Community Participation on an Urban Sanitation Program: a Comparative Study

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Abstract. Sanitation development becomes one aspect, particularly the sixth pillar, of Sustainable Development Goals that aims at ensuring the access to water and sanitation for all. The success of the sanitation program will bring about significant changes in the human life. However, it is necessary to consider community involvement in the development program in all of the steps holistically – planning, implementation, operation and maintenance. This research scrutinizes the key factors of successful urban sanitation development programs in Talangagung sub-district as compared to Ardirejo sub-district in Kepanjen district in Malang regency, Indonesia. Through field observation in the two-research areas, and questionnaire survey distributed to 104 heads of households in Talangagung sub-district and 84 heads of households in Ardirejo sub-district, an evaluation on the suitability of the program as well as the social capital measurement was conducted. The result of estimation illustrates that Talangagung sub-district has higher score than Ardirejo sub-district, which respectively 470 and 340 for the whole steps of the development. Then, the study continued with the social capital measurement using three indicators of social network analysis – covering rate of participation, density and centrality. In general, the rate of participation and density of the residents involved in the urban sanitation program development in Talangagung sub-district was higher value than in Ardirejo sub-district. However, the residents’ participation in the development process tends to decrease from the planning – implementation – operation/maintenance. It is predicted that the low participation in the third step – operation/maintenance, is due to the lack of understanding of the whole participants, since the information is exclusively understood by the organizing committee. In other words, there is asymmetrical information occurring between the organizing committee and the residents. For the centrality, this research utilized three indices of the centrality covering degree – closeness – betweenness centrality. The estimation result at planning step draws that there are 21 central actors in Talangagung, wherein 8 of them are the committee members and 13 of them are regular residents. Meanwhile, in Ardirejo sub-district, there are 5 central actors, but all of them are committee members. In the implementation step, there are 10 central actors, consisting of 7 committee members and 3 residents in Talangagung sub-district. Meanwhile, in Ardirejo sub-district, there are 7 central actors and all of them are the committee members. Finally, at the operation/maintenance step, there is no central actor for both sub-districts.

1. Introduction
Sanitation development, in principal, is not only dealing with the development and improvement of sanitation facilities, such as toilets – as a physical approach, but also with the hygienic behaviour as
one basic prerequisites on how people behaviour-changing from the open-defecation or other improper defecation activities into toilet-use as indicated by the availability of sufficient sanitation infrastructure for every single house. Therefore, the success of the development has basic requirements, wherein people participation together with infrastructure development will reach the target of forming a hygienic environment [1].

One big obstacle for the housing settlement, particularly in urban areas, for having a proper sanitation infrastructure is their parcel land limitation – wherein, generally, urban housing settlements might be characterized as dense areas with respect to both housing and population. As a result, it is difficult to fulfill each house with internal sanitation infrastructure – both toilets and septic tanks. Therefore, one common solution is to establish communal sanitation in the available vacant land nearby the houses. This means that the participation of the residents as a result of the community involvement is one of the influential factor towards the success and sustainability of the sanitation development through the community empowerment [2].

In the research areas, generally every house has their individual toilet. However, they do not have sufficient space inside the house to build a proper septic tank. The SPBM Program – a national Program of Urban Sanitation Based on Community that has been implemented in the research area as one among the chosen area of National Program for Community Empowerment in Urban areas (PNPM Mandiri Perkotaan) and has been granted a minimum three-time cycle of The Direct Community Assistance Funds (BLM). The aims of the SPBM Program are i) to support the community empowerment collectively, ii) to strengthen the social network, and iii) to create open communication between the community and the government institution. [3]

Therefore, the first aim of this research is to measure the level of suitability towards the implementation of the program between the two villages, namely Ardirejo and Talangagung, located in Kepanjen District, Malang Regency. The two areas are chosen since the second location seems able to show better development result than the first one. Hence, it is based on the division into four-steps of the program according to SPBM Implementation Guideline (Pedoman Pelaksanaan SPBM) published by Ministry of Public Works (Direktur Jenderal Pekerjaan Umum, 2011), and best lesson learnt from the SPBM Program that might be useful for future programs. The second aim of the research is measuring the social capital of the SPBM Program through three indices of social structure, which consists of the rate of participation, density and centrality as proposed [4][5] using Social Network Analysis (SNA) approach, wherein the equation formula [6]. Finding answer of the second aim might bring a better understanding of whether the functioning of social capital might give significant influence to the success and the sustainability of the SPBM Program, whereby the better community involvement illustrates stronger social ties that make social capital work [7][8].

