COMMUNITY NETWORKS, SOCIAL CAPITAL, AND ACCESS TO DRINKING WATER

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1. Introduction

In recent decades, research theme related to social capital has been broadening discussed ranges across the whole social sciences, from economics, organizational sociology to political science. Therefore, there is not a single unified or generally accepted theory of social capital, as well as methods to measure the social capital.

In this paper we try to investigate the link between social capital and access to drinking water in the community level. Here we associate social capital with local level organizations that is measured simply by the density of the individuals in the participation to community group that exist in their neighborhood. Or in other words, its social capital refers to the network an individual belongs to with respect to empirical data of the case Singosari district in Malang regency Indonesia.

Literature review about social capital to give grand concept of understanding about social relations and its discussion is put in section two. Section three portrays methods on collecting data from face to face questionnaire survey, as well as general description of the study area. In section four, we explain methods to measure social capital that we focus on relational data of the individuals in participating of the community groups using social network analysis. Broader results and discussions are explained in section five, and it is finalized with conclusion in section six.

2. Social Capital: Bonding and Bridging

Putnam (2000:19) defines social capital as "connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them." As mentioned by Marc (2008:311) that "this definition is in broad agreement with major sociological researchers in the field who have defined social capital primarily as the characteristics of social networks and the resources embedded in these social ties."

Defined by Kerry et.al, (2006:39), bonding social capital, which is the close-knit ties among similar individuals or groups, is said to be good for "getting by," whereas the bridging form, representing "weaker" ties among heterogeneous individuals or groups, connects one to new resources, and is needed to "get ahead." In his notion, Putnam (2000) distinguishes central difference between the two is whether the ties are homogeneous or heterogeneous. He distinguishes between 'bridging social capital' in which bonds of connectedness are formed across diverse social groups, and 'bonding social capital' that cements only homogenous groups. Moreover, bonding social capital is "inward looking and tends to reinforce exclusive identities and homogeneous groups", and bridging social capital, in contrast, connect people or groups who are different from each other in some way and addresses how social capital facilitates resource acquisition. Then, unlike bonding social capital, where networks are comprised of similar people with presumably similar resources, bridging social capital is crucial in acquiring a wider variety of resources and enhancing information diffusion within and between groups. In addition, bonding social capital is the relationship within a homogeneous group and "bridging social capital tends to bring together people across diverse social divisions" (Field, 2003; ONS, 2001).

Kerry et.al, (2006:40) reveals that distinction between homogeneous (bonding) and heterogeneous (bridging) ties are also relevant to social capital at the community level., And then, they cited opinion of Woolcock (1998) that the importance of "two distinct, but complementary forms of social capital" in a community – embeddedness and autonomy (p. 162). Embedded ties are those among members of a group, and are characterized by a "high degree of density and closure" (p. 163). Autonomous social ties are those between groups or ties that "provide access to a range of non-community members" (p. 164) that are analogous to vertical ties of bridging social capital. Furthermore, they also noted that according to Paxton (1999), social capital within a single group (bonding social capital) may be positive for that group, but does not necessarily "spill over into … social capital for the community" (p. 96), and she focused on horizontal form of bridging social capital – between-group ties.

Kerry et.al (2006), in term of community action, cited Putnam's notion (1993; 2000) that a well-connected community (i.e. one with "community social capital") should be better able to mobilize local and extra-local resources to effectively act. Furthermore, Woolcock and Narayan describe the combination between bonding and bridging social capital at the community level in the following Table 1.

Table 1. Dimensions of Social Capital at the Community Level		
Extracommunity networks (bridging)	Intracommunity ties (bonding)	
	Low	High
Low	Outcasts	Poor villagers
High	Recent rural-to-urban migrants	Successful members of microfinance programs

Source: Woolcock, M., Narayan Deepa (2000).

3. Description the Case

Face to face questionnaire interview survey method was conducted twice, firstly on December 2008 and secondly on March 2010. Refers to the Instruments of the Social Capital Assessment Tools developed by World Bank (Grootaert et.al, 2004) and combine with preliminary survey information, we develop household questionnaire survey that focus on both current access to water and community network, as well as general demographic data of the respondent. Moreover, we also compose representative questionnaire survey that focus on community and water system characteristics, as well as detail information about rule and norms of access to drinking water.

