Riparian planning in Yogyakarta City

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Abstract. Riparian is a potential for slums in urban areas. The city of Yogyakarta is passed by three rivers namely Code, Gajahwong, and Winongo, crossing the city. Riparian in the three rivers are potential for slum if the area is not well managed. This paper is based on the survey results of the structured interview with the people living in the riparian area in Yogyakarta City. They were 75 respondents from the three riparian. The result shows that several reasons why people prefer to remain living in the area are limited spaces and high land price in the city as well as inherited from their parents. The facts that there are still several problems related to the condition of settlement environment in the riparian, i.e., The condition of densely-populated areas, limited availability of land, and limited public spaces. Efforts that can be done to solve problems related to the riparian planning are anticipating disasters like flood and landslide, paying attention to densely-populated and unwell-planned areas, and handling garbage that has been abandoned into the river. The program expected by those living along both riversides is intended to give priorities on providing some aid for those whose houses are not in good condition, controlling buildings without a permit, and building a dike along the river. Efficiency can be made by making use of the space adequately between the one for settlement and the other one for open-green space for both aesthetic and economic purposes.

1. Introduction

The riparian is a potential for slums in urban areas. It is caused by several reasons, i.e., high population, the short distance between houses and river, people’s misbehavior in discarding garbage into the river, limited well-arranged paths, and susceptibility of the area to flood threat. Three rivers cross the City of Yogyakarta, namely Code River, Gajahwong River, and Winongo River. The riparian area of Code is the most susceptible to flooding, particularly lava flood. The last lava flood took place when Mt. Merapi erupted in 2011. Such flood also once happened some years before 2011, and it caused the settlement on both sides of the river to be affected [1][2]. Since Mt. Merapi is the most active volcano, it is possible that lava flood will happen again in the future. Therefore, several recommendations need to be made to be implemented in the area [3]. They are; 1) the grand design for spatial planning to minimize the society-based disaster risk needs to be made, 2) the technical studies and analysis of disaster risk in an integrated way need to be done, 3) it is necessary to strengthen the society capacity in the spatial planning to minimize the disaster risk, 4) regulations on the implementation of space use and control over the space use in the disaster-susceptible area need to enforced. Thus, further discussion related to the efficiency of space use is of primary importance to be done.

In relation to the settlement in Code Riparian area, there are three rusunawa (flats) that have been built and the people who previously lived in houses on riparian are given priority to move and live in the rusunawa [4]. Those three rusunawa are located closely to one another, less than 1 kilometer far
[4]. They were built not far from the river, an area susceptible to lava flood as a result of the eruption of Mt. Merapi [1]. The three rusunawa were built to help solve the problem of a slum in the riparian area. In relation to the problem of the slum, it can be viewed from the aspect of facilities based on the criteria of slum area set out by the Department of Public Works in 2007 [5]. The condition of most facilities in one of the areas of riparian area belonging to the village of Tegal Panggung is categorized medium-slum [5]. Tegal Panggung is one of the villages in Yogyakarta City which is located in riparian.

On the other side, the riparian planning shows a successful result [6]. One of the areas where the neighborhood used to be considered slum shows a successful result of maintaining the settlement to be a well-managed area [6]. The same case is also found in one of the settlement area belonging to the riparian at Gajah Wong river. The area, also known as a Green Kampong, shows that the management of the area has been well implemented due to the presence of the river-structuring community and the leader of the community [6]. The management of the area shows that self-reliance and creativity of the community can result in clean and beautiful public space and neighborhood [6].

Studies over the problems and the need for the program to help solve the problems need to be done. Therefore, studies over the survey results related to the riparian planning of the three rivers are of primary importance to be done. Several issues on riparian planning that are presented in this paper are related to; 1) people’s home status, 2) the condition of the settlement environment, 3) communities concerned with the riparian planning, 3) the availability of public spaces, 4) arising problems related to the riparian planning, and 5) efforts that need to be done and priorities that need to be given related to the riparian planning.

2. Method
This paper is documenting the part of results of Collecting People Aspiration Survey in Yogyakarta City in 2016, especially for the cases of riparian at Code, Gajahwong, and Winongo Rivers [7]. The results of this survey are used by the Yogyakarta municipal government as one of the inputs in preparing an annual development plan the following year. The analysis used in this research is descriptive quantitative.

