

Social Capital to Strengthen Collective Action in Environmental Protection¹

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ABSTRACT

Increasing population overtime has made pressure on environmental quality. With assumption environmental goods and services are collective goods, government has major rule to provide it. But often government has limitation on their capacity as well as their political will. With this condition exist, can society take action to provide environmental goods and services? Some studies have shown that community can perform collective action to solve the problem and/or support government environmental program. In this context, social capital is an important factor to make a successful collective action. In Indonesia, research on social capital has widely used for several decades in its relation to health, poverty, social problem and political process. This study aims to test hypothesis whether there is positive relation between social capital and collective environmental action. Data is taken from IFLS (Indonesia Family Life Survey) and the result from probit estimation showed that the higher the social capital level, the more likely individual is willing to contribute in collective action to protect the environment. This study will enrich reference on the role of social capital, especially in its relation to environmental quality. From policy maker viewpoint, it is important to understand how a community performs self-governed solution to make sure that intervention from government is appropriate.

Keywords: Social Capital, Collective Action, Environmental Protection

JEL Classifications: Z13, Q01, C21

INTRODUCTION

Population Density and Environmental Problem

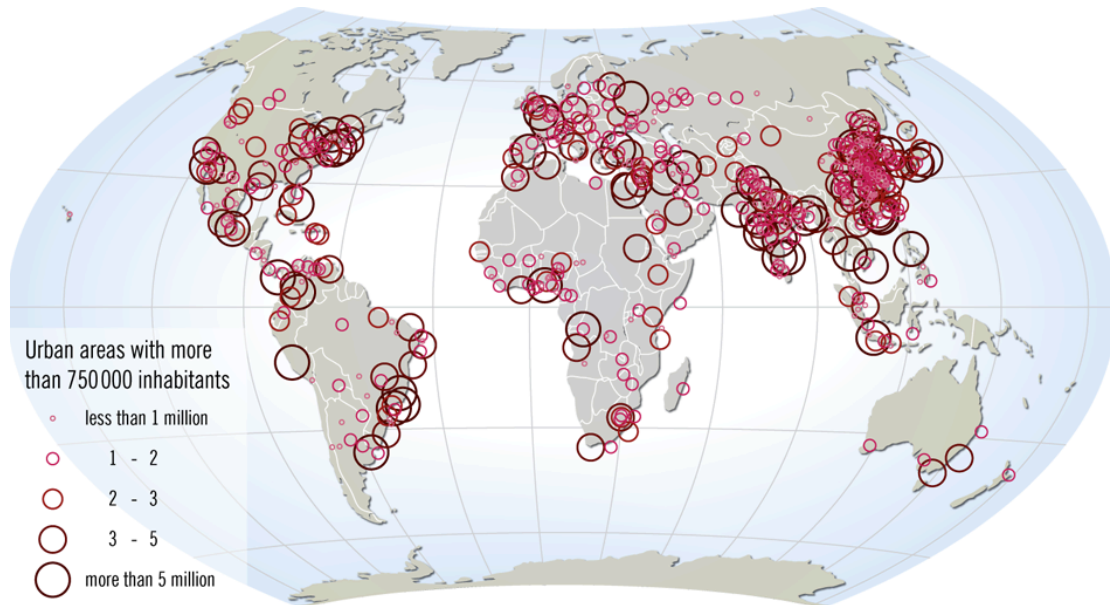
More than 7 billions of people live in this world now and the figure will reach 8 billions in 2025 (World Bank). Half of the world population concentrated in urban area which only counted for 2,8% from total mainland (UNFPA, 2008). By 2030, it was projected that urban population will reach 5 billions and 81 percent of them are in the developing countries. By that time, urban population in Asia and Africa will be doubled than 30 years ago (UNFPA, 2008). In Indonesia, Sarosa (2010) predicted that

¹ Presented in HDCA (Human Development and Capability Association) Conference as poster presentation, Jakarta, September, 5th-7th 2012.

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in 2030, 70 percent of population would live in urban area –compared to 54 percent in 2010 (World Bank). Figure 1 shows the distribution of cities in the world and the density in each city.