Through systematic sampling, the first target for the household questionnaire survey is 500 households living at Toyomarto village and Candi Renggo village, Singosari district which selected as the respondents. Hence the results and the substantial assessments replicate the essential characteristics of the contacted people. In order to optimize representativeness of the inhabitants, the respondents selected for the study are the husband, the wife or the head of family that are chosen so as they represent typical precious inhabitants. Moreover, precise data in this micro level of sub village is not available in formal document such as Regency Statistic Data. Therefore we conducted preliminary survey to capture the real condition of the society. The second target for the representative questionnaire survey, we selected 17 representative people in both villages as the respondents covering 2-head of village, 6-head of sub village, 7-head of HIPPAM (community based on drinking water), and a head of HIPPA (community based on irrigation water).

Singosari district is the highest populated district in Malang regency consists of 17 villages covering 140,245 inhabitants with total area 11,374 Ha (Regional Bureau Statistic, 2008). Toyomarto village lies from 600 to 1,500 meter above sea level and has total area of 1,550.64 Ha. Land use of the village is dominated by paddy field (54%), and then it is followed by government plantation and forest (28%) and residential area (18%). Candi Renggo village lies from 400 to 550 meter above sea level and has total area of 340,18 Ha. Land use of the village consists of paddy field (54%) and residential area (46%). In addition, Sumberawan spring and Banyon spring are located in Toyomarto village, whereas Ken Dedes Pond is located in Candi Renggo village. Majority household income of the respondents is less than IDR 1 million (¥ 10.000) per month (64%). This indicates that the residents are in the lower middle class of socio-economic status that the monthly minimum wage of Malang Regency in 2009 is determined at IDR. 945.500. According to education statistics (source: www.NationMaster.com), average years of schooling of adults in Indonesia is 5 years. It implies that around half of the respondents in the study are have education level above the national average. In this sense, in general, the respondents in the study area have similarity in geographic and demographic situation.

Based on Data Compilation of Water System in Malang Regency (2008), only 28% residents in Singosari district have direct water pipeline connection to house. PDAM (Local Company of Drinking Water), a conventional water service provider serves 13% residents, and rest of 9% are served by HIPPAM (Resident Association of Drinking Water User), a community based water management. According to Wydick (2008) about categorization of goods by rivalry and excludability, access to water that the respondents acquire from both water providers (PDAM and HIPPAM) could be categorized as club goods that it is non-rival among its members but prohibit others from consuming it. In this paper, we distinguish the respondent into two groups' access to water with hypothesis that the respondents of HIPPAM (217 households) have higher level of social capital than the respondents who join PDAM (109 households), in line with the notion of Woolcock and Narayan (2000:226) that describe social capital as "the norms and networks that enable people to act collectively." Furthermore, Aoki (2009) defined the community as a group of agents who repeatedly interact with each other in social and economic domains and thus are mutually identifiable. Thus, a group of agents can be categorized as the community if they fulfill three characteristics as follows. Firstly, membership is relatively stable that they share (limited) information or the use of certain local commons. Secondly, they create internal rule as substantial regulation or able to form their community norms as endogenous rules. Thirdly, then they utilize the community norms for self-enforceable without third-party involvement. In this sense, HIPPAM could be classified as the community that fulfills all the characteristics, whereas PDAM only has the first characteristics of the community in Aoki's definition.

4. Methodology

Primary data on this research, as mentioned by Narayan and Pricehett (1999) employing an index of social capital at the household and community level which included density and characteristic of informal and formal groups and networks to which people belonged. It is covering 15 community groups namely (1) religious, (2) cultural/social, (3) HIPPAM, (4) PDAM, (5) HIPPA, (6) ethnic based, (7) community organization, (8) finance, (9) production, (10) union (labor/trade), (11) political party, (12) professional association, (13) business association, (14) social movement, and

(15) others. The last group is an option that the respondent should specify the name of association when they mention that they involved in different community organization outside the fourteen.

