

RIVER MITIGATION AS A FORM OF ELDERLY- NATURE INTERACTION IN DENSELY POPULATED SETTLEMENT IN YOGYAKARTA

MITIGASI SUNGAI SEBAGAI BENTUK INTERAKSI LANSIA DENGAN ALAM DI PERMUKIMAN PADAT KOTA YOGYAKARTA

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ABSTRACT

High population density has been associated with disease susceptibility. To address this problem many suggest that the negative effects of population density can be reduced by interacting with nature as a restorative activity. This study aims to determine how the elderly in the residential areas on the banks of the Winongo river, Ngampilan District, Yogyakarta City with high population density interact with nature in the riverside environment, and what form of space is needed. This study uses a deductive exploratory method with elderly respondents who are active on the riverbank. The results showed that the riverside space which is used as a space for interaction between the elderly and nature is a room with sitting facilities, walls that are not closed, and shade that is not too tight. Interactions with nature that occur can be in the form of physical restoration, recreation, domestic, and mitigation activities. The activity of seeing water levels as flood mitigation is the most dominant form. Physical limitations make elderly people more aware of disasters along the riverbanks. A space that makes it easier for the elderly to do disaster anticipation activities needs to be prepared for long-term planning.

Keywords: *Elderly-nature; Interaction; River; Mitigation; Yogyakarta.*

ABSTRAK

Kepadatan populasi yang tinggi berkaitan dengan persoalan kerentanan terhadap penyakit. Untuk menjawab persoalan tersebut banyak saran disampaikan bahwa efek negatif kepadatan populasi dapat dikurangi dengan berinteraksi dengan alam sebagai aktivitas restoratif. Penelitian ini bertujuan untuk mengetahui bagaimana lansia di wilayah permukiman tepi sungai Winongo, Kecamatan Ngampilan, Kota Yogyakarta dengan kepadatan penduduk tinggi melakukan interaksi dengan alam di lingkungan tepi sungai, dan bagaimana bentuk ruang yang dibutuhkan. Penelitian ini menggunakan metode

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eksploratif deduktif dengan responden lansia yang beraktivitas di tepi sungai. Hasil penelitian menunjukkan ruang tepian sungai yang digunakan sebagai ruang interaksi lansia dengan alam adalah ruang dengan fasilitas duduk, dinding yang tidak tertutup, dan naungan yang tidak terlalu rapat. Interaksi dengan alam yang terjadi dapat berupa aktivitas restorasi fisik, rekreasi, domestik, dan mitigasi. Aktivitas melihat ketinggian air sebagai mitigasi banjir menjadi bentuk yang paling dominan. Keterbatasan fisik membuat kewaspadaan lansia terhadap bencana di sepanjang bantaran sungai lebih tinggi. Ruang yang memudahkan lansia melakukan kegiatan antisipasi kebencanaan perlu dipersiapkan untuk perencanaan jangka panjang.

Kata Kunci: *Lansia-alam; Interaksi; Sungai; Mitigasi; Yogyakarta.*

INTRODUCTION

High population density can increase disease susceptibility, especially in the elderly. According to Gong et al. (2012) densely populated cities tend to increase stress levels disrupting mental health and well-being. The decline in physical and psychological conditions in the elderly makes the elderly more vulnerable to the negative impacts of high population density, a strategy is needed to reduce the negative impact of high population density, especially for the elderly.

The negative effects of population density can be reduced by interacting with nature as a restorative activity. Creating a natural space as a space for physical and non-physical activities is considered capable of having a positive impact on life, both physically and psychologically. Finlay etc. (2015) revealed that the elderly have a positive impact on physical, mental, and social health in later life from the existence of a green or blue space. Green and blue spaces can also serve as spaces for multi-generational interaction, including pre-planned activities with family and friends, or spontaneous socializing with neighbors.

Natural space which can be an area of interaction between the elderly and nature can occur anywhere, either in the green space

area or in the blue space area. Natural areas in the wild, as well as urban settings such as gardens, parks, and forests, are common features of green space (Van Dillen et al., 2012; Lee and Maheswaran, 2011; Maas et al., 2006). According to White et al (2010) for the aquatic environment of urban and natural areas in the form of water flow or puddles which include rivers, lakes, oceans, and fountain features, it can be termed the blue space.