2. Research method

2.1. Research area
Ardirejo Village (210.74 Ha) and Talangagung Village (354.91 Ha) are administratively located in Kepanjen district, Malang regency. Based on an internal evaluation of the SPBM program, the program that has been conducted in Ardirejo village could not be done maximally due to (i) less community contribution occurrence, (ii) dissemination information at the socialization, and (iii) poor maintenance of the result. Meanwhile, the program in Talangagung village could be done in better level among the entire six villages in Kepanjen district. Therefore, in order to have a better understanding of the program, this research tries to compare the program between the two villages.

2.2. Sample
In order to have sufficient answers for the main research aims, the gathered data have been compiled in two ways – covering field observation and interview to the targeted population using questionnaire survey. For the first research question, the chosen respondents are the ones who have sufficient knowledge about the whole program. Therefore, two respondents from each village have
been chosen using purposive sampling method. The chosen respondents are the heads of the Community Self-supporting Group (KSM) and the facilitators of the program, who know very well about the whole process of the program in the area. Then, the respondents chosen to answer the second research question are the heads of household of the participants of the SPBM program – as the program beneficiaries, and the whole committee members of the KSM. The number of the beneficiaries of the program in Ardirejo village and Talangagung village are 84 and 104 households, respectively. On one side, the number of the committee members of KSM in Ardirejo village are 7 people, covering the tasks as chairman, vice-chairman, secretary, treasury, task force, as well as logistic and public relation. On the other side, the composition of the committee members of KSM in Talangagung village are mostly similar with two more additional committee members that function as the security and budgeting officers; hence it consists of 9 people. The following Table 1 indicates the number of households as the beneficiaries program at the sub-hamlet/hamlet areas.

**Table 1. Number of SPBM program beneficiaries**

| Ardirejo Village | Talangagung Village |
|-----------------|---------------------|
| Sub-hamlet (RT)/ hamlet (RW) | Number (HH) | Sub-hamlet (RT)/ hamlet (RW) | Number (HH) |
| RT 1/ RW 2       | 38                  | RT 19/ RW 3               | 20          |
| RT 2/ RW         | 46                  | RT 20/ RW 3               | 84          |
| Total            | 84                  | Total                    | 104         |

Considering the first research question [9], whereby a list of questions in the questionnaire survey were divided into 4 categories – classified based on the four-steps of the SPBM program covering Planning (input) – Implementation (process) – Post Implementation (output) – Impact Post the Program after the completion of the whole activities (impact). In the planning step, four variables were considered consisting of i) the program socialization – the number of socialization, ii) the involved actors – the number of involved actors, iii) the funding – the funding disbursement criteria, and iv) the human resources – the number of KSM committee. In the implementation step, there were five variables covering i) the planning of the work, ii) the work force arrangement, iii) the procurement of goods and services, iv) the monitoring and supervision of the construction implementation, and the activity report. In the post implementation step, the variables consist of the utilization of the constructed sanitation, ii) the improvement of the access to basic sanitation, and iii) the institution. In the step of the post impact of the program, the variables were i) changes of the community’s knowledge, ii) changes of the community’s attitude and behaviour, and iii) the level of public health. Then, simple scoring analysis is applied as the approach for suitability evaluation of the program, and it is continued by weighting method through classification rank.

Then, the second research question was addressed using Social Network Analysis approach that required affiliation data, wherein the whole respondents were asked about their participation in the program – which then classified into three steps: Planning – Implementation – Operational and Monitoring. The type of the affiliation data here might be classified as informal network since the social network that had been formed was due to their relation on the events for each step of the program. The procedure of analysis might be described as follows. First, the affiliation data were collected in the shape of rectangular matrix labelled as incidence matrix of respondent – event (n x m) that illustrated the participation or involvement of each respondent at every step activity of the program. Second, the incidence matrix was transformed into a square matrix called the adjacency matrix of respondent-by-respondent (n x n). Third, the affiliation data in the shape of adjacency matrix as input to measure the three indices using software called UCINET 6 version 6.365. For the second research aim, the number of respondents became set of actors labelled as n and the number of activities at each step became set of events labelled as m.
3. Estimation result and discussion

3.1. Suitability analysis

The following Table 2 illustrates the results of the scoring analysis of the two villages classified into 5 categories of suitability – very low (100-180), low (181-260), enough/pretty (261-340), suitable (341-420) and high (421-500). In general, based on the expert’s evaluation – the heads of KSM and facilitators, Talangagung village has higher score than Ardirejo village for the whole four-steps.

