundancy analysis [11]. In this study, the formative latent variable is social exclusion. Thus, redundancy analysis was performed by correlating the formative indicators (as the independent variable) and the reflective indicators (as the dependent variable) from social exclusion.

The formative indicators of social exclusion consist of five normal activities as explained previously. Meanwhile, the reflective indicators of social exclusion are several factors influencing people’s social exclusion state that are easy to be measured (e.g. income, education, housing
condition). Specifically for the income level indicator, the data is obtained by collecting perceptions of respondents about the adequacy of income levels to meet their household needs just in case they are unable to mention the exact amount of their income. Other indicators such as education and housing condition are made into a categorical-ordinal type so that there are ranks or levels in each answer as well as any other statements related to perception. Figure 2 shows the result of the redundancy analysis. Although the value is below the expected value, it can still be accepted since the value is above 0.5.

The next step is to perform collinearity assessment. The assessment of the formative indicator, which can be done by evaluating the VIF value and tolerance, is necessary since it is the cause of the formative latent variable. The relations between a formative indicator and its latent variable is similar to a multiple regression equation that requires all independent variables to not be highly correlated.

Table 4 shows that the VIF value and tolerance for all formative indicators are at the expected value, which is VIF < 5 and tolerance > 0.20 [11]. Therefore, each formative indicator is not highly correlated. Next, the outer weights need to be evaluated to find out the significance and relevance of the indicators. The weight can be obtained from a bootstrapping process. The T statistic value from the bootstrapping process can be used to assess the significance of an indicator in forming its latent variable. Table 5 shows the result of the bootstrapping process. According to [11], the Eks_Prod indicator did not have enough empirical evidence to be included in the analysis. Therefore, it was deleted.

![Figure 2. Results of Redundancy Analysis](image)

### Table 4. Collinearity Evaluation

| Formative Latent Variable | Indicators | Tolerance | VIF  |
|---------------------------|------------|-----------|------|
| Social Exclusion          | Eks_Prod   | .747      | 1.338|
|                           | Eks_Kons   | .560      | 1.786|
|                           | Eks_Invest | .548      | 1.826|
|                           | Eks_Politik| .511      | 1.955|
|                           | Eks_Sosial | .683      | 1.464|

### Table 5. Result of Formative Measurement Model Evaluation

| Latent Variable | Indicators | Outer Weights | Outer Loadings | t Statistics | Sig. Level | p Value | Confidence Interval |
|-----------------|------------|---------------|----------------|--------------|------------|---------|---------------------|
| Social Exclusion| Eks_Invest | 0.215         | 0.781          | 3.105        | ***        | 0.002   | 0.080, 0.350        |
|                 | Eks_Kons   | 0.294         | 0.778          | 4.992        | ***        | 0.000   | 0.178, 0.410        |
|                 | Eks_Politik| 0.515         | 0.904          | 7.596        | ***        | 0.000   | 0.382, 0.648        |
|                 | Eks_Prod   | 0.067         | 0.487          | 1.227        | NS         | 0.220   | -0.039, 0.173       |
|                 | Eks_Sosial | 0.163         | 0.644          | 2.673        | ***        | 0.008   | 0.043, 0.283        |

*p < 0.1; **p < 0.05; ***p < 0.01; NS: non-significant
Bootstrap confidence interval for error probability of 0.05 (α = 5%)
5.2. Measurement Model Evaluation

The structural model evaluation was done to find the relationship among latent variables in the model [11]. This step consists of several assessments, including significance and relevance of the inner model, determination coefficient value ($R^2$), $f^2$ effect value, $Q^2$ value, and $q^2$ effect value. To measure relevance from a significant relationship, it was necessary to see the path coefficient value and compare it to the relationship among other latent variables. A path can be significant but the path coefficient is so low that it is considered irrelevant [11]. $R^2$ is a parameter used to measure model accuracy and describe the influence of all independent variables on the dependent variables. The $R^2$ value ranges from 0 to 1 where a higher value means higher accuracy [11].

The $f^2$ value is obtained from $R^2$ and is used to measure the level of importance of an independent variable in explaining a dependent variable. The $Q^2$ value is used to predict the existing indicator of reflective dependent latent variable and dependent variable with a single indicator. The expected $Q^2$ value is above zero, which indicates that the independent variable can reflect every indicator in a dependent variable in the model [11]. Table 6 and 7 show the result of the structural model evaluation.

| Table 6. Value of Path Coefficient, $f^2$ Effect, and $q^2$ Effect |
|---------------------------------------------------------------|
| **Motorcycle Availability** | **Social Exclusion** |
| **Path Coefficient** | **$f^2$ Effect** | **$q^2$ Effect** | **Path Coefficient** | **$f^2$ Effect** | **$q^2$ Effect** |
| Accessibility | 0.174 | 0.053 | 0.033 | 0.901 | 3.383 | 0.784 |
| Individual Characteristics | 0.233 | 0.075 | 0.050 | 0.073 | 0.020 | 0.002 |
| Motorcycle Availability | - | - | - | -1.02 | 0.015 | -0.004 |
| Travel Behavior | -0.456 | 0.323 | 0.201 | -0.009 | 0.000 | -0.002 |

| Table 7. $R^2$ and $Q^2$ Value |
|-----------------|
| **Latent Variable** | **$R^2$ Adjusted** | **$Q^2$** |
| Social Exclusion | 0.798 | 0.462 |
| Motorcycle Availability | 0.386 | 0.295 |

The $f^2$ and $q^2$ values can be compared with the other dependent and independent latent variables. In the motorcycle dependent variable, the accessibility variable and individual characteristic have a low effect, whereas the behavior variable has a quite high effect. This means that the use or ownership of a motorcycle is most affected by the travel behavior. Among all independent latent variables, accessibility has the highest $f^2$ and $q^2$ value to predict social exclusion. According to this study, generally in both study area, accessibility is the most important point to consider in affecting social exclusion.