Based on the central distinction between bonding and bridging social capital in the sense of homogeneous and heterogeneous ties (mentioned by Kerry et.al, 2006; Paxton, 1999); Woolcock, 1998), we define the characteristic of the community groups as follows. The first type characterized as the community group which has limited linkages within community area (locally organization) which is describes bonding and horizontal bridging social capital. The other type characterized as the community group which has linkages with regional and/ or national, or even more with international organization, which its analysis result describes vertical bridging social capital. According to this classification, community group such as religious, cultural/social, Hippam, Hippa, ethnic based, finance and production is categorized into the first type. And then, another seven community organizations could be categorized into the second type. Meanwhile, finally the last option could not classify either the first or the second type of community group, because of the obscurity of the respondents answer.

Then, we analysis community network in the research area through social relation of respondent on participating into community group where the strength of a relation can be measured by the number of interlocks that it involves and it showed by density in adjacency matrix. Measuring density depends upon two parameters of network structure, namely the 'inclusiveness' of the graph and the 'sum of the degrees of its points.' Inclusiveness refers the number of connected points - the total number of points minus the number of isolated points expressed as a proportion of the total number of points. And the degree of a point is shown by the number of non-zero entries for that point in its row or column entry in the adjacency matrix. In addition, two points that are connected by a line are said to be adjacent to one another that two agents represented by points are directly related or connected with one another. Every graph has associated with it an adjacency matrix, which is a binary nxn matrix A in which $a_{ij} = 1$ and $a_{ji} = 1$ if point i is adjacent to point j, and $a_{ij} = 0$ and $a_{ji} = 0$ otherwise. Finally, density defined as the number of lines in a graph divided by the number of possible which is defined as $n(n-1)2$ (John Scott, 1991). Thus, the more inclusive is the group, the higher density of social relation that individuals are connected to one another.

Procedure to measure the level of bonding social capital is as follows. In the first step we construct incidence matrix size (217 x 1 for HIPPAM and 109 x 1 for PDAM) which describes interlock of the two agents into a locally community group. Value of 1 will be give it to the relation that it occurs if they are directly connected one another because they participate in the same community group, or 0 otherwise. In order to measure density of the respondent in each locally community group which describes homogeneous ties, in the second step we change the incidence matrix into adjacency matrix (217 x 217 for HIPPAM and 109 x 109 for PDAM). And then change value of the adjacency matrix into binary that connection A-to-B is equal with connection B-to-A with value 1, and 0 if A and/ or B do not join in the same locally community group that we continue to measure inclusiveness and density of each value of social capital.

Applying the same method, we measure bridging social capital that we classify the community group into two characteristics of the form of social capital. First, social relations between respondents into seven locally community groups which describes horizontal bonding social capital. Secondly, social relations between respondents into another seven community groups which have linkage with regional, national or international organizations that illustrates vertical bridging social capital.

5. Results and Discussions

It is illustrated in Table 2, that in general, the respondent of HIPPAM joins in more varies types of community groups than the respondent of PDAM. Since our research based on social relations among individuals within and or between groups, consequently number of respondent who belong to a community group will give significant effect to the measurement of social capital itself. Majority member of HIPPAM and PDAM have almost similar pattern of participation in the community group covering religious, cultural/social, community organization and finance. Except one strange occurrence that HIPPAM's member tend to join in the group of PDAM rather than the group of HIPPAM, as well as happen to the member of PDAM.

Table 2. Respondent Participation of in Community Group

Community Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
HIPPAM	175	33	1	95	1	1	23	19	5	0	1	2	1	0	3	360
PDAM	71	34	22	0	0	6	39	9	0	0	1	0	2	1	0	185

These following facts may give explanation of that strange occurrence. When we asked whether the respondents want to change their current water resources, 7 members of HIPPAM want to obtain water from PDAM, as well as 6 members of PDAM want to change to HIPPAM. Three reasons of their opinion are they desire (i) more fluent water supply, (ii) better management, and (iii) cheaper price. Even investigation result of water satisfaction through question "do you satisfied in current drinking water condition?" using three categorize (good = 3, average = 2 and bad = 1) related to taste, quality, quantity, price and availability describe high level of water satisfaction for HIPPAM's respondent (mean value 2.82), and moderate level of water satisfaction for PDAM's respondent (mean value 2.33). In addition, both of HIPPAM and PDAM have no regular meeting which provides a forum for discussion between members and the committee of the organization. It seems that absence of regular meeting have resulted in lack of sense

of belonging to a group.