**Table 2. The evaluation of the SPBM program**

| Step                            | Ardirejo village | Talangagung Village |
|---------------------------------|------------------|---------------------|
|                                 | Score  | Classification | Suitability | Score  | Classification | Suitability |
| Planning Process (input)        | 330    | 3              | Enough/Pretty | 430    | 5              | High        |
| Implementation Process (process)| 340    | 3              | Enough/Pretty | 453,33 | 5              | High        |
| Post-implementation Process (output) | 333,3 | 3              | Enough/Pretty | 366,67 | 4              | Suitable    |
| Impact Post the Program (outcome) | 383,3 | 4              | Suitable     | 433,33 | 5              | High        |

Table 3 indicates the total score for each village at the whole four-steps. The total score for Ardirejo Village is within the range of 261 – 340, meaning the SBPM Program has been conducted in enough/pretty suitability. Meanwhile, for Talangagung Village, the total score is between 421-500. It means that the SPBM Program in Talangagung village had been done in high suitability. Thus, we might assume that the SPBM Program in Talangagung village has been done successfully with higher suitability level than the one conducted in Ardirejo village.

**Table 3. The scoring calculation for the whole steps**

| Step                            | Ardirejo village | Talangagung Village |
|---------------------------------|------------------|---------------------|
|                                 | Weight | Classification | Scores  | Weight | Classification | Scores  |
| Planning Program (input)        | 12,5   | 3              | 37,5    | 12,5   | 5              | 62,5    |
| Implementation Program (process)| 17,5   | 3              | 52,5    | 17,5   | 5              | 87,5    |
| Post-implementation Program (output) | 30     | 3              | 90      | 30     | 4              | 120     |
| Impact Post the Program (outcome) | 40     | 4              | 160     | 40     | 5              | 200     |
| Total                           | 340    |                | 470     |        |                |         |

3.2. Social network analysis

3.2.1 The rate of participation. The purpose of the analysis is to obtain descriptions of participation level of the whole community in the research area through the respondents’ affiliation data at each step of the program in each village. The measurement of the participation rate in Ardirejo village was based on 9 activities covering 3-steps: Planning – Implementation – Operational and Maintenance, which consisted of 6 – 2 – 1 composition, respectively. Meanwhile, similar measurement in Talangagung village consisted of 10 activities, which were divided into 6 – 3 – 1 composition. The following Picture 1 describes the number of participation of the respondents in each village as the whole beneficiaries group.
Table 4 illustrates the calculation of the participation rate in the research areas. The classification of participation rate is divided into three categories – low, middle, high in different total number of activities in each village as mentioned above.

### Table 4. The rate of participation

| Step                  | No. Of Respondent | No of Activity | RoP   | Classification | No. Of Respondent | No of Activity | RoP   | Classification |
|-----------------------|-------------------|----------------|-------|----------------|-------------------|----------------|-------|----------------|
| Planning              | 84                | 6              | 2.27  | Middle         | 104               | 6              | 2.90  | Middle         |
| Implementation        | 84                | 2              | 0.40  | Low            | 104               | 3              | 1.32  | Middle         |
| Operational & Maintenance | 84          | 1              | 0.20  | Low            | 104               | 1              | 0.50  | Middle         |

