Communication Network Structure in Developing Water-Friendly Behavior in Dense Community

Nurmala K Pandjaitan¹, Megafirmawanti Lasinta²

¹ Department of Communication and Community Development Science, Bogor Agricultural University (IPB), Bogor, Indonesia
² Graduate Student of Agricultural and Rural Development Communication Program, Bogor Agricultural University (IPB), Bogor, Indonesia

E-mail: nurmala_katrina@yahoo.co.id

Abstract. Water is the main element for the survival of human life and other living things. The availability of water is not only the responsibility of the government but also involves the community in its preservation through water-friendly behavior in the community. In fact, many residents have not yet realized the importance of saving water and maintaining water sources around it. One way to improve water-friendly behavior is through a process of communication between citizens in the community. This study aimed to analyze the structure of communication networks among citizens in an effort to build water-friendly behavior in densely populated communities that experience limited water. Primary data was obtained through surveys on 50 respondents who were equipped with qualitative data through interviews. The data were analyzed by the sociometric method and showed that the structure of the communication network in establishing water-friendly behavior was in the form of radial personal networks where the information center in the community was located in certain people. In this structure there are individuals who act as star actors. They are individuals with important positions in the community who act as Chair of RT and Posyandu Cadres. Most of the star in the network are women. The network structure formed also shows the existence of isolated individuals. People who are isolates are individuals who are elderly (above 50 years) with a solid level of activity (trading). They have the opinion that environmental management in the community is only incidental and unsustainable. In addition there are bridges in the network structure, namely individuals who become members in more than one click or group in the community. The process of interaction between individuals in the community in an effort to build water-friendly behavior is mostly done through face to face communication in daily conversations and at formal meetings such as RT meetings and socialization from the government.

Keywords: Community, communication network structure, water-friendly behavior

1. Introduction

Water is one of the important elements for human life. As a non-renewable natural resource, water needs to be maintained and sustainable for current and future generations. Improper use of water by humans can have fatal consequences such as a water crisis and the spread of various diseases. One source of water that must be preserved is the river. In Bogor City, the source of raw water for consumption is obtained from treated river water. This indirectly indicates that the good and bad quality of river water influences the quality of water consumed by community members of Bogor City. Maintaining urban water quality is not merely the duty of the government as a public servant. Community members as one of the entities in the social system have the most important role. The way that community members can do to maintain water quality is to familiarize water-friendly behavior.
Building water-friendly behavior in community members requires a continuous process of communication. This is done so that information on water-friendly behavior that becomes a discourse in implemented communities becomes a real behavior of community members. Thus, an analysis of the communication network structure related to information on water-friendly behavior in the community is important to do. Analysis of communication networks is important to find out who is the most important figure in the community. That way, communication interventions carried out to build sustainable water-friendly behavior are right on target. The structure of the communication network can show the flow of information in the community, who speaks to whom and which individuals have not joined the community communication network.

2. Purpose and Method
The purpose of this study was to determine the structure of communication networks in disseminating information about water-friendly behavior, analyzing the role of the parties or figures in the established network and analyzing the communication channels used by community members in water-friendly behavior communication networks. The method used in this study was sociometry. Primary data was obtained through surveys on 50 respondents who were equipped with qualitative data through interviews. Determination of the sample was used a simple random sampling.

3. Conceptual Framework

3.1. Communication Network Structure
Behavioral interventions through community networks can facilitate the adoption process, especially for complex and socially determined behaviors. Littlejohn and Foss (2012) stated network as social arrangement created by communication between individuals and groups. When individual members in a group communicate, links are formed. The link is the communication path in a group. Rogers (2003) divided the communication network structure into two, namely interlocking personal network and radial personal network. In the interlocking network, each individual connected has a relatively similar background (homophile), has relatively few members and there is strong integration or unity between one individual and another individual. This allows effective communication to affect behavior. Information flow is not diverse because network tends not to be open to external information sources. Radial network generally has a larger size, a smaller level of integration, and has heterophile characteristics and has high diversity, so the information flow becomes richer/more diverse.

