Plagiasi. SPATIAL MODELLING OF MULTIDIMENSIONAL POVERTY IN JABUNG DISTRICT, MALANG REGENCY, INDONESIA

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Abstract. This research attempts to scrutinize both roles of physical and social infrastructures concerning poverty level using the spatial approach as an idea to be able to propose a proper poverty alleviation recommendation. To reach the research's goal, Jabung District, Malang Regency, Indonesia wherein 35% households are identified as a poor household that is scattered within their 15 villages was chosen as a case study. The objectives of the research are to measure poverty level using the multidimension poverty index (MPI), measure social capital indices – the rate of participation (RoP) and density, implying social network analysis, and scrutinize neighborhood relationships among villages using spatial regression analysis. Data collection has been conducted through field observation as well as a face-to-face questionnaire survey towards 274 heads of households distributed proportionally within the villages. The first research aims of the MPI, it is identified that among 5 poverty levels there is 4 poverty level: very low – low – medium – high consisting 3, 2, 5, 5 villages, respectively. Meaning the targeted areas for dealing with poverty alleviation are the fifth villages with high poor levels – Jabung (0,34), Taji (0,31), and Kemiri – Gunungjati – Slamparejo with the value of 0,29. Among 15 villages, the RoP of the community could be classified into medium and high at the ratio of 11:4 villages, respectively. Then, for the density, three classes are formed from low – medium – high at the village level – 8: 5: 2, respectively. As a whole, the second research aims to refers that the community has no strong social capital at the village level yet. The last research question, utilize the spatial regression analysis indicates that the attribute of the RoP has a significant impact to lessen the poor level. Meaning that the stronger social capital that is formed from more participation of the residents in the network would open a wider possibility to eradicate poverty. In addition, a positive value of the weight matrix means geographical distance has a significant influence on poverty. Hence, the poverty alleviation program might focus upon the poor village which has the nearest physical border with another poor village through social infrastructure development as the action of end poverty priority.

Keywords : poverty dimension, rate of participation, density, physical infrastructure access, spatial neighborhood effect

INTRODUCTION

In the SDGs period, poverty is still a worldwide problem, particularly for developing countries that have to be tackled by 2030. Poverty might see a direct result from having very low income or very limited resources that bring further effects, for instance, undernourishment and hunger, a revelation to infectious diseases and mental sickness and drug addiction. Poverty might emerge to a community when the community has no basic abilities, have no income, not served adequate education, have a bad health condition, feel not safe, have low confidence or lack of rights such as freedom of speech (UNDP, 2018). Poverty is also a development problem of Indonesia indicated by lack of access to services of education, and health, insufficient access to hygienic water and sanitation, and difficulties of fulfilled basic needs of food, apparel, and housing (Adi, 2009).

To reach the first goal of the SDGs, the Indonesian government has several programs to reduce poverty such as *Beras Miskin* – Rice for the Needy, *Beras Sejahtera* – Prosperous Rice, *Bantuan Pangan Non-Tunai* – Non-Cash Food Aid, and *Bedah Kemiskinan Rakyat Sejahtera* – Termination Poverty of the Prosperous Folks.

Amongst regencies in East Java Province, Malang Regency has a 10,37% population below the poverty line (Central Bureau of Statistic, 2018). Moreover, Jabung District is one of the districts with 29% of households identified as poor households (Central Statistics Agency of Malang Regency, 2018).

To be able to propose recommendations of poverty alleviation through spatial modelling at Jabung District, Malang Regency of Indonesia, the study has 3 research objectives. First, measuring the poverty level at each village in the district from three poverty dimensions using the Multiple Poverty Index (MPI). Second, calculating indices of Rate of Participation (RoP) and Density as a reflection of social relationships among villagers (Ari et.al, 2017) implying Social Network Analysis (SNA). Third, finding significant variables of poverty level at the district using Spatial Regression Analysis. To investigate an appropriate answer for the third research aim, the basic idea of the research is derived from the assumption that understanding the influence of both physical and social infrastructures as well as spatial neighborhood effect might develop an appropriate strategy for dealing with poverty alleviation (Ari et.al, 2017). The MPI value from the first research objective will be a dependent variable, whereby poverty does not merely look from an economic aspect, but it has three dimensions (Research Team

MPI Indonesia, 2015), as representative of lack of physical infrastructures and its impacts (UNDP, 2018; Adi, 2009). The independent variable consists of i) access to physical infrastructures from home to the public facility, ii) social capital value among households within village level that is labeled as social infrastructures, and iii) spatial neighborhood effect between villages at the district. Social ties among households depict a function of the formation of social capital that might be able to mobilize both internal and external resources between individuals in the knot with multiple memberships of certain institutions (Putnam, 2000; Wasserman & Faust, 1994; Coleman, 1990). In addition, through evidence review of public services in the United Kingdom that inappropriate understanding of social networks and social capital might lead to wrong policy on how to deal with poverty through public services (Matthews & Besemer, 2014). Therefore, the research is an attempt to propose a holistic approach on the development of poverty alleviation method through integration between access to a public facility, social capital, and geographical position between villages that generally previous researches did it in separate ways that it might guide to misleading on targeting poverty policy.