In the survey of Collecting People Aspiration of Yogyakarta City in 2016, there were 1000 respondents from 14 sub-districts. There are six issues exposed in the event, i.e., education, health, people-based economy, culture-based tourism, planning for river area, and regional development. This paper focuses on the issue of the planning for river area with 75 respondents, 25 respondents from each riparian. Meanwhile, the number of respondents in each area of the riparian of the respective village can be seen in table 1. The respondents are therefore those living on the riversides of Winongo, Code, and Gajah Wong. The research location can be seen in figure 1. They are taken randomly as purposive sampling, comprising the board members of RW (Rukun Warga/administrative unit at the next-to-lowest level in city), RT (Rukun Tetangga/neighborhood association), PKK (Pendidikan Kesejahteraan Keluarga/program at village level to educate women on various aspects of family welfare), youth figures, common people, and those in charge of maintaining the environment and security. In collecting the data, a structured interview is conducted.
Table 1. Distribution of the Number of Respondents.

| Name of River | Village   | Sub District | Number of Respondents |
|---------------|-----------|--------------|-----------------------|
| Winongo       | Bener     | Tegalrejo    | 5                     |
|               | Bumiyo    | Jetis        | 5                     |
|               | Pringgokusuman | Gedong Tengen | 5             |
|               | Ngampilan | Ngampilan    | 5                     |
|               | Gedongkiwo| Mantrijeron  | 5                     |
| North Code     | Terban    | Gondokusuman | 2                     |
|               | Cokrodiningratan | Jetis | 2     |
|               | Kotabaru  | Gondokusuman | 2                     |
|               | Gowongan  | Jetis        | 2                     |
| Middle Code    | Tegalpangung | Danurejan  | 3                     |
|               | Purwo Kinanti | Pakualaman | 2                 |
|               | Keparakan  | Mergangsan   | 3                     |
| South Code     | Brontokusuman | Mergangsan | 5                     |
|               | Sorosutan  | Umbulharjo   | 4                     |
| Gajahwong      | Rejowinangun | Kotagede   | 10                    |
|               | Prenggan   | Kotagede     | 15                    |
| Total          |           |              | 75                    |
3. Result
The survey results show that the respondents consist of 19 from RT board members, four from RW board members, four from PKK board members, two youth figures, 13 common people, and one from environment and security cadres respectively. The respondents are between 21 and 77 years old. Most respondents are SMA (Sekolah Menengah Atas/Senior High School) leavers (28 respondents). For occupation, most respondents are housewives (27 respondents). Furthermore, in this paper will describe characteristics of the settlement, the condition of settlement environment, communities for structuring river area, the availability of public spaces, problems related to the structuring for the river area, efforts to improve the structuring for the river area and program priority.

3.1. Characteristics of settlement
Based on the survey results, 93% of the respondents reveal that they have been living in the riparian area for more than ten years. Meanwhile, only 7% of the respondent state that they have been living in the area for less than ten years. It shows that some of the citizens of Yogyakarta city have been living around riparian for long. There are several reasons why they prefer to live there. They are, among others, limited space, high land price, and ancestor descent. It is these factors that cause them to find it difficult to move out. 70% of the respondents say that they have possessed a certificate of ownership for their land. Meanwhile, 13% of the respondents say that their land status is Magersari (living on state-owned land), 2% state that they have possessed a letter of HGB (Hak Guna Bangunan/ Building Use Right), and 5% of them are tenants. Figure 2 shows the percentage of the home status of the people living in the riparian area in Yogyakarta city.

![Figure 2. Percentage of houses status of the people living around the riparian area in Yogyakarta City.](image)

3.2. Condition of settlement environment
Based on the survey results, 61% of the respondent state that their settlement area and the river have been well managed. In addition to the role of local people, the city government of Yogyakarta has played an essential role in the success of the structuring of the river and their neighborhood. One of the local people’s roles in the managing of the river and its surrounding area is the establishment of community focusing on maintaining the condition of environment and river. About the problem of settlement area and river management, the main problem is the condition of densely-populated settlement area. In addition, the availability of land and public space that is limited also leads to another crucial problem.

Based on the Mayor’s Decision No. 393 the Year 2014 on the stipulation for the location of an area that should not be used adequately for building houses in the city of Yogyakarta, 3,304 houses are not adequately used for living in [8]. In 2015, the City Government of Yogyakarta recollected the data of the area with dirty settlement and houses that are not adequately used for living in. Based on the result
of datum collection, in the city of Yogyakarta, there is an area with slum of 264.90 hectares and 3,194 houses that are not adequately used for living in [8]. The area with slum and not adequate houses for a living in the city of Yogyakarta is associated with the riparian area; this is Winongo River in the western part, Code River in the central part, and Gajah Wong River in the eastern part of the city. Houses that are closely located to one another and paths that are too narrow are factors leading to creating a densely-populated settlement area, and that slum is inevitable. Several problems related to the structuring of the area around the river are shown in figure 3.