3.2. Individual Role in Communication Network
According to Eriyanto (2014), in addition to consisting of actors (node) and link (edge) a network also consists of the following components:

3.2.1 Component. A grouping of actors (nodes) that have at least one link in the network.
3.2.2 Click. A grouping of actors that is more stringent than the component. Click is marked by a complete and maximum relationship between actors.
3.2.3 Bridge. A link (edge/ties) that connects two separate groups in a network. The characteristic of the bridge is that without this link, the two groups will separate into separate components.
3.2.4 Hubs. Refers to actors who have the most connections in the network.
3.2.5 Cutpoint. The actor who becomes the bond of the network, where without the actor's presence the network will be divided. Cutpoint is similar to a bridge that connects actors. The difference between a bridge is a link from two actors while a cutpoint refers to an actor (node).
3.2.6 Isolate. Namely the actor (node) that does not have a single link with other actors in the network.

3.3. Communication channel
Community communication channels in both urban and rural areas are important things to note. Often, an information or innovation that wants to be disseminated to community members does not refer to
channels that are often used by citizens in communicating with other fellow community members. This has become ambiguous and has an impact on the dissemination of information that is not comprehensive to citizens. As a result, information or behavior that is expected to occur cannot be realized. According to Leewis (2009), communication channels for community change can be divided into three types as described in the following table.

Table 1 Comparison of quality functions with the basic forms of interpersonal communication, conventional mass media and hybrid media according to Leewis 2009

| Function                                                                 | Conventional Channel | Interpersonal Channel | Hybrid Channel |
|--------------------------------------------------------------------------|----------------------|-----------------------|---------------|
| Possibility to convey artificial messages (in view of the different potentials between activities) | -                    | +                     | 0             |
| Potential to attract attention                                           | +                    | 0                     | -             |
| Potential to support active learning and decision making                 | -                    | +                     | 0             |
| The possibility of building and using relationships of trust and mutual involvement | -                    | +                     | -             |
| Cost per person achieved                                                 | -                    | +                     | 0             |
| The potential to reach many audiences                                    | +                    | -                     | 0/ - *         |

*Description:*

| a+ | Relatively high (In various contexts) |
|-----|----------------------------------------|
| b0  | Average                                |
| c-  | Relatively low                          |
| d*  | when access to computers is high, the potential to reach a medium audience is many, when access to computers is low, the potential to reach many audiences is low |

3.4. Water-friendly behavior

Behavior is a real action that can be observed. Individual behavior is influenced by the information he receives through the communication process. Water-friendly behavior is one sub in eco-friendly behavior, namely individual efforts to limit actions that damage and endanger the environment (Albayrak et al. 2011). In this study, the water-friendly behaviors analyzed were (1) Reminding family members to save water, (2) Controlling water accounts every month, (3) Limiting the amount of water for bathing, washing dishes and washing clothes, (4) Replacing water faucets damaged ones, (5) Leaving water faucets closed, (6) Utilizing rainwater, (7) Utilizing leftover rice washing water, (8) Using washing machines, (9) Using septic tanks, and (10) Disposing garbage at appropriate place.

4. Results and Discussion

4.1. Communication Network Structure

The network structure formed in connection with efforts to form water-friendly behavior for community members at Pulo Geulis is a radial personal network. Referring to Rogers (2003) radial personal network is a form of network where the information center in the community is only spread to several individuals in the community. The description of the network structure is shown in Figure 1.
Description:

- Information center
- Citizens in the community
- A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P: Opinion leader
- 5, 38, 49: Isolate
- 37, 35, 48, 50: Some of the Bridges

Figure 1 Communication Network Structure in Water-Friendly Behavior

The box is the information center in the community. While the circle is an individual who gets environmental information from the information center. There are 17 information centers (star) in the network. In the concept of environmental communication by Cox and Pezullo (2018) the information center is referred to as a source or party that provides environmental influence. The source of influence in the network above consists of male and female actors but is more dominantly occupied by women (10 out of a total of 17 main actors). Rogers (2003) explained that radial personal network is a network that occurs in large-sized communities, meaning that the number of populations in that community is counted. Pulo Geulis has a total population of 2640 people. This community is one of the densely populated communities located on the banks of the Ciliwung River in Bogor City. This level of density has an impact on the form of network that spreads to several sources of information and is not centred on just one individual.