RESEARCH METHOD

Data Collection and Sampling

The Jabung District is chosen for the research due to its poverty situation whereby the district is categorized as one of the thirty-three districts with a high number of poor households in Malang Regency (Central Statistics Agency of Malang Regency, 2018). Primary data collection is designed into a questionnaire survey to consist of three parts – personal identity, attributes of the three dimensions of MPI, and attributes of community memberships into the existing community groups at the village. The face-to-face interview is aimed at the head of households that are proportionally distributed between poor and non-poor households for having a general picture of the families in the study area. The sample of respondents is 274 households distributed proportionally at each village whereby the district consists of 15 villages and 22.275 households with a total of 75.113 inhabitants (Central Statistics Agency of Malang Regency, 2018). Total time for collecting data is at about 3 weeks covering 1-week for the interview, and the other 2-week for field observation of the infrastructure data and secondary data, which is conducted by 4 surveyors. The secondary data is collected at each village government office and community health center in the district. The first period of data collection was carried out in July 2019, but due to the unpredicted global pandemic of Covid-19, a re-survey was conducted on July-August 2020 for assurance of the data validity. Hence the data at the research is a compilation for both period data collection, whereby in general,

the pattern of the data is quite similar, except community activity to participate at the community groups that is a bit lessen during the pandemic than the previous year, so the newest data is applied for the social network analysis (SNA).

Analytical Method

a.   Multidimensional Poverty Index (MPI)

the first objectives of the research are measuring the MPI covering dimensions of i) Education, ii) Health, and iii) Living Standards of each village at the district, wherein the primary data is the main source for its measurement. A family is recognized as an impoverished household when its value of C_i is ≥ 0.33 (OPHDI, 2010). C_i is labelled as the poverty index score of households i, which is equal to sum up of the total value of the whole number of households of its weights from indicator i ($W_{1...n}$) multiple by 1 or 0 if respondents are included or not included into the indicator 1 ($I_{1...n}$).

The following Table 1 displays a more detailed description for each dimension, and indicator of the MPI measurement, whereby the description of the indicator is modified based on the Indonesian situation, and for the weight for each indicator is referred to the UNDP (2016). According to the Development Framework of Education (National Planning Board, 2016), for the education dimension, each household member has to fulfill their study at a minimum level of senior high school at the age between 6 to 23 years old. Referring to the decree of the Indonesian Ministry of Health No.1995/Menkes/SK/XII/2010, for the dimension of health, the citizen will be defined as poor if in a family has one or more malnutrition and child mortality cases (Decree of the Indonesian Ministry of Health, 2010). On the Technical Notes HDR (UNDP, 2016), the living standards comprises six indicators, a household is categorized as poor if i) they use traditional cooking fuels such as firewood, ii) have no private or even communal sanitation, iii) do not have access to safe water network (such as acquire freshwater directly from well, spring, or river), iv) do not get electricity supply, v) use traditional floor material (such as dirt, sand land, animal manure), and vi) have less than 1 asset of information, mobility, and livelihood. Then, referring to UNDP (2016), the weight is divided into 3 equally based on the number of dimensions. In more detail, 1/6 is the weight for each indicator since the first and second dimensions consist of 2 indicators, meanwhile, the weight of each indicator of the third dimension is 1/18 since it has 6 indicators.

Table 1. Dimension and Indicator of Multidimensional Poverty Index

Dimensions	Description of Indicator	Weights
Health	Nutrition: Child (<5 years) with malnutrition	1/6 = 0,167

Dimensions	Description of Indicator	Weights
	Child Mortality: Child (<5 years) has died in the household within the last five years	1/6 = 0,167
Education	Educational Years: No household member has completed twelve years of schooling	1/6 = 0,167
	School Attendance: Child of school-aged does not attend school until their age to complete 12 years of schooling	1/6 = 0,167
Living Standards	Cooking Fuel: manure, firewood, or wood coal	1/18 = 0,056
	Sanitation: unimproved household's sanitation facility, or improved shared household's sanitation	1/18 = 0,056
	Drinking-Water: no access to safe drinking water, or access to safe drinking water with roundtrip walking distance from home at about 30-minute or longer	1/18 = 0,056
	Electricity: no access to electricity network	1/18 = 0,056
	Floor: a soil, gravel, or manure floor	1/18 = 0,056
	Assets: do not have a TV, radio, mobile phone, motorcycle, car.	1/18 = 0,056

Referring to Indonesia MPI Research Team (2015), measuring the MPI is multiplying the percentage of the poor people or in other words, multiply the headcount ratio (H) with the intensity of poverty (A). In more detail, the headcount ratio (H) is a ratio between the number of poor multidimensional individuals (q) and a total number of population (n). Value of A is a ratio between sum up of poverty index score of households i to q (ci) and the number of poor multidimensional individuals. Then, the dimension contribution k to poverty is expressed as a ratio between sum up j member of k of the sump up c_{ij} from 1 to q ($\Sigma j \in k \ \Sigma_1^q \ cij$) and a total number of populations (n), divided by the MPI value. According to the Module (MPI Research Team in Indonesia, 2015), the value of MPI's measurement can be differentiated into 5 levels, from very low – low – medium – high – very high, at the value of $<0,09 - 0,09$-$018 - 0,18$-$0,27 - 0,27$-$0,36 - >0,36$, respectively. The calculation implies that the lower value of MPI means a better level of poverty or it shows lower level of poverty, and vice versa. The following Table 2 displays a detailed measurement of the indicator of each dimension in the MPI with binary choice (0 and 1).

