Study of Physical Arrangement with M3K Concept Based On Element Urban Design in Gemblakan Bawah Village Kota Yogyakarta

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Abstract. The river boundary is a buffer zone between the river and terrestrial aquatic ecosystems. The community's lack understanding of river border functions causes the use of river boundary as residential areas. This condition occurs in the River Code boundary, Yogyakarta. To restore the river border, Pamerti Kali Code (a community engaged in the Code River observer) initiated the concept of M3K (Mundur Munggah Madhep Kali). The physical arrangement of settlements with the M3K concept has been realized in the slum village in Gemblakan Bawah Village located on the banks of the Code River. This village is the 1st segment of 4 segments that are planned for structuring. After the M3K concept was implemented, this village was transformed into a tourist village. In the urban design context, every city must pay attention to element urban design so that the city has clear characteristics. So structuring settlements with M3K needs to be assessed based on the elements of urban design. The purpose of this paper is to identify the application of elements urban design in physical arrangement with the concept of M3K in Kampung Gemblakan Bawah. This research used quantitative methods with quantitative descriptive and frequency distribution analysis. The author obtained data by conducting surveys and questionnaires to 78 families. The analysis was carried out by analyzing the physical condition of the Gemblakan Bawah Village after applying M3K concept based on urban design elements (land use, building and massing, circulation and parking, open space, signage, pedestrian ways, and activity support). The results of the study prove that settlement arrangements with the M3K concept make urban design elements in residential areas increase. Among them are improvements in the form of the regularity of buildings, improvement of river bank circulation into non-motorized lanes as well as new open spaces and the existence of new spaces, support activities in the form of tourism activities that result in improved environmental quality in Gemblakan Bawah Village.

Keywords : urban design, settlement, stream buffer, urban

1. Introduction

Urbanization is one of the external physical factors that influence the development of the city [1]. The urbanization process in urban areas due to the encouragement factors is contained in the social-psychological aspects of immigrants, the attraction factor because of the more attractive business, economic and socio-cultural opportunities compared to the village [2]. Population growth continues to
have spatial consequences, namely the demands of space for housing needs, residential houses or trade and services. The limitation of land causes a high density of buildings with irregular distribution directions which cause pressure on the surrounding area, especially in the riverbank area [3].

Settlements on river banks are dense settlements that occupy land on the river banks that can contaminate the river, which lead to flooding [4]. As a result of the increasing number of people living on rivers banks, rivers lose morphological stability and hydraulic components [5]. So, the arrangement of the waterfront area needs to be done. The arrangement of the riverfront area is related to the physical and non-physical elements of the area, namely the characteristics of the activities. The structuring model of a residential area along the river includes vitalization, revitalization, redevelopment, renewal, intensification of development, rehabilitation of the area, and improvement of environmental quality through improved facilities and infrastructure [5]. Yogyakarta is one of the cities that implements a river bank settlement arrangement model.

Yogyakarta city is divided by 3 rivers, namely the Winongo, Code and Gajahwong, where the majority of the river border areas undergo changes in function to become a cultivation function. Settlements Problems in river banks also occur in the Yogyakarta city. River boundary settlements in the city of Yogyakarta have a variety of different problems, especially in terms of land ownership status. There are two land ownership statuses (legal and sultan ground) in settlements located on the Stream buffer in Yogyakarta city. The people living in the sultan ground area on the stream buffer will find it easier to arrange their settlements compared to the people who have certificates of ownership rights to the land they occupy. This is because the people who live in the sultan ground area will surely obey the Sultan's command to arrange their settlements. Until now the Yogyakarta Palace has a role that remains important in the dynamics of the life of the people of Yogyakarta [6]. The condition of the stream buffer settlement in Yogyakarta city is a unique condition that does not occur in other cities in Indonesia.

The Code River is an undulating river and is located in the central Yogyakarta. Code River area administratively passes 8 (eight) districts and 14 sub-districts. Code River area is part of an urban area in the middle of the urban area of Yogyakarta. River Code is in the middle of Yogyakarta City which is the center of economic, political, social and cultural activities. The stream buffer located in or across the central part of the urban area of Yogyakarta is interesting to study because as an urban area, some of the lands have been used for building construction. This is reinforced by the results of the study of the most dominant types of spatial utilization in stream buffer of Code River is informal settlements(65%) [7].