![Figure 3. Percentage of problems related to the planning for the settlement area around the river.](image)

In addition to the problems mentioned above, the people living in the area on both sides of the river also reveal other problems. They are, for example, inadequate infrastructure, too narrow paths, different path race, and sanitation problem. Some of them do not have their sanitation facilities and that they go to the river to take a bath, do the laundry, and have a bowel motion. The respondents claim that any effort that needs to be done to help solve the problems is by establishing excellent cooperation between the local government and the local people in facing the problems related to managing the settlement area, improving people’s awareness, restructuring dirty settlement, and increasing the number of public spaces. Therefore, optimizing the role of the society is of primary importance in solving the problems mentioned above. The involvement of the society in every planning process is still limited, whereas, in fact, they know more about their environmental condition, problems, and situation of the area.

In relation to sewers from household, based on the survey result, 33% of the respondents throw their liquid household waste into the communal IPAL sewers, and 32% of the respondents throw their liquid household waste directly into the river. Meanwhile, 15% throw their liquid household waste into their septic tank, 12% into the sewage system, 6% into the gutter, and 2% into the well. The information mentioned above is shown in figure 4.
Furthermore, for throwing their solid household waste, 71% of the respondents throw their solid household waste onto TPS (Tempat Pembuangan Sampah/garbage-throwing points). Twenty percent of the respondent state that their solid household waste is taken by a garbage picker. In addition, 8% of the respondents send their solid household waste to garbage bank, and 1% burns it. Based on the percentage presented above, it can be said that most of the community in the riparian area have been aware of the importance of throwing their solid household waste to TPS with the help of garbage pickers. This condition shows that the awareness of throwing their garbage onto the right place is high. They are aware because the impact of dumping garbage into the river will lead to siltation of the river, aesthetic damage and the possibility of water rise during the rainy season and that flood is inevitable.

3.3. Communities for structuring river area

Based on the survey result, 61% of the respondents reveal that there are river communities around their area and 39% state that river communities are not found in their area. The communities found there are, among others, Lintas Winongo, FKWA (Forum Komunikasi Winongo Asri/Communication Forum of Winongo Asri), Berskap, Tagama (Tanggap Bencana/Disaster Alertness), Komunitas Dewa Bonto (Dewa Bonto Community), Pemerti Code, Komunitas Sungai Gajah Wong (Gajah Wong River Community, and Mertikali. Those communities are found in the area of those three rivers. The presence of the communities is of primary importance for both the City Government of Yogyakarta and local people since they can become a partner in developing the local potentials and solving any arising problem related to the river.

Fifty-seven percent of the respondents reveal that they are actively participating in the existing communities. Meanwhile, 42% are not. Thus, more people are participating in the communities. It shows that they are becoming aware of the importance to make the river cleaner and more beautiful. Up until now, the communities have undergone various activities. Based on the survey result as shown in Figure 5, 60% of the respondent state that they have been focusing on clearing up the river. It is the result of their awareness of how to keep the river clean, irrespective of more and more garbage thrown into the river. River communities like Merti Kali Code and Code Boyong Muda have even done a regular activity to walk along the river for clearing it up from garbage.
Figure 5. Percentage of Activities Done by River Communities According to the People Living in the Riparian Area in Yogyakarta City.

The presence of these communities is of primary importance since they can strengthen the empowerment and participation of society in developing their area. In relation to this matter, in the area of riversides. The participation of the people should be implemented by empowering local communities [9]. The existing communities need to be coordinated into one formal organization that is supported by the local government [9]. Supports from the government can be in the form of facilitating programs, creating a network, and providing the fund. Meanwhile, other sites like universities, private sectors, NGOs, and the like are also able to play an essential role in strengthening the communities by setting up empowering programs [9].

3.4. The availability of public spaces

The survey result shows that one of the problems related to the settlement area is limited public spaces. However, 72% of the respondents, based on the survey result, claim that there are enough public spaces in their neighborhood and the people there make use of them. Only 28% of them do not use the public spaces. According to the respondents, the public spaces available show that the city government of Yogyakarta has been successful in providing public service for the people. Meanwhile, the public space is mostly used for field, playground, and park as shown in figure 6. The public spaces need to be optimally used in such a way for the sake of the people’s interest.