Table 2. Measurement of MPI Indicators

Dimensions	Indicator
Education (National Education Development Framework, National Planning Board 2016)	Years of Education: 1 = less than senior high school level 0 = senior high school and higher School attendance 1 = do not attend the school between age 6–23 years old 0 = attending the school between age 6-23 years old
Health (KepMenKes RI No.1995/Menkes/SK/XII/2010)	Nutrition 1 = one or more cases of malnutrition in a household 0 = no case of malnutrition in a household Child Mortality 1 = one or more cases of child mortality in a household 0 = no case of child mortality in a household
Standard of Living (Technical Notes HDR, 2016)	Cooking Fuel: 1 = using firewood for cooking 0 = using Liquid Propane Gas (LPG), Biogas and Electricity Sanitation: 1 = no sanitation, jointly sanitation, and communal sanitation 0 = personal sanitation Drinking-Water: 1 = using no piped drinking water (river, well, spring) 0 = using piping drinking water (PDAM, HIPPAM) Electricity: 1 = no access to electricity 0 = have access to electricity
	Floor: 1 = infeasible floor pavement (soil, sand-land, animal feces) 0 = feasible floor pavement Assets: 1 = having <1 of information, mobility, livelihood assets 0 = having a minimum 1 of the information

Dimensions	Indicator
	assets, and 1 of mobility and livelihood assets

b. Two Indices of Social Capital

Answering the second research question, the research is necessary to measure two indices of social capital namely the RoP and density as the independent variable for the modelling (Ari et.al, 2017;2013;2011). Referring to the theory and formula of the SNA developed by Scott (2000) and Wasserman and Faust (1994), the two indices are calculated by UCINET 6.3 as the analytical software. The type of data is called affiliation data of the respondents' memberships to the groups of community and is stored in the form of a matrix. Firstly, the data is stored as incidence matrix (nxm) and then it has to change to adjacency matrix (nxn), as basic data on measuring a social relation between respondents at a village, whereby the two indices will represent their level of social capital.

The RoP is a ratio between the sum of the number of memberships of each household to community groups (x_{ij}) and a total number of respondents/head of households (g) in a village area (Wasserman & Faust, 2009). The value of the RoP is varied from one network to others, depend on the number of present groups of the community. The higher value of the RoP indicates the higher average of the total respondents in a certain area. The research classifies the value of the RoP into three – low, medium, and high, to be able to compare the RoP among villages (Ari et.al 2017;2013;2011).

Density is used to identify how dense relationship among village members within a network (Scott,2000; Wasserman and Faust, 2009) which is the ratio of the summation of the connected number of the respondents i to j ($\sum_i^g =1 \sum_i^g =1 x_{ij}^N$) to multiply the number of respondents (g) and the number of isolated respondents (g-1). Isolated respondents are heads of households who do not have affiliation with others since they do not join in any kind of community group within a certain village. The value of the density is between $0 – 1$ (Wasserman and Faust, 1994; Scott, 2000), and it will classify into three levels similar to the RoP (Ari et.al 2017;2013;2011). The higher value of density of an area defines the deeper social relations amongst respondents within the area.

According to Scott (2000), type data for the SNA is namely affiliation that is formed by linkages among people within each village through their membership towards existing community group. The community groups consist of i) Male Quran Recitation, ii) Female Quran Recitation, iii) Quran Recitation, and iv) Youth Group. The basic difference between the three and the last community groups is their basic activity. The three groups are pure religious activity

amongst Muslim people for having a better understanding about the religion, meanwhile, the last group is a communal activity for the whole villagers related with their daily activity such as communal work of environmental cleanliness and independent day festival that is conducted several times within a year.

c. Spatial Regression Analysis

The analysis uses Geographic Data Analysis (GeoDa) to identify spatial data analysis established by Dr. Luc Anselin and his team (Anselin,1988) to discover the answer to the third research question. The space concept is applied through a weight matrix, which describes the position of the location of the area of connectivity in a set of data. In the study, neighbors in the district are described by the Queen weight matrix that determines a neighbor of the village as an adjacent edge or vertex. The characteristics of weights matrices are displayed in a connectivity histogram. Each bar explains the frequency of each neighbor in Jabung District. Spatial autocorrelation (SA) denotes the positive and negative of a variable correlation with itself in spatial location. The positive value describes similar spatial clusters of high-high or low-low, meanwhile, the negative indicates different values of spatial outliers of high-low or low-high. The research calculates the SA by putting the values of the MPI as variable and the Queen weight matrix as spatial settings. The positive SA presents during high values of the MPI correlate with high values of the neighboring, and vice versa (Anselin, 1988).

Moran Scatter Plot of displays the type and strong point of the SA in a distribution of data, whereby the slope depicts the Moran's I value as observing of global clustering of the SA in a set of data. The scatter plot consists of four quadrants that display the relationship between the MPI value of a village to its neighbors with the positive and negative SA (Yuriantari et al, 2017).

The presence or absence of significant or outlier spatial clusters for each position is specified by the Local Indicators of Spatial Association (LISA). Regarding Li (2017), in particular, the maps of LISA are effective for evaluating the proposition of spatial arbitrariness and recognize local hot spots.