4.2 Individual role in network

The network structure that is formed in the dissemination of information about water-friendly behaviour in the communities studied shows the existence of a special role that community members have. First is the main actor or star who is the centre of water-friendly behaviour information. There are 17 actors who are sources of influence in the network. Based on survey data and interviews conducted, the star is occupied by individuals who have an important role in the community. The actor who has the most links in the network is actor A which is chosen by as many as 14 individuals in the network. The next actor is actor L who has 13 links. The two actors were leaders in RT 1 and RT 2 in the community. A and L are men aged 42 and 61 years. They are individuals with a wider communication network outside their
community of residence. For example, actor A is active as part of security at one of the companies in Bogor City. In addition, A also joins the forum outside the community where he lives.

The next actors are actors B and H who have 9 links or fewer than the previous actors (A and L). As with A and L, actors B and H also have an important role in the community as Posyandu cadres. B and H are women aged 36 and 48 who are active as traders. Next are the E and K actors who have each of the 5 links in a click on the network. E and K are women and have a role as Posyandu Cadres in the community. Actors other than those mentioned have 3 links, 2 links, and even 1 link in a click. The role of these actors in the community is as posyandu cadres or individuals who have special concern for the environment.

The next role is Bridges. From the network structure formed, there are many bridges that connect between one click and the other click. Or in other words, bridges are individuals who are involved in two groups or click on community communication networks. There are 33 bridges in the communication network that were formed. This further illustrates how the structure of community communication networks is diffuse, not centered on one point. The bridge can stream information from one click to another. This affects the information obtained by each individual member in the community communication network that is relatively the same and not lame.

The last part of the communication network structure that is formed above is isolates or individuals who do not have links to the network. There are three isolated individuals namely individuals 5, 38, and 49. In terms of age, individuals who are isolated from community communication networks are individuals who are old (over 45 years) namely number 5 (female) aged 48 years, number 38 (male) aged 61 years, and number 49 (male) aged 58 years. Individuals number 38 and 49 have activities as traders, this affects the level of information obtained from within the community which tends to be less. On the other hand, individuals number 38 and 49 are individuals who have a special opinion about the community in which they live. According to them, environmental information is not spread evenly in the community due to the inactive management of the RT. Actor 49 in the in-depth interview stated “in here, the information is spread only to those people (the ruling family), the management of the RT is not effective”.

4.3 Communication channel

The communication channel that is often used by community members of the Pulo Geulis community is face to face communication in everyday conversation. Community members often gather with neighbours to discuss many things. Almost all respondents answered that they often gather with fellow community members to just talk. But when the researchers asked about the frequency with which they talked about the issue of water-friendly behavior, on average, they answered that they had never discussed the issue in face to face communication when gathering with other community members. This indicates that the issue of water has not become an important issue for community members. According to some respondents, environmental issues such as water saving or waste management will be talked about when the community is involved in certain environmental competitions or assessments.

In addition to face to face communication through daily conversation, the communication channels in Pulo Geulis are formal channels such as RT meeting and socialization from certain agencies. Community members who often attend formal meetings in the community stated that environmental issues especially waste management are often discussed through the RT meeting. This is in accordance with Jalal's statement as the Chair of RT 02 in the community. “Every time we have a RT meeting, I will always emphasize environmental problems, especially rubbish, especially plastic waste, often going into sewers which eventually become blocked”.

Furthermore, the communication channel in Pulo Geulis is an informal channel such as recitation which is held twice a week. The average respondent claimed to be actively involved in the recitation but had never heard a discussion about environmentally friendly behavior in the recitation they attended. According to Aminah (58 years old), the recitation she attended only emphasized the importance of
community members to get closer to God. “It is separate from the discussion of religion and environment, for religion specifically discussed in recitation and the environment there are channels, especially at RT meeting,” said Jalal (42 years) in the interview conducted.

The description of the communication channel in the community indicates that the issue of water-friendly behavior has not become an important issue in the face to face communication channel through daily conversations and communication through informal channels in the form of recitation. In fact, the two channels are the most often used channels by community members. This requires collaboration between every field so that it does not run separately. The role of informal channels in the form of recitations needs to be maximized in order to discuss environmental issues associated with religious studies. That is, good cooperation is needed between the RT management and religious leaders in the community.