Figure 6. Percentage of public space use around the riparian area in Yogyakarta City.

3.5. Problems related to the structuring for the river area

Based on the survey results, the majority problems related to the structuring of the river area are river pollution, much garbage dumped into the river, frequent flood and landside. Even though it has been
described previously that most people have adequately thrown their garbage, much garbage thrown into the river is still found, as shown in figure 7. It is possible that the garbage does not come from the people there, but from outside. Based on the survey result of the collecting people aspiration, various problems can be the guidelines for the city government of Yogyakarta in taking measures of the structuring for the river area.

![Figure 7. Percentage of Problems Related to the Structuring of Riparian Area in the City of Yogyakarta.](image)

3.6. Efforts to improve the structuring of the river area and program priority

According to the result of the interview (shown in figure 8) there are three highest efforts to solve the arising problems related to the structuring for the river area i.e. anticipating the flood and landslide threats (21%), paying particular attention to the densely-populated and unwell-arranged neighborhood (19 %), and handling garbage dumped into the river (17 %). Other efforts to improve the structuring of the area on both sides of the rivers in the city of Yogyakarta are providing green open spaces, making more water-absorbing facilities, building flats, solving river pollution, and paying special attention to narrow and broken paths.

![Figure 8. Percentage of efforts to improve the structuring of the river area in the City of Yogyakarta.](image)

In relation to the program priority, the people living around the riversides are expecting the following; giving aids to those whose houses are not adequately used to live in, controlling houses and any other buildings uncompleted with a permit and constructing dikes for the river. Figure 9 shows the percentage of program priority of the structuring for the riparian area in the city of Yogyakarta.
In relation to these motions for program priority, it is necessary to synchronize them with the strategy related to the structuring for the river area based on the earlier study. For example, the result of research conducted in a slum area of the riversides in the sub-district of Sungai Raya, the Regency of Kubu Raya, recommended planning strategy in the structuring for the respective slum area, i.e., planning strategies for the building construction and infrastructure [10]. The handling settlements with waterfront concept can be expected to be one of the solutions that will minimize the risk of flooding. He states that this strategy is efficient, easy to apply and compatible with the environment, and can incorporate into the long-term development program for the city [11]. Therefore, this effort requires consistency of all stakeholders since the participatory approach of stakeholders is a key to the success of the efforts [11].

Evaluating implementation of the program is necessary. The implementation of the Program for Structuring and Renovating Facilities of Settlement in the Riparian Area of Code, especially the area located in the Village of Tegal Panggung, is considered being satisfying enough by the people there [5]. It is shown by the fact that 56% of the people there regarded the program for structuring and renovating the facilities in their neighborhood is an excellent success.

Meanwhile, local wisdom is a critical factor to be considered in the structuring for the river area. Local wisdom is fundamental in planning and designing site so that the space created can improve the quality of the urban environment and enhance the image of the area [12]. The aspect of local wisdom in Spatial Urban Design, which is the combination of the spatial analysis using Geographical Information System (GIS) and site planning is essential [12].

Besides the participation of the local people and local wisdom, it is also necessary to give understanding and knowledge to the local people about the existing plan products related to the space structuring in the riparian. It is referred to the research result at Krueng Aceh river [13]. The result shows that the respondents agree to the structuring for the border of Krueng Aceh river based on RTRW (Rencana Tata Ruang Wilayah/Regional Spatial Plan) of Banda Aceh City years 2009 – 2029 as well as the importance of improving the knowledge of the local people about the space structuring based on the plan. Nevertheless, plan product should be in the form of more detailed spatial plan. In addition, it is also necessary to integrate the risk analysis and spatial distribution of the risk included in the detailed spatial plan considering that the riparian area is an area susceptible to flood threat [1].

It is necessary to require society-based planning to make information, policies, and risk-minimizing program by integrating traditional aspects like the knowledge of the public [14]. The social capital of the river bank of Code has been empowered since 1970 with the active role of community leaders and supported by the regional institutions in achieving a better quality of environment [15]. Evaluation of the program achievement of the infrastructure development in the northern part of Code River related to structuring and rehabilitating slum area consist of water supply, path renovation, and solid waste.