RESULT AND DISCUSSION

    a. Multidimensional Poverty Index (MPI)

The following seventh figures indicate general characteristics of education, health, and living standards dimensions at each village in the district from the secondary data compilation.
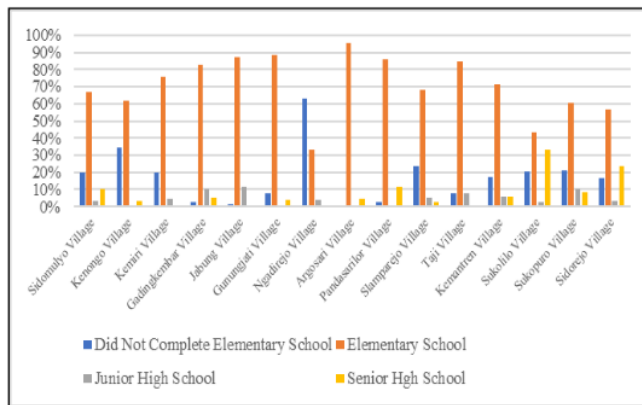
Figure 1. Characteristic of Education

The first figure illustrates 4 levels of the educational background of the resident within 4 categories: i) have not complete Elementary School, i) Elementary School, iii) Junior High School, and iv) Senior High School. The majority level of education is Elementary School, whereby the highest percentage is in Argosari Village (93%). The residents of Sukolilo Village have the highest percentage who graduated from high school (33%). Meanwhile, the highest number of residents who did not complete elementary school are residents of Ngadirejo Village. Referring to National Planning Board (2016), the result might imply that to avoid poverty minimum level of educational background should be no less than high school completion.
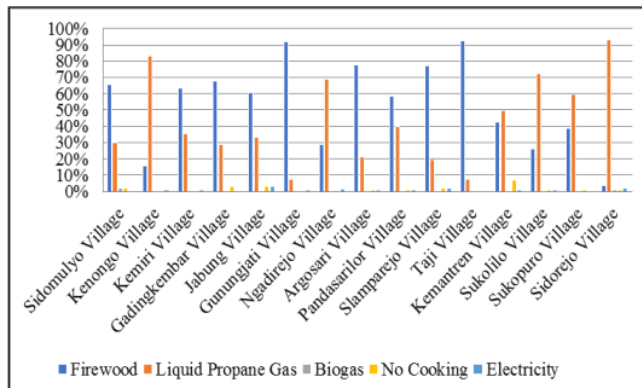

Figure 2. Cooking Fuel Types

Above Figure 2 describes 4 types of cooking fuel used by households covering firewood, Liquid Propane Gas (LPG), Biogas, and Electricity. The majority of households use firewood (50,5%), meanwhile, biogas is the rarest cooking fuel used (1%). The highest firewood users live in Taji Village (91%). Then, the second-largest type of cooking fuel is LPG (40%). The majority of households who use LPG live in Sidorejo Village (91%). Referring to Technical Notes HDR

1   2016 (UNDP, 2016), the higher number of residents who use firewood, the higher the poverty
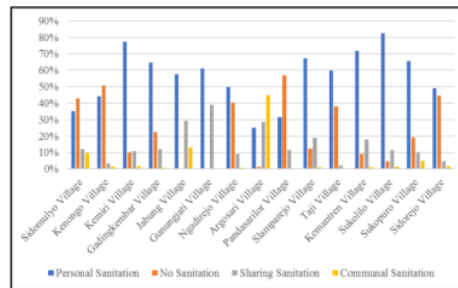
2   level of the area.

3
4   Figure 3. Sanitation Type

5   According to Figure 3, there is 4 type of sanitation – personal sanitation, no sanitation, jointly

6   sanitation, and communal sanitation. Based on secondary data, 50% of residents of the district

7   use personal sanitation, meanwhile, communal sanitation is the lowest used by the residents

8   (5%). Villages with the highest number of personal, sharing, communal, and no sanitation are

9   as follow Sukolilo (82%), Gunungjati (39%), Argosari (44%), and Pandansarilor (56%),

10   respectively. On one hand, residents are characterized with jointly, communal, and no

11   sanitation would increase the index of multidimensional poverty, and on the other hand,

12   personal sanitation users would not classify as a poor residents, which will not increase the

13   poverty index (Research Team MPI, 2015).
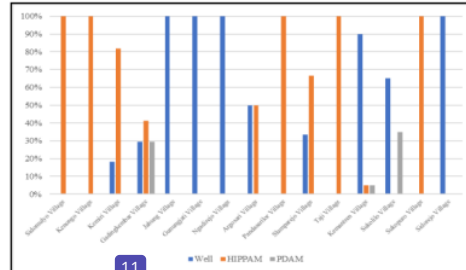

14
15   Figure 4. Access to Drinking-Water Sources

16   Displaying in Figure 4, the existing 3 types of access to drinking water in the district consist

17   of well (without pipeline), HIPPAM – community-based water management (simple pipeline

18   connection system created by the local community that served for the members), and PDAM

19   – local drinking water company. Based on the observation survey, the HIPPAM users spread

20   in 10 villages, wherein the 5 villages namely Sidomulyo, Kenongo, Pandansarilor, Taji, and

21   Sukopuro, 100% households get access to clean water from the HIPPAM services. The PDAM

22   services are only available in 3 villages – Gadingkembar, Kemantren, and Sukolilo.
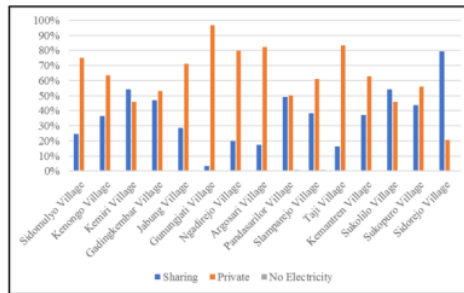
Figure 5. Access to Electricity