The Code River problem is like the classic problem of urban settlements on stream buffer, some of the Code dikes are directly adjacent to the back wall of the house [8]. The settlement of the stream buffer Code in the central area of Yogyakarta City has similar characteristics, river boundaries are lost for occupancy, BCR (Building Coverage Ratio) is very high, lack of green space, difficult accessibility and building orientation back to the river. The disordered settlement causes slum [9]. Most of the problems mentioned have occurred in Gemblakan Bawah which fall into the category of slums.

One of the efforts sought to deal with the slum area issue was launched through ‘Mundur Munggah Madhep Kali’ or M3K concept. Mundur means moving away from the river, madhep means the building faces the river munggah increasing the intensity (floor) of the building. Through this concept, stream buffer is expanded according to standards and make the river a front yard to encourage residents to care of the river [10]. The standard width of stream buffer in urban areas is three meters [11]. The application of the M3K concept was carried out since 2014 at several points in the Code River. Applied to the M3K concept, one of the benefits is open space [12].

In the context of design, every city design must pay attention to the existing design elements so that the city has clear characteristics. So structuring settlements with M3K needs to be assessed based on urban design elements. This study aims to identify the application of urban design elements in physical arrangement with the M3K concept in Gemblakan Bawah Village.

2. Methods
The research method used is a quantitative method. Data were obtained through surveys and questionnaires. In determining the research sample the writer using stratified proportional sampling and the research respondents were households in Gemblakan Bawah, and analysis method used was descriptive quantitative.

3. Research Result

This analysis was conducted to identify the application of elements urban design in physical arrangement with the M3K concept in Gemblakan Bawah Village. Aspects that will be studied include land use, building form and mass, circulation and parking, open space, pedestrian area, signage, and activity support.

3.1 Land Use

Land use in Kampung Gemblakan Bawah has settlement functions. The current function is in accordance with the directives in PERDA Yogyakarta No. 1 Tahun 2015, as a residential area. The application of the M3K concept resulted in the width of the stream buffer reaching 3 meters. This condition is in accordance with the rules about the width of the undulating river in urban areas of 3 meters [11]. Visually, settlement arrangement results can be seen through imagery, taking into account the comparison of river border lines (GSS) after the arrangement.

![Strem Buffer Conditions](image)

**Figure 1. Overview of the Conditions of River Border Lines**

The arrangement of stream buffer settlements is done by raising the river embankment and widening the road in the river border. The hope is that when the water discharge on the Code River rises, the water from the Code River no longer inundates the residents' settlements. After structuring, the Gemblakan Bawah Village is no longer experiencing flooding even though the Code River is flooded (Questionnaire Results, 2018). The existence of a wide enough circulation in the river boundary makes the evacuation path easier. At present Gemblakan Bawah Village has flood mitigation efforts. The flood disaster mitigation system includes making safe distances between rivers and settlements, not disposing garbage / or hard objects into rivers, not planting trees in river areas, maintaining and caring for facilities built as a means of prevention and handling of floods. Efforts that have been made in flood mitigation have been synergized between physical development and non-physical development. This synergy is expected to provide optimal results in flood disaster mitigation [13].

The settlement arrangement efforts carried out have been carried out in accordance with the settlement arrangement theory on the banks of the river. Efforts made in structuring settlements on the banks of the River Code have been carried out in stages to free the river border from buildings. The arrangement carried out is in accordance with efforts to control settlements to restore conservation land by Maryono [11]. The theory of structuring riverbank settlements can be implemented in Gemblakan Bawah Village.
3.2 Building and Massing

The settlement arrangement that is applied only affects changes in buildings along the river and some buildings behind it due to budget constraints (Figure 2). The condition of the building is dominated by permanent buildings with a BCR of 100%, the distance between buildings is <1m, and there are no building boundaries. Riverbanks have wide front limits, ranging from 2.5 to 3 meters (increasing from 1 to 1.5 meters from the previous scale). Steps to regulate the layout of buildings from river boundaries can be adjusted to the theory of building layout rules on the road lines in the concept of provision regarding the placement and placement of buildings.

![Delineation of the arranged building](image1)

![Building Condition In-Stream Buffer](image2)

**Figure 2.** Building and Massing in Gemblakan Bawah Village

The arrangement of buildings with M3K is in accordance with the theory of building layout regulation, the arrangement of continuity of building faces along the road, the retreat of the ground floor of the building, the retreat of the corners of the building, but did not carry out the retreat of the top of the building. This is because the results of community consultations that have two-level buildings on the banks of the river do not agree to be supported, ideal conditions for building boundaries cannot be fulfilled. So there is a river border section that is less than 3 meters wide.