Figure 9. Percentage of program priority of the structuring of riparian area in Yogyakarta City.
The evaluation was involved the local society. The evaluation is focused on the problems before the program was set up, the benefits and impacts of the program, and responses to the program as well. The results show that the program of supplying water and renovating path could be accomplished. Meanwhile, the program of handling solid waste could not be continued.

Considering that those living on the riparian are mostly from low-income people, it is necessary to increase their economic condition to support the better settlement neighborhood. The better neighborhood in floodplain area through improving based economic activities [17].

4. Conclusion and Recommendation

The research results show that the problems found in the riparian area are a high density of population and limited land space. However, the people living in the area have done many things in structuring their neighbourhood. It is shown by their awareness and the presence of several communities in structuring the rivers and their surrounding area. Several steps they have taken are, for example, anticipating flood and landslide threats, giving particular attention to the densely-populated and unwell-arranged settlement, and handling garbage dumped into the river. They do hope to live in the area and that they do not mind being involved in structuring their neighborhood. Therefore, they propose a program to the city government so that it provides some aids for those whose houses are not proper to live in, controls any building which is not allowed (no permit), takes measures in structuring their neighbourhood, and builds river dikes and open green spaces.

Some recommendations resulting from this research and others that have been done previously are related to efficiency, meaning that it can be done by building rusunawa intended to those who previously resided in the area of riversides. Nevertheless, in implementing the recommendation to build a rusunawa, it is necessary to enforce the existing rules. They are, for example; the people should be from the local area (proven by their identity card), they should live in the area no longer than six years, they should be encouraged to have a place of their own to live in after living in the rusunawa for a specified period, and they should have income with the amount in line with the stated requirements [18].

Efficiency can be achieved through the balanced use of land space between the one for settlement and the one for green open space in the form of the park for both environmental beauty and economic purpose. In addition, efficiency can also be achieved by structuring the area with the concept of ecotourism [1] and community innovation. Integrating the economic values that are still possible to push but still based on the aspects of environmental preservation, empowerment of the local people, and sustainability is the key to the success of the program. One of the city government’s steps through Bappeda (Badan Perencanaan Pembangunan Daerah/Regional Development Planning Board) is setting up a plan for developing green open space. An idea to build Code River View is one of the plans [19]. This idea is one of the efforts to make the riparian area at Code River well-arranged and that the economic values can grow through various events of ecotourism and innovation. The same case has been proven successful in the area of both sides of the river in other cities, like the one in the city of Malang. The concept of Kampung 3D and colorful kampung is, in fact, able to increase the economic condition of the local people there and improve the popularity of the kampung in particular and the city in general. Therefore, efficiency in land space use along with added value needs to be realized in its implementation in the context of achieving urban space structuring as one of the viewpoints in managing urban resources for better condition.

Research to the examined public perception of the disasters risk on the socio-cultural and regional environment needs to be done [20]. Some recommendation to the people who live in the high disaster risk area is raising awareness of hazards and the risk of disasters, including education and training, encouraging voluntary work and improving public access to vital information resources [20].

It is essential in the riparian area of Yogyakarta City related to improving public access to vital information resources. It is also will help the community in the area to get some informal education through a training program that can encourage them in increasing valuable social-economic condition.
A requirement to community resilience and to prepare them to cope with disasters is the crucial issues for the future research [20].

The same theme research is also needed to be done in the riparian area of Yogyakarta City. This theme is also an essential thing for the risk area of flood and lahars [21]. In relation to the arrangement of riparian area in Yogyakarta City, several risk reduction programs through adequate land-use planning and early-warning systems supported by education, capacity, and confidence-building efforts are needed, for handling flood and lava flood areas.

In relation to the programs that have been in progress, it is necessary to evaluate them so that the programs stipulated for the next steps are in line with the real needs for better implementation. Inputs and feedbacks from local society are of primary importance for the continuation of the programs and events. They constitute an effort to improve the participation of the local people in development, and that local wisdom can indirectly be accommodated. Thus, by doing so, the development that is implemented matches the real needs of the local people so that efficiency can be achieved from both sides, programs in line with the real needs and the arising problems. In relation to the survey of collecting people aspiration from the local people, it is right as one of the methods and efforts in accommodating aspiration from the local people in development, especially in the structuring for river area.

5. Acknowledgements
The authors would like to thank Bappeda of Yogyakarta City which has given opportunities in handling the Project of Survey of Collecting People Aspiration in the City of Yogyakarta. This paper is a part of the survey results that are rewritten and intended to disseminate the survey results with more analysis by referring to several references and previous research resultant.

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