In general, the participation rate of the community in Talangagung village is higher than the in Ardirejo village for the whole three-steps. At the planning step, the average number of community’s participation is 2 – 3 amongst 6 activities for both villages, with slightly higher rate of participation in Talangagung village. At the implementation step, some communities in Ardirejo village participated in one activity, but some of others did not join in any activity. Meanwhile, for the community in Talangagung village, generally they joined in 1 – 2 amongst 3 activities. At the operational and maintenance step, there was only one activity available. However, the number of participation in both research areas were not many, wherein about 80% of the communities in Ardirejo village did not participate in the activity, meanwhile, about 50% of the communities in Talangagung village participated on it. Hence, in the communities in Talangagung village, one in every two community members participated in the activity. For the whole steps, the communities in Ardirejo village joined 3 – 4 amongst 9 activities. Meanwhile, the communities in Talangagung village participated in 5 – 6 amongst 10 activities. Therefore, we may infer that within the whole steps, the communities in Talangagung village can be classified as having middle rate of participation, while the communities in Ardirejo village can be classified as middle rate only in one out of the three steps.
The declining participation in the activity could be explained with two reasons. First, it was caused by community reluctance to participate in each step due to clashes between the working time and the communal work activity schedules. Second, some communities also thought that representativeness of the committee members of KSM was more than enough to run the program, particularly in the operational and maintenance steps.

3.2.2 Density. The value of density is between 0 – 1, which, in this research, is classified into three level covering low – middle – high. The purpose is to attain a clear illustration on how dense communities’ informal network at each step of the program within the village. The following Table 5 describes the density of the SPBM program in the research areas.

Table 5. Density

| Village     | Classification       | Step              | Density | Category |
|-------------|----------------------|-------------------|---------|----------|
| Ardirejo    | 0-0.33 (Low)         | Planning          | 0.675   | High     |
|             | 0.34-0.66 (Middle)   | Implementation    | 0.062   | Low      |
|             | 0.67-1.00 (High)     | Operational & Maintenance | 0.039 | Low     |
| Talangagung | Planning             | 0.918             | High    |
|             | Implementation       | 0.477             | Middle  |
|             | Operational & Maintenance | 0.248 | Low     |

The density at the planning step illustrates high level of participation for both villages. This means that the majority of the community were involved in the activities at the planning step. The highest attendance was present at the village discussion I, wherein the information dissemination was firstly conducted. At the planning step, only less than 10% of communities in Talangagung village did not participate in the activity, and it had much higher density as compared to Ardirejo village. As a result, the flow of information as well as resources might be disseminated more effectively among the communities in Talangagung village than in Ardirejo village.

At the implementation step, the density of the communities in Talangagung village can be classified as middle level (0.477). This level is very much higher than density in the Ardirejo village, which shows low density level (0.062). This result might represent that the majority of the communities in Ardirejo village (93.8%) did not participate in the second step of the program. Meanwhile, only about 47.7% of the communities in Talangagung village participated in the program. At the last step, the value of density is even lower, wherein communities in both villages indicated low level of density. However, the level of density of the community in Talangagung village still show higher level than the one in in Ardirejo village. It is about 24.8% : 3.9% communities involvement between the two villages, respectively. The majority of community who were involved in the operational and maintenance step came from the committee members of KSM. It might represent that the flow of information as well resources is dominated by the committee members. As a consequence, in one hand, the sustainability of the program might fully depended upon the committee members of KSM, and on the other hand, the common community might only act as pure users of the result of the program.

3.2.3 Centrality. In this research, there are three different types of centrality – degree, closeness, betweenness that were measured in order to find a prominent actor for each step of the program. Similar with the density, the index values of centrality is between 0 – 1, and they are classified into three levels too. The following Table 6 illustrates the results of the three-centrality measurement for both villages at the three-steps.

The degree of centrality measures the number of networks of an actor to the rest actors within the networks, in order to identify the most popular actors in the network. Among 84 respondents in Ardirejo village, there were 63 respondents with high level of centrality degree at the planning step. In addition, the whole respondents had high levels of centrality degree. It might be referred that most of them knew each other, with almost similar influence to share information as well as any resources to others. The closeness centrality exemplifies actors that have the closest distance to the rest of the
actors in the network that referred to how fast the central actors disseminate the information and resources to the rest of actors in the network. In this measurement, an actor who did not participate in any activity has to be omitted from the calculation, since this actor could contribute nothing to the network. Since the number of community members participated lessened from the first step to the second and the third step, the closeness levels also decreased. This means that the number of prominent actors with regard to their closest ‘geodesic’ distance in the network was also getting lower from first step to the rest of steps. The last measurement of centrality is betweenness aimed at scrutinizing the prominent actors that are indicated through their position as a bridging of the information flow as well as resources to the rest of actors in the network. The more mediating position played by an actor, the higher the level of betweenness they have. However, since most of the respondents have direct relation to each other, which is shown by themajority high degree centrality, the degree of betweenness is in the low level. It implies that in the network among the communities in Ardirejo village, there is no single actor who played the significant role as mediators.