Table 3. Bonding Social Capital the Respondent of HIPPAM

Community group	1	2	3	5	6	7	8
No. of connected point	175	33	0	0	0	23	19
Inclusiveness	0.81	0.152	0	0	0	0.106	0.0876
No. of lines	15225	528	0	0	0	253	171
Density	0.65	0.023	0	0	0	0.011	0.0073

Table 3 illustrates the result of social relations of HIPPAM's member within a community group. Among the seven groups, only religious group shows high level of bonding social capital which 81 percent of respondents are join in the religious group and 65% of them are connected to one another. Whereas, bonding social capital in the cultural/social group, community organization as well as finance group is very low. Because only few respondents that have relationship with one another.

Table 4. Bridging Social Capital the Respondent of HIPPAM

HIPPAM	Horizontal Bridging	Vertical Bridging
No. of connected	184	96
Inclusiveness	0.85	0.44
No. of lines	15432	4469
Density	0.66	0.19

Then we continue to measure social relations of individuals between the seven locally community groups in order to get the level of horizontal bridging social capital, and another the seven vertical community groups for measuring vertical bridging social capital, as depicted in Table 4. The result illustrates high horizontal bridging social capital among HIPPAM's member due to bigger possibility of the respondent to have linkages with others between the seven locally community groups. But, social relations of vertical bridging social capital illustrates that the member of HIPPAM have less participation into community group which has linkages with regional, national or international organizations. Thus, member of HIPPAM has quite rich social relations within religious group and between the seven locally community groups, but lack of connection to the vertical community groups.

Table 5. Bonding Social Capital the Respondent of PDAM

Community Group	1	2	3	5	6	7	8
No. of connected point	71	34	22	0	6	39	9
Inclusiveness	0.651	0.312	0.202	0	0.055	0.358	0.083
No. of lines	2485	561	231	0	15	741	36
Density	0.42	0.095	0.039	0	0.0025	0.13	0.0061

In general, the result of social relations for PDAM's member suggest similar pattern with the HIPPAM, but with lower level of social capital. The respondents who acquire drinking water from PDAM have strong bonding social capital only within the religious group, and quite high horizontal bridging social capital between the seven locally community groups. Whereas, their vertical bridging social capital is very low or almost zero due to only two respondents that are connected to one another and form a single social relations. In detail, the result for both bonding and bridging social capital of the respondents of PDAM are depicted in Table 5 and 6.

Table 6. Bridging Social Capital the Respondent of PDAM

PDAM	Horizontal Bridging	Vertical Bridging
No. of connected point	95	2
Inclusiveness	0.872	0.01835
No. of lines	3241	1
Density	0.551	0.00017

According to Masao et.al (2006), there are two characteristic of social relationships namely open network and closed network. Open network is a large, open, diverse, and externally focused network. It is excellent for getting lots of new information, learning about new opportunities, and finding resources. However, it is not so good for building consensus, producing consistent expectations, or developing a sense of common mission (may be prone to conflicts or tension. Meanwhile, closed network is a small, closed, homogenous, and internally focused network. It is good for building group loyalty, identity, and a sense of common purpose. The disadvantage is that it may be inadequate for getting information or other resources, or insufficient for influencing people outside the networks. It is subject to group

thinking and the development of an us-versus-them view of the world. In line with this notion, the result suggested that the respondents of these two water service provider seems to have closed network that it may not positive to the development of access to drinking water for all citizen.

6. Conclusion

The social relations that are illustrated from level of bonding and bridging social capital of both the water providers – HIPPAM and PDAM seems illustrate similar pattern. The result of research suggests that bonding social capital is found high only in the social relation among member of religious group. And then, it is also show quite similar result for horizontal bridging social capital that it possible to occur due to larger number of respondents will have more possibility to relate within several community groups. But, severe lack of vertical bridging social capital occurs.