Figure 1. The Distribution of Urban Areas in The World in 2005



Source: <http://mappery.com/World-map-of-large-urban-areas-in-2005>

As the center of economic activity, cities have attracted people to come in. Urbanization become natural process as long as the city can give more value added to them. Actually, cities can provide efficient livelihood to human; as people live close to each other, provision of social services e.g. health and education as well as environmental services e.g. water and sanitation become cheaper and accessible in proximity. But the increase of density overtime -often exceeds its carrying capacity- will make impacts on environmental quality which further will decrease quality of life.

Urbanization has made some environmental issues and has made great threat to health and safety in cities. This threat comes from water and air pollution, especially at the household and community levels. Not only from outdoor air pollution, low-income households –especially women and children- also face danger from indoor air pollution which emerge from cooking and heating in poorly-ventilated housing. Waterborne diseases are found most commonly in low-income neighborhoods as a result of inadequate sanitation, drainage and solid waste collection services. Uncollected and improperly handled solid waste can have serious health consequences. They block drainage systems, which eventually cause flooding, and contaminate groundwater at landfill sites (Ichimura, 2003 and Shin et.al., 1997).

In many cities, particularly those in Pacific Island countries, it is difficult to secure land for waste disposal facilities, especially onshore landfill sites. Most cities in the region are also unable to manage the increasing amounts of hazardous wastes generated by rapid industrialization (Ichimura, 2003). Fewer than 60 percent of the

urban population in developing countries has access to adequate sanitation, and only one-third are connected to sewer systems (World Bank, 1991). The inability of many local and municipal governments in developing countries to provide adequate infrastructure and services has led to the degradation of the living and natural environment in and around cities.

The Role of Government, Private Sector and Community

In developing economies, there is necessity of combining the role of state, market and community in building economic system. Economic system is how economic agents coordinate various economic activities to achieve socially optimum condition. The market play role in coordinating the activities of profit seeking individuals through free transactions of private goods. The state is the agent supplying public goods by means of legitimate coercive power. But if the assumption of perfect information is failed to achieve, where as this most probably happen in developing economies, then market and government failure could happen in pervasive (Hayami & Godo, 2005).

Who is actually responsible for protecting the urban environment? Environmental goods can be seen as collective goods, which usually provided by government. But Krueger (1990) mentioned that government, who actually by theory responsible to correct market failure, could get into government failures. These failures are in the context of commission -providing public goods inefficiently-, and in the context of omission -not being able to provide the public goods. In the absence of government action, collective goods will not be provided unless the society takes the action. Because non-exclusivity becomes the inherent characteristic of collective goods, we cannot expect that individual will provide the goods by themselves due to incentive to free ride.

Actually community has the potential to solve collective problem. Community is the agent that guides community members to voluntary cooperation based on close personal ties and mutual trust. Communities discussed here characterized by arm's length relation of locational affinities (Hayami & Godo, 2005). Community as a group can have self-regulation ability to make cooperation and dealing with collective problem that they have faced. As Wade (1987) mentioned that in the management of common-property resources, collective action has become an alternative to privatization or state regulation. Community can play role as the agent who can self-coordinate to solve the problem. The question then, in what condition self-coordination can occur and collective goods will be provided? Social capital is a concept that can explain how self-governance of community can occur. In Indonesia, research on social capital has widely used for several decades in its relation to health (Miller et al., 2006), poverty (Grootaert, 1999), and political process (Qibthiyyah et al., 2011). This study will emphasize whether there is relationship between social capital and collective action to solve environmental problem.