A description of how the elderly interact with nature, can be divided into two parts, namely the dimensions of exposure and the dimensions of experience. Keniger et al. (2013), which is in line with Rosa, (2019) states that the dimension of exposure is a dimension that states how the elderly can interact with nature intentionally, incidentally, or indirectly, such as through a window. Meanwhile, the interaction experience dimension with nature described by Clayton et al., (2017) is a dimension that provides an overview of how the elderly interact, how to use it, who encourages it, whether it is integrated with other activities, together with other people or alone, and whether to provide impact. In table 1, the experience and exposure dimension points can be seen.

Table 1
Human interaction with nature

Exposure Dimension	
Indirect	(Keniger et al., 2013)
Incidental	(Rosa, 2019)
Deliberate / Direct	(Lumber et al., 2017 ; Giusti et al., 2018)
Dimensions of nature experiences	
Observing or Interacting	(Berns dan Simpson, 2009) (Clayton et al., 2017)
Consumptive or Appreciative	
Self-directed or Other-directed	
Separate or Integrated	
Solitary or Shared	
Positive or Negative	

Source: Keniger et al., (2013); Rosa (2019); Lumber et al., (2017); Giusti et al., (2018) Berns dan Simpson., (2009); Clayton et al., (2017)

Yogyakarta City is one of the cities in Indonesia with a high population density and number of elderly people. The proportion of the elderly population in Indonesia in the *Survei Sosial Ekonomi Nasional* (Susenas) March 2019 data shows during a period of nearly five decades (1971-2019) the number of elderly people has doubled, and the percentage of elderly people reached 9.60% or around 25.64 million people in 2019. The problem of population density coupled with a decrease in physical and psychological health conditions makes the elderly in Yogyakarta City require attention so that they have a good quality of life and avoid the risk of diseases such as depression.

Ngampilan district listed in table 2 is the district with the highest proportion of the population and the high proportion of elderly people. From the results of population density data for the city of Yogyakarta, the Ngampilan sub-district is the area with the highest population density and part of its area is crossed by a river, namely the Winongo River, as shown in figure 1. With geographic conditions and a high population of elderly people, it can be an interesting path related to how the elderly experience the aging-in-place process in a location that is on a riverbank with a high population density.

Table 2
Density and Number of Elderly City of Yogyakarta

	Sub-district	Area size	Population density	Number of Elderly	Percentage of Elderly
			Per sq. km		
1.	Mantrijeron	2,61	12.799	3.448	9,79%
2.	Kraton	1,40	12.554	2.233	10,20%
3.	Mergangsan	2,31	13.275	3.105	9,74%
4.	Umbulharjo	8,12	11.179	5.885	8,62%
5.	Kotagede	3,07	12.070	2.759	8%
6.	Gondokusuman	3,99	11.895	1.662	9,26%
7.	Danurejan	1,10	17.389	1.944	11,09%
8.	Pakualaman	0,63	14.827	1.121	10,49%
9.	Gondomanan	1,12	12.229	1.662	11,09%
10.	Ngampilan	0,82	20.770	1.792	9,63%
11.	Wirobrajan	1,76	14.768	2.603	9,37%
12.	Gedongtengen	0,96	19.154	2.087	10%
13.	Jetis	1,70	14.108	2.755	10%
14.	Tegalrejo	2,91	13.139	3.393	9%
	Total	32,5	13.007		

Source: BPS Kota Yogyakarta, Kota Yogyakarta Dalam Angka 2018.

This study aims to find and understand the relationship between the interaction of the elderly and nature with the physical settings of the riverbank area in the densely populated settlements of the city of Yogyakarta on the banks of the Winongo river.

The method used is the deductive exploratory method. To observe the interaction between the elderly and nature in the riverside area in densely populated Yogyakarta

City, the data collection technique used was field observation and interview. Observation data includes physical data, individual data, and data on the occurrence of the process of interaction between the elderly and nature. Place-centered mapping data was also used to find the tendency for places or areas of river banks that were used as places of interaction.