It is shown in Figure 5, access to electricity for each household in the study area consists of i) personal, ii) sharing, and iii) no electricity wherein the electricity is provided by the State Electricity Company. The first type means for households who are customers and have 'direct' electricity connection to their houses. The second one is a household with an electricity connection via a neighbor that is a customer of the Company. Then, the last type is household without access to electricity. The number of households regarding the types is 4.087, 2.313, and 12, respectively. Households with no access to electricity are located in 6 villages – Sidomulyo, Jabung, Argosari, Pandansarilor, Slamparejo, and Sukolilo. In addition, the majority of households with sharing electricity live in Jabung Village at an amount of 296 households. The number of households in the second and third types might increase poverty level due to the basic necessity of electricity for supporting daily activity.
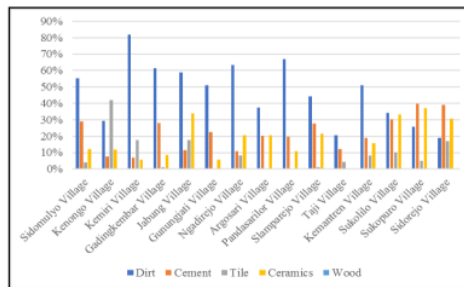

Figure 6. Type of Floor

It can be seen in Figure 6, there are 5 types of floor of the houses comprise of dirt, cement, tile, ceramics, and wood. There are 9 villages whereby more than 40% of households per village still have dirt as the floor that is in total covering 3.436 households. Kemiri Village has the highest number of households with a dirt floor, meanwhile, Taji Village has the lowest number of it. Meaning that a higher number of households with dirt floors might heighten MPI value.
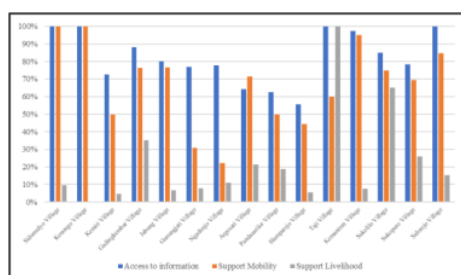
Figure 7. Assets of Households

Based on Figure 7, there are 4 components of asset of household: 1) Access of information: household which has one of the communication tools - television, radio, telephone/handphone, and laptop/computer; 2) Support mobility: household which has one tool to facilitate mobility for human or goods – truck, car, motorcycle, bike, animal train and motorboat; and 3) support livelihood: household which has one thing to support livelihood – refrigerator, horse, cow, sheep, goat, chicken, soil, garden or rice field. In general, households at each village in Jabung District have the asset of access to information at above 50%. Three villages – Gunungjati, Ngadirejo, and Slamparejo have households with the asset of support mobility below 50%. Only two villages – Taji and Sukolilo which have the asset of support livelihood, meanwhile the rest of it do not have it. Slamparejo Village has the lowest number of households with a total of 3 assets, meanwhile, Taji Village has the highest one.

The following Table 3 illustrates the result of the poverty level of the MPI measurement, whereby value and classification of poverty level at each village are described at the second and third columns, and its contribution of deprivation of each dimension is put at the last three columns.

It is identified that among 5 poverty levels (MPI Research Team in Indonesia, 2015), there is 4 poverty level in Jabung District: very low – low – medium – high occur at 3, 2, 5, 5 number of villages, respectively. Moreover, the following Table 3 illustrates that the village of Kemiri, Jabung, Gunungjati, Slamparejo, and Taji have higher MPI values than others in Jabung District. Interestingly, the poorest village in the district is in Jabung village with an MPI value = 0,34 whereby the village is also the capital of the district. In the meantime, the most welfare village indicated by the lowest value of MPI is in Sukolilo Village (0,05). The higher MPI value indicates the more cases of poverty found in households in the village.

Table 3. Value of MPI

Villages	MPI	Classification	Deprivation Contribution of each dimension to total poverty (%)		
			Education	Health	Living Standards
Sidomulyo	0.10	Low	44	0	56
Kenongo	0.16	Low	51	11	37

Villages	MPI	Classification	Deprivation Contribution of each dimension to total poverty (%)		
			Education	Health	Living Standards
Kemiri	0.29	High	50	0	50
Gading Kembar	0.20	Medium	57	0	43
Jabung	0.34	High	55	0	45
Gunungjati	0.29	High	43	0	57
Ngadirejo	0.19	Medium	59	0	41
Argosari	0.22	Medium	48	4	48
Pandansari Lor	0.18	Medium	44	0	56
Slamparejo	0.29	High	60	0	40
Taji	0.31	High	64	0	36
Kemantren	0.05	Very Low	49	0	51
Sukolilo	0.04	Very Low	49	25	26
Sukopuro	0.23	Medium	46	0	54
Sidorejo	0.05	Very Low	78	0	22

Based on MPI Data source 2017 (Humanitarian Data Exchange, 2020), the MPI of East Java Province was 0.011 a slightly lower than the MPI of Indonesia at about 0.014. We may see from Table 3 that on average villages in Jabung District Malang Regency has a higher level of MPI value than the East Java province, even if it compares with the lowest value of MPI at Sukolilo village, the value of the village is still higher than the province. In more detail, the deprivation contribution of each dimension to total poverty of East Java Province was 30.51 - 33.11% % - 36.38% of Education – Health – Living Standards, respectively. If we compare with the result of Jabung District, the district's poverty is the contributed by two dimensions of the Education and Living Standards, since the dimension of Health indicates better result at about 0 – 25%. In addition, detailed information on each dimension's contribution is valuable for figuring a deprivation structure of the district, then it could be continued to develop policy targeting on end poverty action plan. Education and Living Standards affect the values of the MPI at the whole villages in Jabung District. Meanwhile, the Health dimension affects the values of the MPI in three villages amongst the whole fifteen villages, namely Kenongo, Argosari, and Sukolilo. Meaning, that the poverty alleviation program in Jabung District could take into consideration mostly the two dimensions – Education and Living Standards.