Significance of the Study

Almost every city in the world has challenge to make them livable and sustainable. As government sector cannot do the task alone, the success of managing sustainable city must include contribution from all three stakeholders i.e. government, private sector

and community. The potential of community to involve in solving environmental problems has been greater overtime and to be optimizing this potential, we have to understand well on the behavior of individual as optimizing agent in the context of community action. Understanding what factors contribute in encouraging community to make collective action is very useful for policy maker to consider in what way government can intervene and how can government make policy that can synergize between government and community action. As Cardenas and Ostrom (2004) mentioned that understanding the behavior of community and individual in communities making decisions to solve their common problem and how self-governed solutions can emerge are both crucial to enhance policy analysis. In regard to the role of community, various studies have explored what drives individual participate in collective action and what makes it effective in solving environmental problem they are facing, however studies on the working of collective action related to social capital as factor driving collective action is still rare; especially in the context of collective environmental action. This study can resolve the issue on how community and government can best performed in dealing with environmental protection in urban communities related to their social capital status.

Research Questions and Research Objectives

From background described above, some research question and research objectives are constructed. The aim of this study is to examine the relationship between social capital and collective environmental action. This study also wants to look at household's characteristics that affect collective environmental action. Research question for this study are: (1) Is collective environmental action influenced by social capital level of the community? (2) What are individual, household and community characteristics that affect collective environmental action?

LITERATURE REVIEW

The Concept of Social Capital

Over the past decades, the idea of social capital has been utilized in many empirical social studies. Although the fundamental idea of social capital can be traced back in de Tocqueville ([1840] 1945 as in Ostrom and Ahn, 2003), the term 'social capital' first used in Jane Jacob's classic work in 1961, *The Death and Life of Great American Cities*, where she explained that the dense social networks that existed in older, mixed-use urban neighborhoods constituted a form of *social capital* and were far more responsible for cleanliness, absence of street crime, and other quality of life measures than were formal institutional factors like police protection (Jacobs, 1961). The term social capital again appears in wider use after sociologist James Coleman published his work and political scientist Robert Putnam published his empirical work on declining social capital in America (Coleman, 1988 and Putnam, 1995).

Coleman's work (1988,1990) is about application of rational choice theory to the classical issues of sociology. As neoclassical economics focused on individual behavior and sociologist focused on group behavior, where group norms is the only matter, Coleman concluded that group norms have to be understood as the result of

the purposive action of rational individuals (Frank, 1992).

Social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them (Putnam, 2000). Fukuyama (1997) defined social capital simply as the existence of a certain informal values or norms shared among members of a group that permits cooperation among them.

Values and norms shared have to be a positive one, not like in Southern Italy, where Gambetta (1988) describe how the Mafia colluding to undertake illegal economic activity. He showed that close connection between members of community is not enough to form social capital since trust between members of community is so low. A society of many virtuous but isolated individuals is not necessarily rich in social capital (Putnam, 2000). Social networks will facilitate collective action while institution will set the roles in cooperation (Ahn and Ostrom, 2002).

We can also make the definition become clear especially from economist point of view, by define social capital parallel to other forms of capital, e.g. physical capital and human capital (Lin, 1999). However, in more theoretically oriented studies, there are findings that ambiguity in the concept still exists. The clarity of the definition of social capital can develop better measure of social capital and to design stronger empirical studies to test social capital theories (Ahn & Ostrom, 2002).

All forms of capital involve investments that increase the probability of higher returns from individual and joint efforts over a future period (Ahn & Ostrom, 2002). Social capital associated with investment in social relations with expected returns, in other words; individual engage in interactions and networking in order to produce profits. Action of building social networks by individuals can be explained by four explanations: (1) it facilitates the flow of information; (2) social ties may exert influence on the agents who play critical role in decisions involving the actor; (3) social tie resources, and the acknowledged relationships to the individual, may be conceived by the organization or its agents as certifications of the individual's social credentials, some of which reflect the individual's accessibility to resources through social networks and relations –his/her social capital; and (4) social relations are expected to reinforce identity and recognition. Being assured and recognized of one's worthiness as an individual and a member of a social group sharing similar interests and resources not only provides emotional support but also public acknowledgement of one's claim to certain resources (Lin, 1999).

Glaeser, Laibson, and Sacerdote (2002) analyze individual's decisions to accumulate social capital. Their study has made some conclusions i.e. social capital first rise and then falls with age; social capital declines with expected mobility; social capital rises in occupations with greater return to social skills; social capital is higher among homeowners; social connections fall sharply with physical distance; and people who invest in human capital also invest in social capital.