6. Importance-Performance Matrix Analysis (IPMA)

In order to obtain a more comprehensive result, IPMA is needed. IPMA is an additional analysis to capture the level of independent variable importance to a particular dependent variable. In addition, IPMA can be used to see the performance of variables in the model. In IPMA, the data of each latent variable is averaged and rescaled to find the performance value of each variable on the target variable. This value, combined with the importance value obtained from previous analysis, can be used to formulate intervention priority to improve the performance of the targeted variable, which in this case,
is social exclusion. The IPMA result for both study areas of the determined indicator is shown in Figure 3 and 4.

In both study areas, it can be seen that accessibility variable plays an important role in the social exclusion variable. The accessibility variable is expected to be the most noticed variable to intervene social exclusion. Furthermore, the performance value is still below average. This means that an intervention in accessibility is going to highly affect social exclusion.

From Figure 3, it can be concluded that the indicator that needs to be prioritized is accessibility in relation to the availability of alternative modes. Cibeureum Village respondents stated that there are some difficulties in traveling due to the lack of alternative modes. Respondents believed that the available public transport cannot fulfill their demand so it is difficult for them to travel outside at particular times. Alternative modes do not only mean the provision of public transport because it is sometimes considered inefficient to provide public transport in rural areas [12].

![Figure 3. Results of IPMA on Cibeureum Village](image1.png)

![Figure 4. Results of IPMA on Bunikasih Village](image2.png)
A similar result is obtained from IPMA in Bunikasih Village. It is known that almost all accessibility indicators in this area have low performance values. From the IPMA chart, the most important indicator is accessibility in terms of alternative modes availability and travel cost. In Bunikasih Village, there is no public transportation or any other alternative modes to support people’s movement. The existing transportation in Bunikasih Village is informal such as rental motorcycle (ojek) and car with very high costs. The lack of alternative transport modes and high travel cost makes villagers reluctant to do external movements. Though in reality, the chance of being socially included becomes higher when people do more external movement where people can access normal activities. For example, in the case of consumption activity, the price of goods in the central market will be more affordable so that people do not need to spend much money.

7. Conclusion

Based on the study findings, it can be seen that every TDA variable has a different influence on social exclusion. In general, three TDA variables, i.e., individual characteristics, motorcycle availability, and travel behavior have a low influence on social exclusion. Hence, intervention in these variables will not have much impact on reducing people’s vulnerability to social exclusion. The developed theory regarding TDA and social exclusion often involves the four variables that are included in this study. However, the study found that accessibility variable has a very strong influence on social exclusion in a rural context, more than any other variables that were analyzed. Furthermore, a low value of performance makes this variable even more important to be prioritized so that villagers’ vulnerability to social exclusion can be reduced. According to this study, an improvement of accessibility in both areas in terms of the provision of alternative modes and travel cost can affect people’s ability to access normal activities in society.

Interestingly, in both areas, it turned out that motorcycles have only have little influence on the relationship between TDA variables and social exclusion. The availability of a motorcycle does not increase the respondent’s mobility or accessibility in both study areas, especially for daily activities such as working and shopping. The respondents in both study areas do have motorcycles but they rarely use it. This is due to the condition of destinations that can be reached by foot or because it is impossible to reach the destinations using a motorcycle. Another reason relates the driver and the motorcycle itself, such as the absence of license and registrations of the motorcycle.

Specifically, in Cibeureum Village, the important accessibility variables that influence social exclusion are distance and travel time to basic facilities. However, those two variables already perform well so it is better to look at other important variables with bad performance. In this village, the provision of alternative modes that can fulfill villagers’ demand is the most improvement to assist their movement to the central market and the bank which are located quite far from where they live. This makes sense because the existing public transportation is very limited, both in the terms of fleet number and service hours. Meanwhile, in Bunikasih Village, the accessibility variables that are considered important are the provision of alternative modes and the reduction of travel costs. Since those two variables are in bad performance, they have to be prioritized. In other words, in Bunikasih Village, the provision of alternative modes is not enough. They also require affordable transport modes so that their vulnerability to social exclusion can be reduced. As previously explained, specifically in this village, the main activity with high urgency to be intervened is shopping activity.

Conclusively, this study has confirmed that improving accessibility through providing alternative affordable modes in a rural context is essential. However, this may be challenging and it may require demand-based alternative modes, rather than route-based ones to fulfill their specific travel pattern which can vary in space and time.

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