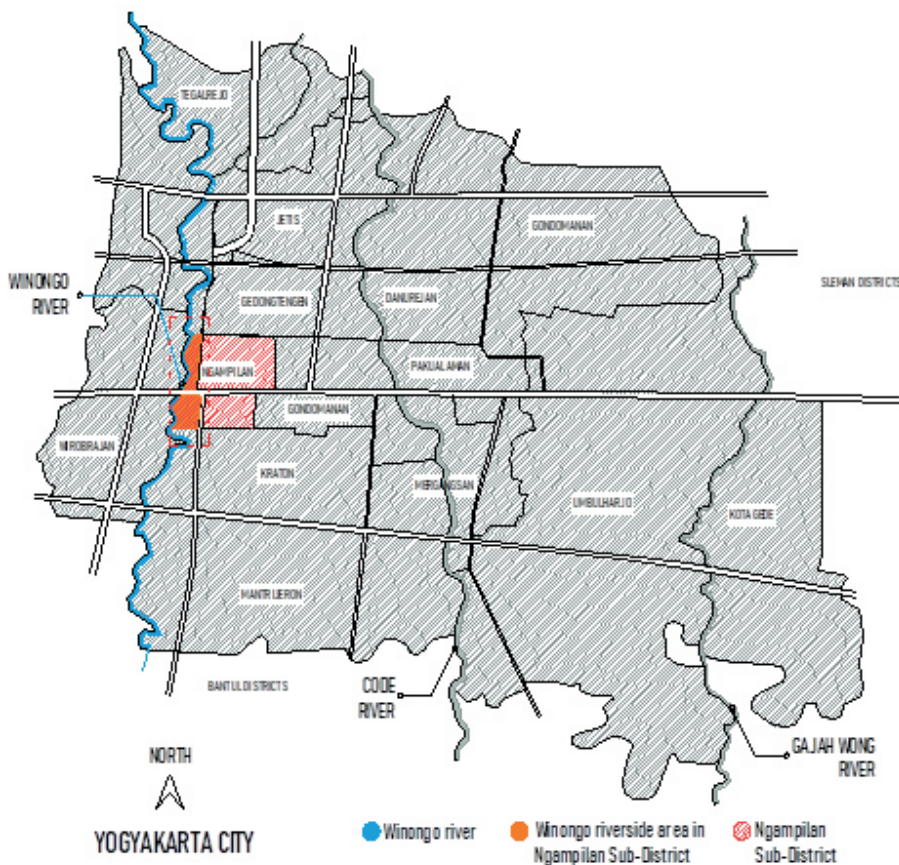


Figure 1
Distribution of sub district and river areas in Yogyakarta City
 Source: Google maps 2019 data processed

The location of this research is on the banks of the Winongo River in Ngampilan. Location selection is under the criteria of a high population density and a high number of elderly populations. The focus of this research is to formulate the concept of interaction between the elderly in dense settlements on the banks of the Winongo River by identifying the physical settings of the interaction space, the patterns of interaction between the elderly and nature, and the influence of spatial differences on the interaction of the elderly with nature in riverbank areas in densely populated settlements of Yogyakarta city.

The respondents of this research are the elderly who have activities in the riverside area. Sampling was done purposively by where the activities of the elderly are. The number of samples taken in this study was based on 10 observations at different times and locations.

This study uses dominant option data and does not use statistical methods in obtaining relationships because the spatial setting data used by the elderly to interact with nature is visual justification data from personal interviews. Data from elderly interviews were dialogued with conditions in the field. The domination of room selection was based on easy access, visibility, and facilities.

DISCUSSION
Physical Condition of the Riverbank

The characteristics of the settlements on the banks of the Winongo river are dense settlement types. this study found the residential on the banks of the Winongo river area have a high level of density, the characters of the buildings that are coincided with each other are often found. The densely populated state needs to be considered because dense-

ly populated cities can increase emotional stress, damage mental health, and well-being (Gong et al., 2012, et al., 2010). Even though it has a high population density, the potential for riverbank blue space is expected to have a positive impact, as stated by Dempsey et al (2018) stated that exposure to blue spaces such as beaches can reduce depression, especially in terms of salutogenic health effects.