4.4 Water-Friendly Behavior
The main water source for the Pulo Geulis community in their daily activities is the PDAM. The way each individual community treats water in their activities is quite different and diverse. In more detail, a description of the water-friendly behavior of the Pulo Geulis community are:

4.4.1 98% of community members have the awareness to remind their family members to save water. That is, from 50 respondents, only 1 respondent did not do this. Based on the interview conducted, the respondent admitted that did not need to remind the family members because each individual had their own level of awareness regarding water use in the household.

4.4.2 70% of community members always control water accounts every month to be used as control in spending on household water. But the other 30% is just paying off bills in the water account every month. They don't need to control the expenditure of water every month.

4.4.3 58% of community members try to limit the amount of water for bathing, washing dishes and washing clothes. The amount does not have a definite size, but the respondent admitted that he deliberately made enough water for this purpose. The other 42% felt that there was no need to limit water for this purpose in order to get maximum results in every activity.

4.4.4 68% of community members always replace damaged water faucet. But another 32% claimed that they did not always replace damaged faucet. According to them, the faucet does not need to be replaced if only lightly damaged (dripping water in small amounts) because in the end the water from the damaged faucet will also be used for daily needs.

4.4.5 42% of Pulo Geulis community members always leave the water faucet closed but 48% deliberately leave the faucet in a slightly open condition in order to hold water into the bathtub.

4.4.6 62% of community members realize the importance of using rainwater. Rainwater is used for the purpose of washing vehicles, watering plants, and cleaning the terrace and yard. Another 32% thought rainwater did not need to be used because water from the PDAM could meet their needs for water. Rainwater is also considered dirty and will become a nest of mosquitoes if it is accommodated for days. Other respondents also claimed that they could not use rainwater because they did not have adequate storage containers.

4.4.7 46% of community members in Pulo Geulis use the remaining rice washing water for watering plants. As many as 54% of the residents do not use rice washing water because they do not have plants in their yard.

4.4.8 Only 30% of community members use washing machines. This is related to the economic level of the community, which on average are in low and middle-income economies.

4.4.9 32% of community members have used septic tanks but still more community members (68%) dispose of their black water waste directly into river bodies. The reason most often conveyed was due to the hard structure of the land in the Pulo Geulis area, making it difficult to install septic tanks in the homes of the residents. Another reason for the difficulty in installing septic tanks is the relatively high cost of installing septic tanks.

4.4.10 96% of community members have realized the importance of disposing of garbage at the agreed place. In this case, garbage disposal in Pulo Geulis is managed by young people who pick up
household garbage to people's homes and then dispose of the garbage to the polling station closest to Pulo Geulis. Two respondents who still disposed of garbage to the river claimed that dumping garbage into the river felt more practical and easier than having to collect it to officers who picked up garbage every day.

Other data found through the survey also showed that there are no community members (0%) who have biopore holes or water infiltration holes in their yard. The reason for this is because the conditions of the community members' housing are so close together that no more yard can be utilized. In addition, the condition of the roads and yards that have been cemented/asphalt by the government is also the main reason why community members cannot dispose of biopore holes. Based on the description of 10 points of water-friendly behavior above, it can be explained that there are several factors that influence the difficulty of community members in carrying out water-friendly behavior. First; rocky soil structure factors and the high cost of septic tanks installation are the reason why residents still dump toilet waste directly into river bodies. Secondly, the infrastructure which supports water-friendly behavior is not well available, for example; do not have adequate rainwater storage containers so that rainwater is left to flow without being utilized.

5 Conclusion
Based on the results of surveys, interviews and data analysis carried out, the conclusions in this study are:

- The structure of the communication network that is formed in relation to the issue of water-friendly behavior is a spread structure so that a comprehensive approach is needed to the main actors in the network.
- There are individuals who are isolated from community communication networks so that a special approach is needed for these individuals.
- The communication channel used in disseminating the issue of water-friendly behavior has not been carried out optimally. An approach with religious leaders is needed to deliver environmentally friendly messages in the recitation forum that is often held.
- Water-friendly behavior of Pulo Geulis community members is not only influenced by individual factors or human factors, but also closely related to infrastructure management in the form of water-friendly roads.

6 Recommendation

- The government of Bogor city needs to optimize the other communication channels of communities so that information on water-friendly behavior is spread widely to the residents of Pulo Geulis. Examples of channels needed are pamphlets or posters about water-friendly behavior.
- Training is needed to form a professional information sources that have comprehensive knowledge of water-friendly behavior. One house is one source of water-friendly information.

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