After structuring, the facade of the riverbank building is changed. The face of the riverbank building is dominated by buildings that have been plastered. The arrangement of riverbank settlements also affects changes in building functions, namely residential buildings (2nd floor) and stalls (1st floor). However, the addition of building functions did not occur in all buildings affected by the M3K program.

The orientation of the riverbank building is facing the river [14]. The river can be cleaner because the river is used as the front yard of the house. The implementation of the M3K concept results in the regularity of buildings that cause sunlight and wind to enter residential areas so that the residential environment is not humid, comfort, health, and freshness can be felt in homes. All of these changes result in an increase in the visual quality of the environment, and the creation of an impression of relief in balancing building height and building density.

Efforts to rebuild buildings affected by the M3K program were not immediately resolved by the community because of limited funding and personal funds. There was one building that was not completed by the building owner because they thought the entire rebuilding was borne by the government. Based on this fact, it can be indicated that the need for more in-depth socialization by the facilitator team relates to the funding and technical implementation of the program to minimize problems during program execution.

Regarding the conditions of settlements in Gemblakan Bawah which are included in fire-prone areas, currently the village has hydrants as a fire disaster mitigation system i.e. Fire Hydrant Bar - dry. The use of dry hydrants is efficient enough to help outages during fires in densely populated villages.
Gemblakan Bawah village can be accessed through 4 main door points, 3 points are on Jl. Mataram and 1 point are on Jl. Mas Suharto. The three points are on Jl. Mataram has a width of 1 - 2.5 m and can be passed by motorized, while one main point is on Jl. Mas Suharto has a width of 2 m, can only be passed on foot. The width of the Gemblakan Bawah road consists of <1.5 meters and 2 meters. Road pavement in the form of paving, cement, and stone temples are in good condition. Changes in the pavement from paving/cement in some parts of the village road to stone temples have created new problems. The community complained that the change of pavement into stone temples made the village road more slippery. So that if the road is wet due to rain, the community must be more carefully walking or driving on the road that uses temple pavement so as not to slip.

Circulation in the village area does not distinguish between human circulation and vehicles. Based on the description of the circulation of space in the Gemblakan Bawah Village, circulation patterns can be produced. The existing circulation pattern develops in all directions, does not have a center of space, creates a square or rectangular space area. Based on the description of the condition, the circulation pattern of the Gemblakan Bawah Village space is a grid. Environmental management only changes the dimensions and functions of circulation along the stream buffer river and the alley in the village through the road at the stream buffer. The arrangement with the M3K concept resulted in a circulation width on the edge of the river to 2-3 meters and widening the alley into the settlement through a border area almost 1 meter wide. The stream buffer width is in accordance with the stream buffer width standard. Circulation in the border area is only used for pedestrians. One of the efforts made to prevent vehicles from entering the border area of the river is to make different heights between the entrance alley and the road at the river border (Figure 5). After the establishment of the riverbank circulation path as a pedestrian pathway, Gemblakan Bawah Village looks more comfortable.
Villagers parked vehicles along the road around his house because of limited space for parking vehicles. This condition can still be tolerated by the community, even though it results in reduced dimensions of road width. People who live close to the sports field will park their vehicles on the edge of the field and free of charge.

Circulation conditions after the settlement arrangement program is then improved. Circulation of circulation is done by widening the circulation and adding special circulation for pedestrians. Whereas in terms of parking, settlement arrangement only affects the changes in the parking habits of the riverbank community because of the function of pedestrian-specific river bank circulation.

3.4 Open Space

Open space in Gemblakan Bawah Village concerns landscaping; hard elements (hardscape) which include sports fields, pedestrian lanes, circulation paths (linear space) and space/hall of community associations. The sports field in RW 7 has street furniture in the form of lights, seating, and plants with pavement in the form of stone temples. The field in RW 7 is a private field owned by people who are freed in general use to the community. Apart from being used as a sports facility, this field is used as a parking bag for the people who live around the field and also as a socialization space for citizens (Questionnaire Results, 2018).

Based on the provisions of open space regulated in SNI 03-1733-2004 [15], Gemblakan Village must have at least one open space which functions as a sports room and children's playground. The physical arrangement with M3K produces new open spaces in the river border area that are used as a space for interaction between the people who live on the banks of the river and places for organizing community events. In addition, in order to have community space amid limited land, the community elevates the MCK building and utilizes the second floor as a community room. After structuring settlements, open spaces in the river border area make residents feel more comfortable because space is cleaner, more beautiful and green. The addition of children's play space in the new open space makes parents not worried because children no longer play on the river. The wide dimensions of this linear open space are 2-3 m with stone pavement temples which are also equipped with.
Based on the depiction of open space in the Lower Gemblakan Village after structuring with the M3K concept it can be concluded that there are many new open spaces equipped with supporting facilities. The availability of open space is in accordance with SNI 03-1733-2004. New open spaces need more attention to hygiene conditions so that more space is maintained.