The following Figure 8 describes a map of the MPI level per village for the whole Jabung District. The five villages with high poverty levels, geographically they are neighbors to each other, as well as for the other five villages with medium poverty levels. It is quite different from the village with low and very low poverty levels, whereby the villages with high poverty levels tend to form a kind of 'geographic' cluster than the villages characterized by a lower levels of poverty. The map gives a more interesting fact that it can be assumed or even questioned that poverty level and geographic areas have a connection to each other.

1   Therefore, measurement of the MPI is continued with the second and third research questions

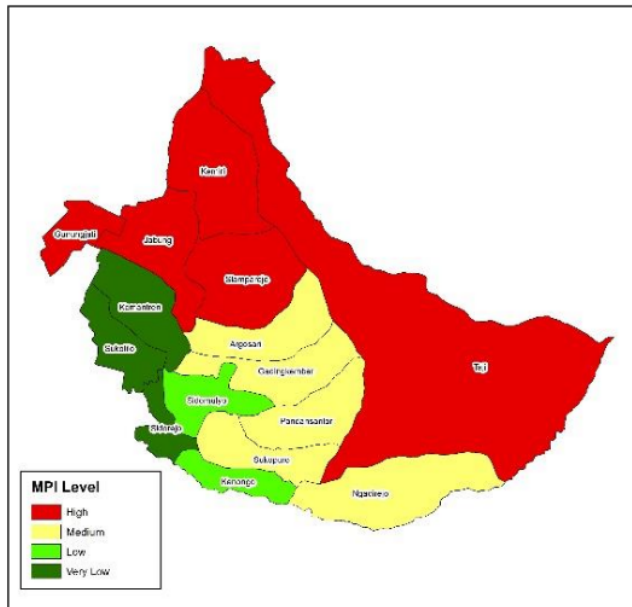2   for having a better understanding of the poverty occurrence.

3
4   Figure 8. MPI Level Map of Jabung District

5

6   **b. Two Indices of Social Capital**

7   In general, The RoP illustrates the involvement rates of the community members to the

8   present local institutional at a network (Wasserman and Faust, 1994; Scott, 2000) that will

9   describe the average participation of the villagers. Then, the density describes a level of

10   relationship between residents within a network (Wasserman and Faust, 1994; Scott, 2000)

11   that might give a significant difference of flowing of information or resource among residents

12   in the village.

13   Table 4. RoP for Each Village in Jabung District

Village	Value	No of Institution	Level
Sidomulyo	2.40	4	Medium
Kenongo	2.76	4	High
Kemiri	2.00	4	Medium
Gading Kembar	2.20	4	Medium
Jabung	1.80	4	Medium
Gunungjati	2.15	4	Medium
Ngadirejo	2.33	4	Medium
Argosari	2.42	4	Medium
Pandansari Lor	2.50	4	Medium
Slamparejo	2.00	4	Medium
Taji	2.10	4	Medium
Kemantren	2.80	4	High

Sukolilo	2.75	4	High
Sukopuro	2.21	4	Medium
Sidorejo	2.84	4	High

Exposing in Table 4, every village has a similar number of groups – at about 4 types of the local institution. There are 4 villages classified as having high RoP – Kenongo, Kemantren, Sukolilo, and Sidorejo, whereby average households have an affiliation to 2 – 3 types of the local institution. Then, 11 of 15 villages have a medium level of the RoP – on average households have an affiliation to 1 – 2 of the fourth types of the local institution.

Table 5. Density for Each Village in Jabung District

Village	Value	Level
Sidomulyo	0.30	Low
Kenongo	1	High
Kemiri	0.44	Medium
Gading Kembar	0.44	Medium
Jabung	0.23	Low
Gunungjati	0.64	Medium
Ngadirejo	0.38	Medium
Argosari	0.22	Low
Pandansari Lor	0.18	Low
Slamparejo	0.31	Low
Taji	0.90	High
Kemantren	0.41	Medium
Sukolilo	0.41	Low
Sukopuro	0.24	Low
Sidorejo	0.30	Low

Table 5 depicts 3 levels of density for each village from high – medium – low covering number of villages at 2, 5, 8, respectively. In terms of social networks, when an actor has a connection to others in the network, it might open the happening of the information and resources flows. Hence, the higher density assumes that the community might have a higher possibility to mobilize both local and extra-local 'energy' within the network (Putnam, 2000).

The village which has a higher level of the RoP indicates the greater number of villagers become members of the greater number of local institutions. And the village which has a higher level of density specifies a deeper social relationship to each other between community members. The measurement of the two indices of social capital in the level of village indicates that generally social capital of the community in the district does not so strong. It might give an impact on their ability to utilize their internal and external information as well resources for their community's needs.

The research assumes that the two indices of social capital might be useful for the villagers to deal with their multidimensional poverty. Henceforth, the indices are placed in the model as independent 'social' variables along with time travel to physical infrastructures as the independent 'physical' variables. In other words, the RoP and density are the independent

variables in conjunction with the geographical distance of the three-physical infrastructure in Spatial Regression Analysis.