There are two perspectives emerge in the context of the return or profit from social capital; whether it is obtained for the groups or individuals. The first perspective is focus on how individuals access and use the resources embedded in social networks to gain returns or preserve gains. From this perspective, social capital can be seen as similar to human capital in the context of the investment made by individuals will yield benefits the respective individual. Note that aggregation of individual returns also benefits the collective. Nonetheless, the focal points for analysis in this perspective are (1) how individuals invest in social relations, and (2) how individuals capture the embedded resources in the relations to generate return (Lin, 1999).

Another perspective has its focus on social capital at the group level, with discussions dwelling on (1) how certain groups develop and maintain more or less social capital as collective asset, and (2) how such a collective asset enhances group members' life chances. While acknowledging the essentiality of individuals interacting and networking in developing payoffs of social capital, the central interest of this perspective is to explore the elements and processes in the production and maintenance of the collective asset. For example, dense and closed networks are seen as the means by which collective capital can be maintained and reproduction of the group can be achieved. Another major interest is how norms and trust, as well as other properties (sanction, authority) of a group, are essential in the production and maintenance of the collective asset. Lochner (1999) also pointed out the importance of looking social capital in the context of social, not individual, since social capital is a collective dimension of society external to the individual. Social capital is the feature of the social structure, not of the individual actors within the social structure; it is an ecologic characteristic. In this way, social capital can be distinguished from the concepts of social networks and support, which are attributes of individuals.

Whether social capital is seen from the societal-group level of the relational level, all scholars remain committed to the view that it is the interacting members who make the maintenance and reproduction of this social asset possible. This consensual view puts social capital firmly in the neo-capital theory camp (Lin, 1999).

From definition of social capital by Putnam and Fukuyama, Ahn and Ostrom (2002) pointed out three basic forms of social capital, i.e. trustworthiness, networks and institutions. Putnam (1995) also made emphasis on two important elements of social capital i.e. civic engagement and social trust. This elements used by Keele (2005) who measure social capital and explored the dynamic of social capital in its relation with environmental quality using time series data in national level. Another construction on social capital made by Lochner, Kawachi, and Kennedy (1999) i.e. collective efficacy, psychological sense of community, neighborhood cohesion and community competence. Each of these existing constructs seems to capture some fundamental aspect of social capital. This construction is important in measuring social capital as variable of analysis.

In Indonesia, some studies about social capital and its relation to quality of life has been made. Tampubolon (2007) has made study on social capital and its relation to poverty alleviation. Social capital can be observed as one of the resources available to all rich and poor that can mediate relation, which can lead to improved income distribution. Miller (2006) has done study on the relationship of social capital to

health quality. In the context of measuring social capital at individual level through questionnaire, Bullen and Onyx (1998) developed questionnaire to measure social capital. It has been widely used in measuring social capital at individual level.

Social Capital and Collective Action

The concept of social capital originated in the fields of sociology and political science to explain how citizens within certain communities cooperate with each other to overcome the dilemmas of collective action (Lochner, Kawachi, & Kennedy, 1999). The dilemmas of collective action first introduced by Mancur Olson (1965) in his book *The Logic of Collective Action*, and afterward the use of economic tools in analyzing individual behavior within group is increasing overtime. Collective action problem can describe how a group of people can solve collective problem i.e. provide collective goods that they needed. Theories of collective action describe setting on a group of individuals, a common interest among them, and potential conflict between the common interest and each individual's interest (Ostrom & Ahn, 2003). Olson (1965) argue that without coercion, an individual with self-interest motives is always better off by choosing not to cooperate with others, and more likely to free-ride to enjoy collective benefit at cost of others. This is possible since collective goods have non-excludable property on enjoying it. Similar argument expressed by Hardin (1968) that in the context of exploitation for collective resource (open access resources), individual always tend to have myopic view that he/she would exploit the resource at the maximum until the resource exhaust, which is known by 'the tragedy of the commons'. In the context of public goods provision, this can be described by free-riders problem.