The characteristics of the position of the dwelling with the river were found in this study. Through observations, it is known that along the Winongo River there are several types of riverbank areas seen from the components that make up the space between

the dwelling and the river, such as there are houses that are located on the banks of a river but are limited by pedestrian paths and open spaces, dwellings that are located on the sides of embankments, and also dwellings that are on the riverbanks without embankments. By looking at the relationship between the house and the river, this study found it is known that there are five types of riverbanks whose location points can be seen in Figure 2. Variations in the shape of the riverbanks based on the connection with the settlement can be seen in Table 3 and more detail is depicted in the form of physical settings which can be seen in Figures 3, 4, 5, 6, and 7.



Figure 2.
River bank variation by location
Source: personal documentation, 2020.

Table 3
Variations in Riverfront Spatial Areas

Variation	Site Situation
Variation A. Settlement : Alley : Shelter : Embankment : River	
Variation B. Settlement : Alley : Embankment : River	
Variation C Settlement : Yard : River Bank : River	
Variation D Houses : Embankments : Roads : Embankment: River	
Variation E Houses : Embankment : River	

Source: personal documentation, 2020.

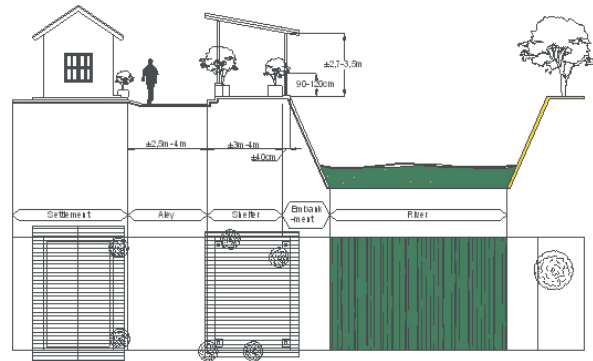


Figure 3.
Physical setting variation A
Source: personal documentation, 2020.

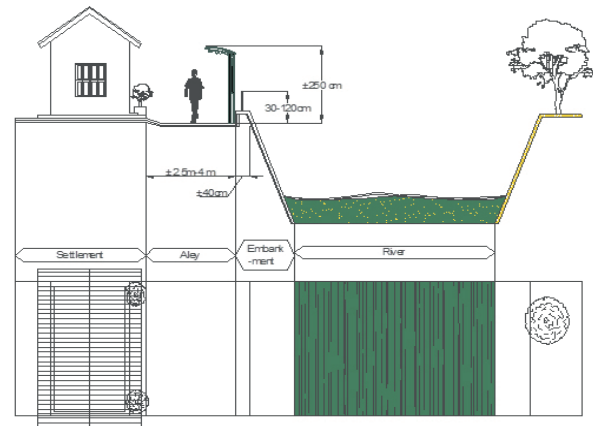


Figure 4.
Physical setting variation B
Source: personal documentation, 2020.

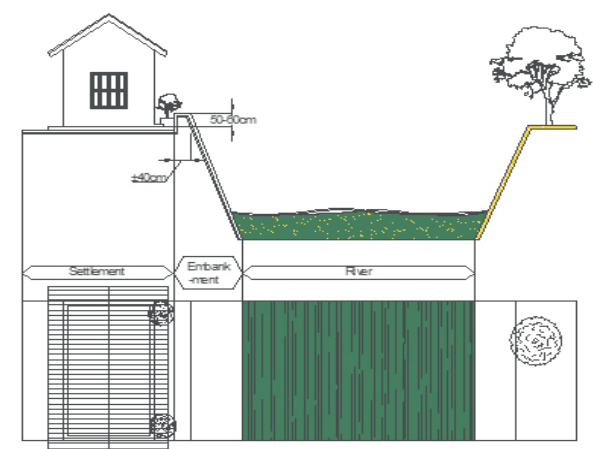


Figure 5.
Physical setting variation C
Source: personal documentation, 2020.