c. Spatial Regression Analysis

In the spatial regression analysis, firstly Queen Weight Matrix is used to define neighbors of each village in the district. The characteristic of the weight matrix is plotted in Figure 9 about the Connectivity Histogram that displays the number of neighbors of each village and its frequency. The minimum number of neighbors (one village with one neighbor) is signed by the blue color bar – occur at 1 village. The orange color bar displays the village with the maximum number of neighbors (one village with 8 neighbors). Four villages have 3 neighbors and the other four villages have 5 neighbors indicated by the light green and pink bar. Hence, number of neighbors in the district is varied from each other. And, the nearest position can have similar characters (in this case is poverty) to the distant ones (Anselin, 1988). Then, to differentiate the MPI correlation, the value of MPI and contiguity matrix is used as input at the SA. The Moran Scatter plot visualizes the type and strength of the SA (Figure 10). In more detail, the slope displays positive autocorrelation of the village with its neighbors through the MPI values, which are High-High and Low-Low.
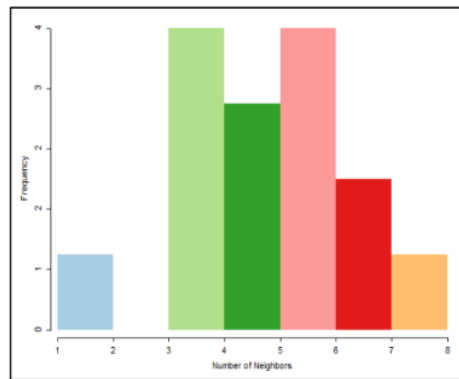

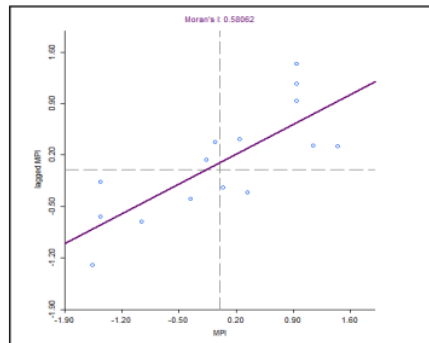Figure 9. Connectivity Histogram

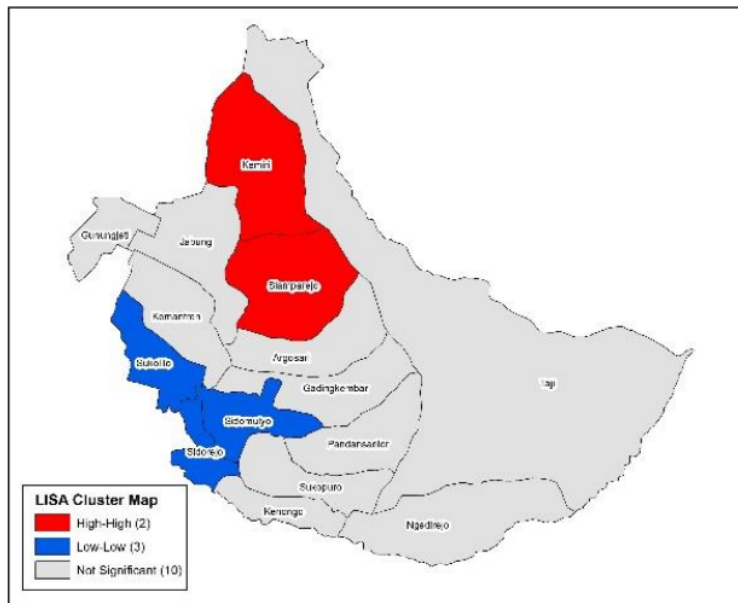Figure 10. Moran Scatter Plot Result

Figure 11. LISA Cluster Map of Jabung District

Figure 11 illustrates a detail of substantial spatial clusters for every village in the district consist of two types:

1. A Cluster of Low-Low: occurred for 3 villages (Sukolilo, Sidorejo, and Sidomulyo) – three non-poor villages (characterized with the low value of MPI), whereby they lie nearby to each other geographically. It refers that there is a tendency of forming clusters between the non-poor villages.

2. A Cluster of High-High: happened for 2 villages (Slamparejo and Kemiri) – two poor villages (indicated with the high value of MPI) neighbors geographically. Though the number of villages is slightly fewer than the first type of cluster, it seems that there is

also a tendency to form a cluster between similar characteristic poor villages which are physically adjacent.

Along with the first geography's law of Tobler (Anselin 1988), the result of research revealed that neighboring villages have higher similarity in values than the detached ones. Therefore, we might infer that there is a tendency for both poor and non-poor adjacent villages to form a cluster to each other due to their structure of spatial. Regarding policy recommendation of policy alleviation for the district might propose as follows:

1. Prioritize development to the poor villages which form a spatial clusters to each other. So that, the negative value might lessen and keep it within the existing villages.

2. Maintain the dynamics of development of the non-poor villages, in particular for the clustered adjacent villages. In the long term, it might disseminate the positive value to other villages either physically neighbors to each other or not.

The first step of spatial regression analysis operates the OLS model. At the first Ordinary Least Square Regression, the five independent variables are i) two social capital indices – comprises Rate of Participation (RoP) (X1), Density (X2), and ii) three physical access describes as travel time (TT) in minutes by motorbike mode – consist of TT to Senior High School (X3), TT to Hospital (X4), TT to District Center of Jabung (X5). The fifth independent variable is hypothesized to have a significant influence on the dependent variable – the MPI value. Except for the independent variable of X1 which accepts H0, the others are rejected. The following model displays the final result of the Spatial Regression Analysis.

$$\hat{y} = 0.64 + 0.38 \sum_{j=1}^{n} i \neq j \ W_{ij}y - 0.22 \ X1 \tag{9}$$

$\hat{y}$　　　= Multidimensional Poverty Index (MPI) value

Wy　　= Weight matric

$X1$　　= Rate of Participation (RoP)