However, Runge (1984) developed assumption that if there is some kind of contract that ties the agents, cooperation will occur. Furthermore, Ostrom (1990) showed that if agents have infinite horizon in looking the ongoing cooperation, then they tend to cooperate. Agents will be aware of making mistakes since the other agent will have opportunity to punish or make revenge. That is why an arm's length (Hayami & Godo, 2005) in community context is important as Olson (1965) argue that small group is an exception for collective action to be possible since in this situation, iterative interaction happened and the possibility of monitoring as well as punishing free-riding behavior may make participation more likely. There are several studies on how collective action can yield an optimal solution for the environment. Ostrom (1990) study on common-pool resource management indicated that collective action by local community would make resource exploitation become more efficient and sustainable in the long run.

Fehr & Fischbacher (2002) described how to put social preference in the context of collective action instead of analyzing collective action in individual context. In this study, it is assumed that individual can be categorized into several types: selfish and conditional cooperators. Conditional cooperators are people who are willing to contribute more to a public good the more others contribute. Conditional cooperation can be considered as a motivation in its own or be a consequence of some fairness preferences like 'altruism', 'warm-glow', 'inequity aversion', or 'reciprocity'. In the study it was shown that a third of the subjects could be classified as free riders, where as 50 percent as conditional cooperators (Fischbacher et. al., 2001). Gould (1993) has developed a clear mathematical model about interdependency on individual decision

to contribute in a collective action problem. In this model, individual responds to the contributions of others because of efficacy concerns and norms of fairness. This assumption likely will have different result from Olson's formulation (1965) which individual as rational egoist will have the optimal solution not to contribute; or become free rider.

Some studies have tried to relate collective action problem with social capital concept. Some keyword for this relation is reciprocity, trust, altruism, conditional cooperation, networks, institutions, social norms and rules. Ahn and Ostrom (2002) have defined such relation by the second generation of collective action.

Second generation of collective action is the development of earlier theory on collective action which framed by the Prisoner's Dilemma game, where in the first-generation theories of collective action is an image of atomized, selfish, and fully rational individuals. The change has been made on the assumption on individual that it was proven in reality and empirical study, mostly in field and laboratory experiment, there is a significant portion of individual that act non-selfish behavior (Ostrom & Ahn, 2003).

Weible (2008) also tried to explain how cooperation might happen. In Olson (1965) argument, individuals made his/her own benefit-cost expectations in order to make choice whether or not to participate in collective action. People are assumed to participate because of selective incentives, that is, if the private benefits exceed the private cost. In this case, usually private cost exceed private benefits, and free-rider problem likely to occur. Weible use Collective Interest Model to explained factor that affect stakeholders' participation in collaborative institution of Marine Protected Areas and tries to overcome this free-rider problem by setting up additional collective interest variables which represent ally efficacy and instrument efficacy.

Community Participation in Environmental Protection & Management

There is some empirical evidence to support the role of communities in providing collective goods. Nam (2010) has shown that community in Mekong Delta River can cooperate together to built bridge that very important to them in supporting their economic and social activity as to increase mobility to outer village. Using field experiment, where villagers given some amount of money, he look at whether the villagers could give some amount of money voluntarily which the sum is enough to built the bridge. In Indonesia, (Pasang, Moore, & Sitorus, 2007) studied on how the role of neighborhood association is very important in succeeding the management of solid waste in Jakarta.

Klyza et.al. (2004) have analyzed how civic engagement can create different forms of social capital through stewardship activities, education and communication, partnerships with other organizations, and alliances with public agencies; and explored how these groups are affecting the policy process. They concluded that the *greening of social capital* is significantly affecting environmental outcomes in the United States. However, concerning civic engagement, Rydin and Pennington (2010) emphasized that to make strategies for encouraging greater public involvement, we have to consider the rationale of participation and the severity of the collective action

problem.

Bowles and Gintis (2000) in their study made relation on social capital and community governance. Communities are part of good governance because they address certain problems that cannot be handled either by individuals acting alone or by markets and governments. Relation of social capital and national environmental performance has empirically proved by Grafton and Knowles (2003) and Pretty and Ward (2001).