Table 6. Centrality

| Step          | Ardirejo village | Talangagung village |
|---------------|------------------|---------------------|
|               | Degree | Closeness | Betweenness | Degree | Closeness | Betweenness |
| Planning      | • Low: 17.8% | • Middle: 22.61% | • Low: 100% | • Middle: 5.76% | • Low: 100% |
|               | • Middle: 7.14% | • High: 77.38% | • Low: 100% | • High: 94.23% | • High: 99.03% |
| Implementation| • Low: 100% | • Low: 69.04% | • Low: 100% | • Low: 17.30% | • Low: 0.17% |
|               | • High: 30.95% | • Medium: 63.46% | • Low: 100% | • Medium: 7.69% | • Low: 100% |
|               | • High: 19.23% | • High: 75% | • Low: 100% | • High: 75% | • Low: 100% |
| Operational &| • Low: 100% | • Low: 79.76% | • Low: 100% | • Low: 50% | • Low: 50% |
| Maintenance   | • High: 20.23% | • High: 50% | • Low: 100% | • Medium: 50% | • High: 50% |

The similar pattern is also found for the centrality measurement in Talangagung village, particularly for betweenness centrality. It means that there is no prominent actor functioning as the mediator in the network. For the degree and closeness of centrality, there are some prominent actors (high level) that could be found for both implementation as well as operational and maintenance steps. This means that the flow of information and resources might able to disseminate through the prominent actors for more effective result.

Figure 2. Netdraw Centrality at the Planning Step - (left) Ardirejo village & (right) Talangagung village

Graph 2 describes the net draw centrality at the planning step for both villages. There are five prominent actors at the planning step in Ardirejo village. All of them are the committee members of KSM covering chairman, vice-chairman, secretary, treasury and logistic section. Thus, none of them is
common community member in the area. In case of Talangagung village, twenty one prominent actors are found, wherein seven of them are the committee members of KSM in the village.

**Figure 3.** Netdraw Centrality at the Implementation Step - (left) Ardirejo village & (right) Talangagung village

From the graph 3 we can assume that at the implementation step, there are seven prominent actors in Ardirejo village – covering the whole committee members of KSM. So, once again, none of the prominent actors comes from common community. In Talangagung village, there are 10 prominent actors that consist of 7 of the 9 committee members of KSM plus 3 prominent actors from common communities. Thus, we may infer that in general, the committee members of KSM play important roles at the implementation step of the program.

Graph 4 illustrates that at the operational and maintenance step, we could not find any central actors in the two villages. In other words, it means there is no central actors in the research areas, even though 17 respondents in Ardirejo village and 52 respondents in Talangagung village participated at the step. Nevertheless, we are still able to find from the calculation that in Talangagung village that the respondents have middle level of degree of centrality and high level of closeness centrality, but it still could not place them as central actors.

**Figure 4.** Netdraw Centrality at the Operational & Maintenance Step - (left) Ardirejo village & (right) Talangagung village

4. Conclusion
Research found that community in Talangagung Village had done their community participation on public sanitation program in the higher level of sustainability than the community in Ardirejo Village [5]. Social Network Analysis with three indices – rate of participation, density and centrality illustrated that community in Talangagung Village had higher social tie through their informal network towards the whole steps of the program than the community in Ardirejo Village. Hence, we might conclude that the strong social tie of the community in Talangagung Village is one of the important factors that assures the success of the program.
As a recommendation, in order to guarantee the success and sustainability of the SPBM program, as well as other participation development programs that required community involvement, this research might suggests three important notes as follow. First, inclusiveness involvement of the community at the whole steps of a kind of empowerment development program is necessary. The role of prominent actors are also important in the sense that the prominent actors might play as a strategic node to foster the flow of information and resources from the government to community – the vertical network as well as among communities – the horizontal network. Second, the symmetry of information for all is also a necessity. One big obstacle for a kind of empowerment and development program is the availability of one group that is very dominant to reach access to the information as well as resources. As a result, it will bring burden for the whole process since these kind of development programs requires solid support from the whole aspects in the community. Third, knowing prominent actors as the booster to the more effective progress of the development programs are necessary too. Government might utilizes them as important channels in the network, in order to foster social structures in the network into stronger community movements.

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