The negative value of the independent variable of the RoP designates as the one significant independent variable whereby the stronger average participation of the community members might give a positive impact to lessen the poverty of the district, and vice versa. Meaning that fostering community participation will widen their opportunity to escape from poverty, since they could utilize their strong social connections between residents to develop welfare for the community (Coleman, 1990; Putnam, 2000; Ostrom & Ahn, 2003; Ari et.al, 2017, 2019, 2020). In the model, the positive value of the weight matrix describes that physical nearness between villages has a significant influence on each other. Once a poor village has a closer distance to another poor village, they might have a higher possibility of having a higher level of poverty, and vice versa. As a whole, the model suggests that it is important to notice that

the poverty action plan will face a bigger challenge to the poor clustered villages so that both physical as well social infrastructures development need to tackle in togetherness.

d. Research implication

Measurement of the MPI indicates that generally poverty in each village is contributed by the dimension of Education and Living Standards. Then, measurement of the two indices of social capital illustrates that the community does not have a strong social relationship that might bring them to have a better possibility to utilize their both internal and external resources. Hence, when we put it together, it brings results even though their level of education does not reach the national standard of education, the community still does not understand the bad impact of it, since they have a common situation with each other community members. A similar reason might happen toward the Living Standards dimension with an impact that they might feel fine with their current assets to support their daily activity. It seems different to the dimension of health, it seems health program reaches them effectively, so the contribution of deprivation of the health dimension is very much low, even though there are three villages have a quite significant percentage of contribution of deprivation of health dimension. Moreover, referring to Ari et al (2020), education level can be one of the causes of poverty, because of the powerlessness of the community as it has shown from the result of the two indices of social capital whereby mostly community does not have a strong social relationship that able to change their preference regarding the importance of education level for their welfare. As a projection, if their understanding remains the same as the previous time, it might lead to endless problems of poverty, and the community might find it difficult to live in prosperity.

Results of the spatial regression analysis reflect that the level of community participation has a significant effect on poverty in the Jabung District. In addition, Yamin (2016) that the positive impact of the social capital will increase better access to information for the people, so they might have opportunities to gain knowledge that widen their perspective on how to develop their welfare.

One thing that needs to be considered in the MPI poverty model that has been carried out through spatial regression analysis is the presence of spatial factors or neighboring factors that also have a significant influence on poverty. It can be seen in the LISA map results which show high-high and low-low clusters. This means that solving the problem of poverty is not only in the one area with the worst MPI value, but also needs to pay attention to the MPI in neighboring villages.

Based on the results of research related to measuring poverty through MPI, it can be seen that poverty in the district is not only related to weak economic conditions, but the dimension of low education, as well as low social capital conditions, are the causes of poverty. According to Malang Regency RPJMD 2016-2021 policies, create jobs and reduce unemployment is indispensable of the end poverty action plan. Meaning that recommendations can be given for the government to consider the education factor and community empowerment through attractive programs in local community institutions so that people might contribute actively to participating in institutions as a place or space to exchange both internal and external information as well resources.

CONCLUSION AND SUGGESTION

The first research objective of the MPI measurement indicates that poverty that occurs in the Jabung District is a result of the contribution of deprivation of Education and Living Standards dimensions since the majority percentage of deprivation contribution of Health dimension is zero. Henceforth, in the point of view of MPI, policy recommendations on ending poverty at the district should focus upon the development of Education and Living Standards dimensions. In more detail, in the level of the village, the fifth villages with the high MPI value should be targeted areas on dealing with poverty alleviation consist of Jabung, Taji, Kemiri, Gunungjati, and Slamparejo.

Furthermore, the research also indicates that there are influences between the value of MPI in Jabung district with the neighbor spatial condition that is shown through the LISA map. It denotes that if a poor village has the nearest physical border with one or more poor village(s), the difficulty level for the village to out of poverty is higher than the cluster of the non-poor village. As consequence, it is still easier for a poor village that is surrounded by non-poor villages to lift from the poor situation than the poor nearest to the other poor villages. In detail, the result specifies that the cluster of High-High is shaped by the villages of Kemiri and Slamparejo. In other words, the focus of the poverty development to the cluster of poor villages – characterized by High-High MPI values is an inevitability. So that the poverty alleviation program might focus upon those areas, wherein social infrastructure development is necessary to be strengthened.

The second research question assumes that a society with strong social relations has a better capacity to maintain both internal and external resources to develop their welfare (Putnam, 2000; Ari et.al, 2017, 2020). Participation of the community to the existing community groups is quite good, it indicates that their majority participation in the level medium. Meanwhile, when we scrutinize their relationship among community members through density index, it

shows a bit lower result, whereby the majority village has a low-density level. Meaning that at the level of the village, the district does not have strong social capital yet. Hence, it might conclude that the poor of a district is also caused by the weak social ties of the residents since they could not maximize utilization of their internal relationship to catch up with both internal and external information and resources for their goodness of life.

At the third research objective, we put together the result of MPI as the dependent variable, access to public facilities, and two indices of social capital as independent variables into spatial regression analysis, the result infers that poverty in the district is affected by quality social ties within community members and neighboring location. Therefore, paying attention to the poor village which has the nearest physical boundary with another poor village through social infrastructure development as a priority on how to culminate poverty in the district is vital.

Lastly, this research proposes a more comprehensive research approach – putting together a three-dimensional of poverty, social and physical infrastructures, as well as geographical location might give a better understanding of poverty in a certain area. Hence, if the approach is applied to other areas it might give academicians as well as policymakers the ability to propose a more suitable action plan on dealing with poverty in togetherness with the community member.

ACKNOWLEDGMENT

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