It is true, that presence of bonding and horizontal bridging social capital in the community is able to bring access to drinking water for people through supplying public facility. An interaction effect shows that bridging and bonding social capital are, to a degree, interchangeable in their ability to facilitate community action (Kerry et.al, 2006). But, this relationship that established by the within "homogenous ties" of people that create social relation towards the between "heterogeneous ties" of people is only able to give limited access to water for people.

In conclusion, the community with high of bonding and horizontal bridging social capital, combine with low vertical bridging social capital may cause the people cannot reap the benefits of their natural wealth. In line with the notion of Putnam (2000) that bonding   social capital has negative effects for society as a whole, but may have positive effects for the members belonging to this closed social group or network. It indicates that in the future it may difficult to increase the number of people who want to get direct water pipeline connection to house, particularly the one who wants to join HIPPAM as a member. As mentioned by Kerry et.al, (2006) that bridging social capital is operationalized as the extent of the community's heterogeneous, external ties. The greater the community's formal and informal ties to the outside, the greater the likelihood that community leaders and members will be exposed to new ideas and new ways of doing this. Therefore, this current situation may hinder the improvement of water services because they already felt satisfy with their current water services and may not know the effective way to improve the existing.

In addition, along with statement from Flora and Flora (1990), one recommendation that able to propose to is "communities and community development professionals should be exist to be able to mobilize and modify local community based water management in order to increase and sustain access to water for all communities".

Kerry et.al, (2006) found that bridging and bonding social capital are strong predictors of community action. HIPPAM represents a kind of community action on community based water management in the research area that in fact shows ability to solve problem on access to water for partly communities. The next research question that is necessary to answer is to test whether social capital is predictor of community action for community based water management on trying to obtain and sustain access to clean water. It will connected with characteristic of water services from HIPPAM as club goods where the very capacity of social groups to act in their collective interest depends crucially on the quality of the formal institutions under they which reside as mentioned by North (1990), as well as, the three forms of social capital mentioned by Coleman (1999).

References
1) Putnam D Robert. 2000. "Bowling Alone: The Collapse and Revival of American Community." Simon & Schuster, New York.
2) Woolcock, M., Narayan Deepa. 2000."Social Capital: Implications for Development Theory, Research and Policy." The World Bank Research Observer, Vol. 15 No. 2, p. 225-249.
3) Kerry Agnitsch, Jan flora, Vern Ryan. 2006. "Bonding and Bridging Social Capital: The Interactive Effects on Community Action." Journal of the Community Development Society, Vol. 37 No. 1.
4) Krishna Prasad Adhikari. 2008. "Bridging, Linking, & Bonding Social Capital In Collective Action The Case of Kalahan Forest Reserve in the Philippines." CAPRI Working Paper No. 79 May 2008
5) Grootaert Christiaan, Narayan Deepa, Jones Veronica Nyhan, Michael Woolcock. 2004. "World Bank Working Paper No. 18: Measuring Social Capital An Integrated Questionnaire." The World Bank, Washington DC.
6) Woolcock, M., A.T. Sweetser. 2002. "Bright Ideas: Social Capital – The bonds That Connect. ADB Review 34 (2).
7) Mark S. Granovetter. 1973."The Strength of Weak Ties." American Journal of Sociology, volume 78, Issue 6 (May, 1973), p. 1360-1380.
8) Ronald Burt. 2000." Structural Holes versus Network Closure as Social Capital." Social Capital: Theory and Research.
9) Aoki, M. 2009. "Community Norms and Embeddedness: a Game-Theoretic Approach (Chapter 4), Communities and Markets in Economic Development." Oxford University Press.
10) John Scott. 1991. "Social Network Analysis: A Handbook." SAGE Publications Ltd.
11) Masao O., Kumiyo N., & Ken-ichi M. 2006. "D-SNS: A Knowledge Exchange Mechanism Using Social Network Density among Mega-Community Users." Supporting the Social side of Large Scale Software Development – CSCW Workshop '06.