Brown and Ashman (1996) in his study made conclusion on cooperation among public agencies, nongovernmental organizations, grassroots groups, and international donors. He mentioned that there are two successful implementation patterns: non-governmental organization (NGO)-mediated cooperation and grassroots-centered cooperation. This conclusion supported idea that social capital has made effect on the effectiveness of the government program.

METHODOLOGY

This study wants to look the relation model between collective environmental action social capital, and several individual, household and community characteristics. As mentioned in literature review, we have found that social capital level affect the effectiveness of collective action (Ahn & Ostrom, 2002). Empirical study by Putnam (1995, 2000) and Keele (2005) pointed two important indicators in social measurement, i.e. trust and civic engagement. In model construction, these two indicators are separated to look at each impact on collective environmental action.

Study on socioeconomic characteristic that affect collective action in relation to environmental protection activity has been broadly discussed in Grazin and Olsen (1991). They identified several individual characteristics from demographic, personal values, environmental knowledge and helping behavior. They have done empirical study on donating, recycling and conservation behaviors and also made valuable compilation from previous study on individual characteristic that affect environmental protection activity. Compilation of studies by Grazin and Olsen (1991) conclude that: (1) older persons are more likely to participate in recycling activity; (2) educational levels have been linked to greater likelihood of participation in environmental protection activity; (3) people with higher incomes are more involved on recycling and energy conservation activities; (4) females are more likely to donate their time to volunteer programs; (5) number of children in a home was negatively related to a person's willingness to pay more for environmental clean up.

Some regional characteristics variables have been added in model building, i.e. type of region (urban or rural) and the severity of environmental problem in the region. The latest is based on consideration of statement from Rydin and Pennington (2010) that to make strategies for encouraging greater public involvement, we have to consider the rationale of participation and the severity of the collective action problem.

Hypotheses

This study will have some hypotheses to be tested. Hypotheses are constructed from the research questions and research objectives mention in background section. In order to test the hypothesis, this study trying to model the problem and by using IFLS data (Indonesia Family Life Survey), try to estimate the relationship on each explanatory variables with the collective environmental action.

Hypotheses for this study are: (with expected sign in the bracket)

- (1) The level of social capital has relationship with collective environmental action (+);
- (2) Individual characteristics that significant in affecting collective environmental action are education (+), gender (female), and age (+);
- (3) Household characteristics that significant in affecting collective environmental action are household income per capita (+) and household member (+); (3) Community characteristics that significant in affecting collective environmental action are type of region (urban), the severity of environmental problem (+).

Model

Based on Ahn & Ostrom (2002), Grazin & Olsen (1991) and Rydin & Pennington (2010), this study developed a model to estimate factors affect collective environmental action. Main components are social capital, individual characteristics, household characteristics and regional characteristics. Social capital consists of social capital variable from 'trust' measurement, and social capital variable from 'civic engagement' measurement. Individual characteristics consist of education level, age, and gender. Household characteristics consist of income per family member, and number of family member. And finally, regional characteristics consist of type of regional (urban or rural) and the severity of environmental problem. From data construction, there are 3 types of local environmental problem: percentage of people who own toilet, sewerage problem and solid waste disposal. The model developed as described below:

$$CEA_i = f(SC_i, IC_i, HC_i, CC_i)$$

Using probit model, then the specification become:

$$\begin{aligned} P(CEA_i = 1|x) = & \Phi(\alpha + \beta_1 SC1_i + \beta_2 SC2_i \\ & + \gamma_1 EDUC_i + \gamma_2 AGE_i + \gamma_3 GENDER_i \\ & + \delta_1 INCOME_i + \delta_2 HHMEMBER_i \\ & + \theta_1 TYPE_i + \theta_2 EP1_i + \theta_3 EP2_i + \theta_4 EP3_i) \end{aligned}$$

Data

This study uses IFLS (Indonesia Family Life Survey) data in estimating the relationship between collective environmental action and social capital. IFLS is an on-going longitudinal survey in Indonesia which represent of about 83% of the

Indonesian population and contains over 30,000 individuals living in 13 of the 27 provinces in the country. From 1993/1994 until 2007/2008 there are four waves of survey, and this study will use cross-sectional data from 4th wave (IFLS4). Data are taken from household survey. Table 1 shows how each variable in the model describe above is defined and measured.