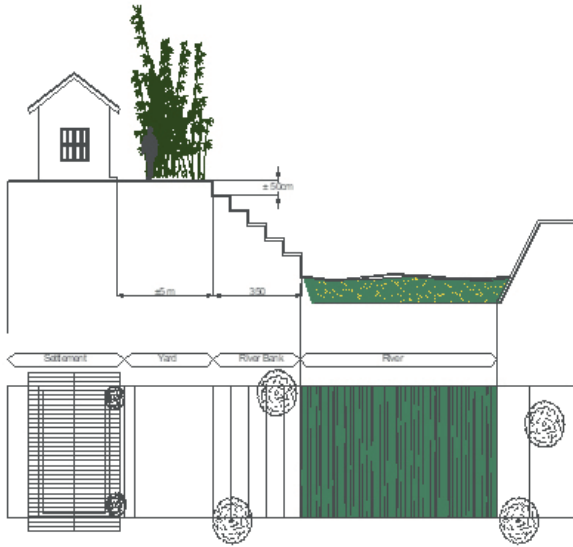


Figure 6.
Physical setting variation D
Source: personal documentation, 2020.



Figure 7.
Physical setting variation E,
Source: personal documentation, 2020.

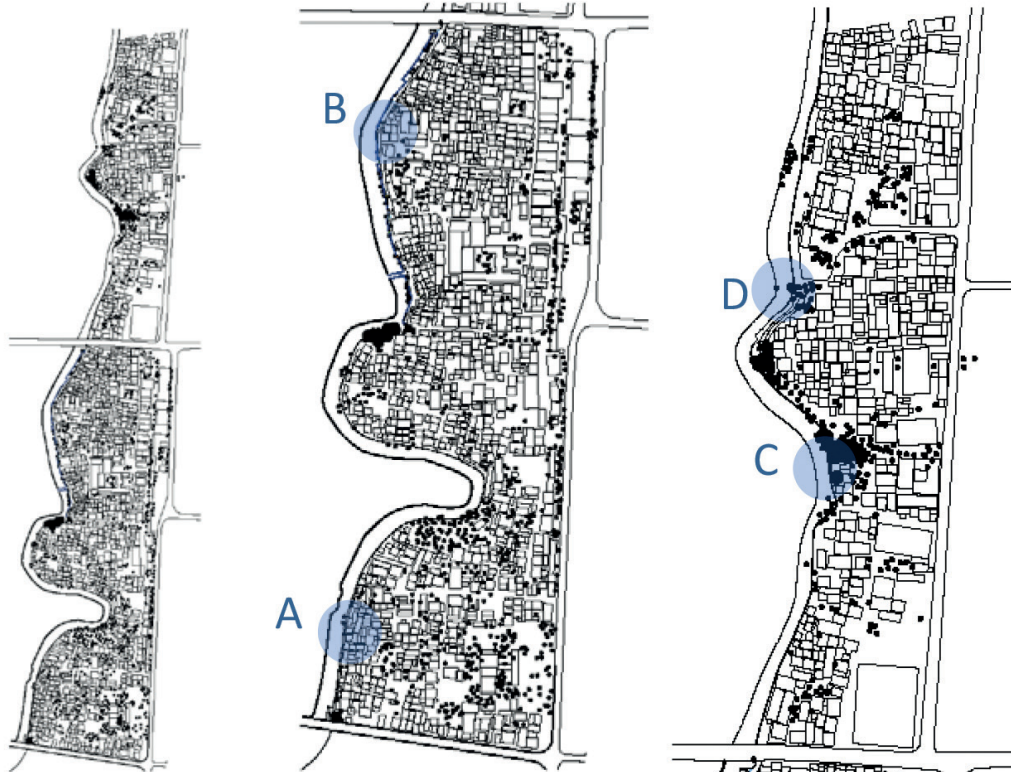


Figure 8
Observation points elderly interactions with nature
Source: personal documentation, 2020.

And through field observations, four location points serve as a space for interaction between the elderly and nature as shown in Figure 8. Through the four observation areas, it is known that observation area number two

is the observation area most often used as a place of interaction between the elderly and nature. In that area, there are two variations of space, namely variation A and variation B, which can be seen in table 4.