3.5 Pedestrian Ways

The arrangement of settlements on the banks of the river produces additional dimensions of the circulation path in the border zone. The addition of dimensions in the circulation path in the border zone is designed to be used as a pedestrian path (3 meters). Regional development plans are directed into the concept of tourism. Current pedestrian elements are pedestrian path elements (temple stone), and pedestrian path support elements (lighting, vegetation, trash cans, and signs).

Pedestrian lanes formed in Gemblakan Bawah not only function as pedestrian circulation paths but also function as a space for social interaction and add to the beauty and comfort of the city. The benefits obtained from the planning and implementation of pedestrian lanes are to foster healthy activities so as to reduce the vulnerability of crime, stimulate various economic activities that can support the development of the region, event promotion/exhibition activities, and can be used for social activities for the village community.

All the people of Gemblakan Bawah Village agreed that riverbank arrangements have made the image of a slum village a healthy village (Questionnaire Results, 2018). The existence of a pedestrian path makes people feel more comfortable, clean and beautiful. As a result, the pedestrian area is often used by the local community as a lounge, meeting room, and children's playroom. Based on these conditions, it can be seen that the planning of pedestrian paths in Kampung Gemblakan Bawah not only emphasizes quality and quantity, but also environmental management [16].

The pedestrian route also managed to attract some visitors from outside the village to take pictures in the pedestrian area. Currently, the street furniture available in the pedestrian area includes gazebos, lighting, benches, plants in pots, trash cans, and spot taking pictures. All road furniture in the pedestrian area can be used and maintained. The arrangement of street furniture, the use of lighting arrangements with a typical atmosphere of pedestrians, has increased the physical value of the area. The results of the implementation of the pedestrian route planning have paid attention to compatibility, the scale of infrastructure material, and dimensions so that pedestrians feel comfortable walking. The development of pedestrian lines along the Code River can have a positive impact on environmental and economic improvements. Pedestrian lanes in the border area of the river can be an alternative destination for tourists visiting the city of Yogyakarta, especially Malioboro.

3.6 Signage
After the arrangement of settlements, the walls of the pedestrian section are decorated with signages that provide educational information to the villagers. Signage was placed on the wall of the building so that it can be classified in the type of wall sign. The nature of signage communication on pedestrian lines is indirect, meaning that the information conveyed has nothing to do with the building where the marker is placed. Signages in pedestrian areas contain educational information such as appeals to love the environment, stay away from drugs, and harmony in life. Design signages along the pedestrian path have been synergized with views of the pedestrian lane. So that pedestrians can feel the match between the marker and the pedestrian path condition. This is in accordance with the design criteria proposed by Lestariningsih [17] regarding the synergy between marker design and the visual area of the city. In addition, mounting markers on pedestrian lines has fulfilled the technical guidelines for mounting signages, ie markers have reflected adequate and regular regional, distance and size characteristics, and markers of harmony with architectural buildings around the location [18].

However, the flood evacuation route marker cannot be clearly seen. The marking of the flood evacuation route is only a sticker that is affixed to the wall or building glass. Marking the flood evacuation route is important to note so that the flood evacuation route needs to be clearly known by villagers and tourists. Given the history of the Lower Gemblakan Village which is prone to flooding from the River Code runoff, the flood evacuation route can be installed along the evacuation route with. Whereas in the river border area a flood evacuation route map can be installed so that information can be read and clearly understood by the village community and tourists.

3.7 Activity Support.

Activity Support in the Gemblakan Bawah Village after making arrangements is a tourist activity. The goal is to be able to have an impact on the economy of the people in Gemblakan Bawah Village. In fact, the economic impact is felt by people who work as traders. This condition is in accordance with the main function of supporting activities, namely moving the function of the main activities of the city to be more alive, continuous, and peaceful [19]. In addition, the arrangement of settlements carried out in Gemblakan Bawah Village attracts many academics/institutions to visit to conduct studies.

Gemblakan Bawah Village provides tourism support facilities such as benches, places to take pictures (selfie locations), and bins. The existence of tourist facilities in the form of places that can be used to take pictures of visitors is used as a way to attract tourists. The decoration of the spot selfie is on the river bank and settlement walls.