Table 1. Variable Description and Data Coding

Dependent Variable	
CEA_i	<i>Collective environmental action</i> Routine collective action in cleaning neighborhood; 'yes' = 1 and 'no' = 0
Independent Variable	
<i>Individual Characteristics</i>	
$SC1_i$	<p><i>Social capital variable 'trust'</i></p> <ol style="list-style-type: none"> 1. I am willing to help people in this village if they need it. 2. In this village I have to be alert or someone is likely to take advantage of me. 3. Taking into account the diversity of ethnicities in the village, I trust people with same ethnicity as mine more. 4. I would be willing to leave my children with my neighbors for a few hours if I cannot bring my children with along. 5. I would be willing to ask my neighbors to look after their house if I leave for a few days? 6. How safe do you consider this village? 7. In most parts of the village, is it safe for you to walk alone at night? <p>For question 8-10: Say you lost a wallet or a purse that contained Rp. 200.000 and your identity card. I'd like you to think about how likely it is that it will be returned with the money if it were found by someone else.</p> <ol style="list-style-type: none"> 8. Say it was found by someone who lives close by. Is it likely or unlikely that it will be returned to you with the Rp. 200.000? 9. Say it was found by a police officer. Is it likely or unlikely that it will be returned to you with the Rp. 200.000? 10. Say it was found by a complete stranger. Is it likely or unlikely that it will be returned to you with the Rp. 200.000? <p>For questions 1-7, (strongly) agree = 1, (strongly) disagree = 0 For questions 8-10, likely = 1, unlikely OR don't know = 0 Answers are summed, so the value will be between 0 and 10</p>
$SC2_i$	<p><i>Social capital variable 'civic engagement'</i></p> <ol style="list-style-type: none"> 1. Community meeting 2. Cooperative 3. Collective action in cleaning neighborhood (routine) 4. Community facility repairmen program 5. Youth group activities 6. Religious activities 7. Village library 8. Saving and loan program 9. Community health funds 10. Neighborhood security system 11. Drinking water system 12. Solid waste management system 13. Family welfare program (PKK) 14. Family planning - integrated health service program (Posyandu) <p>1=if in his/her community there is such kind of program/activity, and 0=for not knowing OR there is no such kind of program/activity. Answers are summed, so the value will be between 0 and 14</p>
$EDUC_i$	<i>Level of education</i> Length of study in years

AGE_i	<i>Age</i> In years
$GENDER_i$	<i>Gender</i> Male = 1 Female = 0
<i>Household Characteristics</i>	
$INCOME_i$	<i>Income per family member</i> Total income gathered in one household is divided by total number of household member. Income includes labor and non-labor income.
$HHMEMBER_i$	<i>Number of household member</i> Number of household member; including non-family member who are supported by head of household.
<i>Regional Characteristics</i>	
$TYPE_i$	<i>Type of region</i> Urban = 1 Rural = 0
$EP1_i$	<i>The level of severity in environmental problem 1 'own toilet'</i> Own toilet = 1 Not own toilet = 0 Measured as ratio of total individual that own toilet (1) respect to total observation.
$EP2_i$	<i>The level of severity in environmental problem 2 'sewerage problem'</i> Drain its sewage in drainage ditch or permanent pit = 1 Others (to the river, pond, etc) = 0 Measured as ratio of total individual that drains its sewage in drainage ditch or permanent pit (1) respect to total observation.
$EP3_i$	<i>The level of severity in environmental problem 'garbage disposal'</i> Disposed in trash can, collected by sanitation service OR burned = 1 Others (to the river, yard, sea, lake, etc) = 0 Measured as ratio of total individual that disposed garbage in trashcan, collected by sanitation service or burned it (1) respect to total observation.