Table 4
Spatial variations and intensity of elderly activities in the observation area

Observation Area	Variation A	Variation B	Variation C	Variation D	Variation E
Area 1					
Area 2					
Area 3					
Area 4					

Source: results of data analysis, 2020.

Information:

- There are variations of this, often used by the elderly
- There are variations of this, rarely used by the elderly
- There is no variation on this

Figure 9
Interaction of the elderly with nature
Source: personal documentation, 2020.

Interaction between Elderly and Nature

The interaction that occurs between the elderly and the river can be seen through two dimensions, namely the dimension of exposure (Keniger et al., 2013) and the experience dimension (Clayton et al., 2017) when the elderly are in the riverbank area. The dimension of exposure is an interaction activity that is divided into forms of exposure, namely indirect exposure, incidental or accidental exposure, and accidental or direct exposure.

The elderly go to the riverbank based on various motivations. In table 5, Through interviews with activity actors who visit the banks of the Winongo river, data is obtained related to the objectives of the elderly to access the riverbank, through the answers of the activity actors, the researcher’s interpretation of the respondent’s answers to the activity motivation questions are grouped, the grouping of activity motivation categories is

divided into physical health recovery motivation, recreation, domestic, and mitigation.

Table 5.
Category of Motivation

The answer of the respondents	Category
<ul style="list-style-type: none"> • For health • provide health • healthier when walking • bask for health • healthier body 	Restoration
<ul style="list-style-type: none"> • take a walk with grandchildren • see river bank view • take a walk in the afternoon • see the river • see people fishing • see nature 	Recreation
<ul style="list-style-type: none"> • selling food • drying clothes • drying food 	Domestic
<ul style="list-style-type: none"> • see the water level • see the flood • see the water discharge 	Mitigation

Source: results of data analysis, 2020.

Table 6.
Variation in motivation categories

Variation of a category (VC)	Category of Motivation				Percentage
	Restoration	Recreation	Domestic	Mitigation	
VC1	•	•		•	10%
VC2	•			•	18%
VC3		•		•	10%
VC4			•	•	15%
VC5	•	•			8%
VC6				•	33%
VC7	•				8%
Total					100%

Source: results of data analysis, 2020.

This study found that the motivation of the elderly to do activities by the river can be influenced by more than one motivation at the same time. Some elderly people do activities on the riverbank based on more than one motivation with different individual variations. In table 6, the combination of variations in the motivation category is grouped based on the chance of motivation for each individual to emerge at the same time, so that there are seven variations. From these seven variations, it is known that VC6 is the most dominant variation by 33% and is followed by VC2 18%, VC4 15%, VC1 10%, VC3 10%, VC5 8%, and VC7 8%. When viewed partially, the dominance of activities on the banks of the river is based on the motive to mitigating the river's water level.

The blue space is thought to provide serenity and restoration. In environmental psychology, the effects of positive mood, attractiveness, and perceived restorative abilities can be attributed to aquatic elements in both artificial and natural environments. According to White et al (2010) the sound of water such as waves, and the activity of immersing oneself in water such as bathing or swimming are often considered to provide calm and restore.

Some elderly people come to interact with nature in the riverside area as a means of recreation. Through interviews, it is known that the purpose of the elderly activities on the banks of the river, one of which is as a

recreational activity, either with children, grandchildren, or alone which aims to enjoy the river and see various events that occur in the river area, such as seeing other people fishing, an activity that is often carried out by the elderly on the riverbank is a form of interaction with the natural environment of the river, and also supported by the presence of other individuals to make activities more lively. Recreational activities are a form of appreciative experience and are experienced in nature, which is following the statement of Berns and Simpson (2009) that defines how people experience nature by looking at the types of activities carried out in nature, namely in the form of consumptive, mechanical, and appreciative activities.

Some elderly people come to interact with nature in the riverside area as a means of recreation. Either with children, grandchildren, or alone enjoying the river and seeing various events that occur in the river area, such as seeing other people fishing, is often done by the elderly as a form of interaction with the river and supported by encouragement from other individuals. Berns and Simpson (2009) define the way people experience nature by looking at the types of activities carried out in nature, namely in the form of consumptive, mechanical, and appreciative activities.