4 Conclusion

The results of the study prove that settlement arrangements with the M3K concept make the urban elements of the city experience improvements in quality and quantity. Improving the quality and quantity of urban design elements makes the quality of the village environment better. Improving the quality and quantity of urban design elements includes:

- Creation of river border spaces that are free from buildings
Improving the visual quality of the environment and building security due to the regularity of buildings and fire disaster mitigation

Structuring and widening the circulation of river banks into non-motorized lanes and new open spaces

Increased number of open spaces equipped with children's play facilities

Availability of pedestrian that fosters regional vitality and improves regional identity

Availability of educative markers that reflect regional characteristics and harmony with the architecture of surrounding buildings. However, the design and size of the flood evacuation route markers need to be improved so that they can be read clearly.

The emergence of new activities in the form of tourism activities that provide economic and social impacts. However, the diversity and intensity of supporting activities need to have more attention to attract tourists to come to the Lower Gembelakan Village

References

[1] I. Khambali, *Model Perencanaan Vegetasi Hutan Kota*, 1st ed. Yogyakarta: Andi Publisher, 2017.

[2] B. Martopo, Sugeng & Mitchell, *Bali: balancing environment, economy, and culture*. Australia: University of Waterloo. Department of Geography, 1995.

[3] B. K. Mokodongan, R. L. E. Sela, and H. H. Karongkong, “Identifikasi Pemanfaatan Kawasan Bantaran Sungai Dayanan Di Kotamobagu,” *Sabua*, vol. 6, no. 3, pp. 273–283, 2014.

[4] E. Poedjioetami, “Penataan Ulang Kawasan Bantaran Sungai dengan Menghadirkan Sentra Ekonomi dan Rekreasi Kota: Studi Kasus Kawasan Dinoyo Tenun, Surabaya,” *J. Rekayasa Perenc.*, vol. 4, no. 3, 2008.

[5] D. K. Rahmadi, “Permukiman Bantaran Sungai pdf.” p. 2, 2009.

[6] S. A. H. Al Munawar, “Khasanah Budaya Keraton Yogyakarta II,” 2001.

[7] Y. I. Winarto, “Identifikasi Variasi, Kondisi, Dan Permasalahan Pemanfaatan Ruang Di Sempadan Sungai Code, Kota Yogyakarta,” 2015.

[8] T. A. Fitria, “Revitalisasi Permukiman di Tepi Sungai Dengan Pendekatan Lansekap Berkelanjutan untuk Meningkatkan Kesehatan Lingkungan,” vol. 1, no. 1, pp. 195–197, 2017.

[9] N. Amri, “Karacteristik Lingkungan Permukiman Kumuh Tepian Sungai Kecamatan Kolaka, Sulawesi Tenggara,” *Univ. Hasanuddin*, no. 1927, 2009.

[10] Z. Dzulfia, “Bangun Rumah ‘Madhep Kali’, Cara Warga Yogyakarta Bersahabat dengan Sungai,” Jakarta, 2017.

[11] A. Maryono, *Pengelolaan Kawasan Sempadan Sungai Dengan Pendekatan Integral : Peraturan, Kelembagaan, Tata Ruang, Sosial, Morfologi, Ekologi, Hidrologi, dan Keteknikan*. Yogyakarta: Gadjah Mada University Press, 2014.

[12] Superman, “Mengelola Koridor Sungai,” 2015.

[13] H. Mulyandari, “Upaya pengelolaan lahan bangunan pada bantaran sungai berbasis lingkungan di kabupaten sleman diy,” pp. 31–40, 2011.

[14] Y. A. Birwono Joga, *Bahasa Pohon Selamatkan Bumi*. Jakarta: PT Gramedia Pustaka Utama, 2013.

[15] National Standardization Agency of Indonesia, *SNI 03-1733-2004 about Housing Planning Procedures in Urban Areas (Tata Cara Perencanaan Lingkungan Perumahan di Perkotaan)*, 2004.

[16] J. T. Rochadi, Mochammad Tri, Titien Woro Murtini, Dwi Suci Sri Lestari, “Linkage System,” in *Perencanaan Urban*, Bandung: ITB, 1991.

[17] D. J. Lestariningsih, “PENGARUH SIGNAGE TERHADAP ESTETIKA VISUAL (KORIDOR KOMERSIAL) JALAN AGUS SALIM SEMARANG.” Universitas Diponegoro, Semarang, 2002.

[18] E. Darmawan, *Teori dan Implementasi Perancaang Kota*, I. Semarang: Badan Penerbit
Universitas Diponegoro, 2003.

[19] H. Shirvani, *The Urban Design Process*. New York: Van Nostrand Rainhold Company, 1985.