Estimation Method

Since dependent variable consist of binary data, binary response model will be used. Saphiro-wilk test will be used to determine between probit and logit estimation. Heckman procedure will be conducted to check whether there is sample selection bias since missing data in dependent variable quite large (15023 of 29903 total observations). Total missing data from independent variables are about 850 observations which will be excluded from the observation.

RESULT AND CONCLUSION

Table 2 below shows the result of probit estimation. The decision to use probit estimation rather than logit estimation is based Saphiro-Wilk test for normal data which is significant (not rejecting null hypothesis which is normal data). The result is transformed to probability derivatives. In the case of binary exogenous variables, the change is presented in probability associated with a change from 0 to 1 of the exogenous variables. Log-likelihood also shows that this model is good, with p-value less than 1%. This model has capability in predicting for about 75%.

Result show the model used for collective environmental action, which indicate by a routine collective action in cleaning the neighborhood (*kerja bakti*). The activity usually done in such kind of activity is cleaning drainage from solid waste that blocked the drainage, collecting waste that uncollectable and burn it, etc. From the estimation result, it could be seen that social capital variable, trust and civic engagement have positive impact on the probability of the individual contributing collective environmental action.

All individual characteristics; age, gender and education are shown statistically significant. Age and education have positive relation with the probability of individual in contributing for collective environmental action. Men are significantly more likely than women to contribute in collective action, which are different from the hypothesis.

From household characteristics, household income has negative relation to the probability of individual to contribute. However, household size does not statistically significant. This variable has to be evaluated and in the next study it is better to use number of dependence.

Regional characteristics results show that individual in urban community are more unlikely to contribute in collective environmental action than rural. Intensity of all environmental problems identified seems does not have impact on the probability conducting collective environmental action.

Table 2. Probit model, marginal effects

Dependent Variables: Collective Environmental Action			
Independent Variables	Coefficient	Standard Error	Mean
<i>Social Capital Variables</i>			
Trust	.0115895***	.00284	7.38559
Civic Engagement	.0233667***	.00263	4.59204
<i>Individual Characteristics</i>			
Education	.0036288***	.0011	8.32974
Age	.0020303***	.00028	37.1149
Gender	.4864074***	.00721	1
<i>Household Characteristics</i>			
Income	-1.25e-09*	.00000	3.6e+06
Household Size	-.000937	.00127	6.17216
<i>Regional Characteristics</i>			
Type of Region	-.0501391***	.00898	1
Environmental Problem 1 Own toilet	.0002573	.00027	85.8442
Environmental Problem 2 Drain of sewage	.0000328	.00027	73.3868

Environmental Problem 3 Solid waste disposal	-0.000396	.00025	73.3922
Observations	15021		
Log-Likelihood Value	-8417.0018		
(Pseudo) R-squared	0.1906		
Correctly Classified	74.46%		

Note: * significant at 10%, ** significant at 5%, *** significant at 1%

Table 3. Estimation Result Sign versus Expected Result Sign

Dependent Variable: "Kerja Bakti" Collective Environmental Action	Estimation Result	Hypothesis
Social Capital: Trust	+	+
Social Capital: Civic Engagement	+	+
Education: Year of study	+	+
Age	+	+
Gender (male=1)	male	female
Income	-	+
Household size	Not significant	+
Type of region (urban=1)	rural	urban
Env. Problem 1 (own toilet)	Not significant	+
Env. Problem 2 (drain of sewage)	Not significant	+
Env. Problem 3 (solid waste disposal)	Not significant	+

From result estimation some points should be considered. First, social capital is important to pursue collective environmental action. Second, government should take appropriate policy intervention by considering social capital that embedded in a community in order not to ruin social structure and institution that already exist. The choice is either not intervene self-govern process in the society to solve their own problem or government can take advantage from social capital to support government program for community. Third, as other form of capital, social capital can be depreciated as well as accumulated overtime. To prevent diminishing of social capital and looking at the benefit of social capital, government should think of how to maintain or increase social capital level of society. Can some action i.e. social engineering accumulate social capital?

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