Apart from being a place of recreation, the river is also used as an area for restoration or natural relaxation, by seeing the river

directly, the elderly feel a positive impact both for physical health such as sunbathing in the morning on the river bank or mental health which gives a relaxing effect, The impact felt by the elderly is following the statement of Finlay et al (2015) which states that with the existence of green and blue spaces, the elderly feel motivated to exercise and enjoy the fresh air outside the home, and have a significant positive impact on the elderly on physical, mental and social health in the future.

The elderly who directly interact with the river also carry out domestic activities, some sell food, or carry out small production activities. The domestic area, which is a riverside area, allows the elderly to directly interact with the river.

Of the various interactions between the elderly and river nature, mitigation activities are the most dominant activities carried out by the elderly. According to Lee and Maheswaran (2011) state that green space can

also maintain and develop environmental social ties. This statement is corresponding the statements and activities of the elderly on the banks of the Winongo river.

Through field observations, many elderly come to the riverbank area in the morning, afternoon, evening, and even night. after being confirmed by interviews, they carry out these activities to check the riverbank area to examine the riverbank area to determine the level of frequent river water discharge overflowing. since many elderly residences are located on the riverbanks, the elderly interact with the river as a form of mitigation if the water suddenly rises.

Mitigate activities are the most dominant activity because the elderly feel that the level of physical strength of the elderly is not as fast as young individuals, by carrying out early mitigation activities, at least they will get more time to make improvements for shelter and evacuation.

Table 7.
Dimensions of nature experiences

Dimensions of nature experiences		100 % Respondent
Observing or Interacting	Observing	100%
	Interacting	0
Consumptive or Appreciative	Consumptive	15%
	Appreciative	85%
Self-directed or Other-directed	Self-directed	100%
	Other-directed	0%
Separate or Integrated	Separate	70%
	Integrated	30%
Solitary or Shared	Solitary	70%
	Shared	30%
Positive or Negative	Positive	100%
	Negative	0%

Source: results of data analysis, 2020

Examining the experiences carried out by the elderly, consists of six dimensions. These dimensions can be seen from the shape of (1) Interacting or Observing, (2) Appreciative or Consumptive, (3) Self-directed or Other-directed, (4) Separate or Integrated, (5) Solitary or Shared, and (6) Positive or Nega-

tive, which can be seen in table 7 on a scale of the percentage of 100% of respondents who did.

In the first dimension between observing or interacting with the elderly tend to do the process of observing, rarely do the elderly do the process of direct interaction with the

river, from the perspective of consumptive or appreciative for the elderly tends to be appreciative, there are no consumptive activities carried out by the elderly in the area of the Winongo river bank. The elderly who interact with the river tend to be based on their direction without being forced by others, the tendency of the elderly to do activities to interact with nature on the riverbank is due to their motives so that personal awareness is the most dominant thing. Elderly people interact with nature directly on the banks of the river, this provides a positive value for the elderly, according to the statements of Lumber et al (2017) and Giusti et al (2018) the best way for humans to connect with nature is to make direct contact with nature and the aesthetic environment on purpose by using various senses.

The interaction activities of the elderly with nature on the riverbank from the side of integration with their daily activities tend to follow the workspace of the elderly. The dominance of the elderly who are on the banks of the Winongo river tends not to work, but some are still actively selling in the riverside area which is directly integrated with the activities of interacting with the river.

In terms of the role of other individuals, it can also be an experience of the elderly in process of interacting with nature, in the area of the Winongo river, many elderly people interact with nature because they are related to recreational needs with their grandchildren or want to interact with other people. From the impact dimension, it is also known that the elderly predominantly feel a positive impact.

In terms of intensity, the elderly tend to interact with nature on the riverbank in the Winongo riverbank area every day. In the research of Finlay et al. (2015) natural space can offer mental well-being, natural experiences also trigger feelings of renewal, restoration, and spiritual connection. In the morning, the elderly start between 5 a.m. to 9 a.m. Every day in the morning many elderly people do sunbathing activities, the cognition the elderly consciously invites them to do activities

in open areas to do the sunbathing process, many use the riverbank area as a place sunbathing, when they do sunbathe, the elderly also observe the river as a form of interaction with the river.

Meanwhile, during the day, the elderly who interact with nature tend to sell in the riverbank area, for the elderly who sell tend to use the morning, afternoon, and evening in their workspace which is on the river bank. And another time that the elderly often enjoy interacting with nature is in the afternoon, from 4 pm to 6 pm. In the afternoon, we can see elderly people going out chatting with other people, playing with their grandchildren, and watching the river.

Perceptively they feel the positive impact of the activities they carry out, and this is very consistent with the statement of Finlay et al. (2015) positive impacts on the elderly for physical, mental, and social health can be obtained from experiences in green or blue spaces.

The spatial domination data used by the elderly to interact with nature becomes an instrument to see the relationship between activities and the space settings used. The space that is often used by the elderly to interact with nature is a space where accessibility and visibility can be reached by the elderly. Rapoport (1997) in Haryadi and Setiawan (2010) says that setting is an interaction between humans and their environment. Settings include the environment in which the community resides (land, water, space, air, air, scenery) and the living things (animals, plants, humans). The space that is often used in the process of interaction between the elderly and the river is the closest space from the elderly's house, limited affordability is the reason 75% of the elderly in the area on the banks of the Winongo River only look for the closest spot with a distance of 10 meters to 40 meters from their residential position.

For the room with the highest visibility, the elderly are often used to carry out the interaction process between the elderly and the river. Ching (2000) stated that in forming a space, it is necessary to pay attention to the

degree of the enclosure which will affect the quality of the designed space. The openness of space is needed by the elderly in interacting with nature, through the observation that the height of the embankment which is more than 120 cm is rarely used by the elderly to carry out the interaction process, the elderly tend to look for riverbank areas that have an embankment with a height of not more than 120 cm, in addition to visibility height, the height of the embankment is even lower, between 50 cm to 70 cm. It can also be used as a sitting area for the elderly so it is more often used as an area of interaction between the elderly and the river.

In some areas that are facilitated with busy play and seating areas, the elderly are not often used. According to Laurens (2004), humans perceive the surrounding space complete with its contents and do not stand alone, a person's tendency to make a certain distance between himself and others is largely determined by the quality of the relationships between the people concerned. Sommer (1969) also states that personal space is not absolute or can change and move, it can be said that personal space is a territory that always follows wherever someone is. On the banks of the Winongo River, some points are rarely used by the elderly to interact with nature, namely areas that are filled with small children and teenagers, such as spaces that are facilitated with playgrounds. The comfort of space that arises from the security side when walking or doing activities is the reason for the elderly to choose a more loose area to make them feel more comfortable and safe.

CONCLUSION

Population density and the threat of flood overflow on the banks of the Winongo river are a challenge for the elderly to survive in the riverbank environment. The dominance of elderly activities on river banks is based on the need to know the condition of river water discharge, this activity is considered as a form of anticipation due to early flooding that can threaten at any time. Apart

from being a form of anticipation, interacting with the riverbank environment can provide recreational benefits that have an impact on psychological conditions. Physical health needs and economic needs can also be integrated with interaction activities with nature on the riverbanks with not too high dominance.

Experiencing activities of the elderly are observing, appreciating nature, based on personal direction, some are integrated with other activities, generally with the support of others, and their activities are considered to have a positive impact. With the interaction activity with nature, the need for affordable space characteristics, easy access to space, high openness of space, having seating facilities, and having physical security are very necessary. The existence of other individuals in the adult category is also considered a necessity, while the category of the complexity of young children playing can be considered a threat related to personal space.

The domination of the space on the banks of the Winongo river has been able to facilitate the activities of the elderly's interactions with nature, but some activities occur in spaces with facilities that have not been prepared so that there is an adaptation of the function of the facility. There needs to be attention from related parties in fulfilling river bank environmental facilities to provide a better experience of interaction with nature, especially for the elderly.

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