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The factors that cause the breach of spatial utilization on the Cikapundung River border, Bandung City

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Abstract. The rapid development in Bandung city causes the existence of river borders is being pushed aside by other uses. Space utilization on the river border should be used as a buffer zone for the river, but on the Cikapundung River Border has changed to built-up area. This research aims to examine the factors that cause the breach of spatial utilization on the Cikapundung River Border. Based on literature studies, there are 9 variables, namely Institution of Spatial Utilization Control; Instrument of Spatial Utilization Control; Socialization and Information Publication to the Community; Community Participation; Community Understanding; Citizen's awareness; Economic Factors; Legal Compliance; and Law Enforcement. The research uses quantitative method with factor analysis techniques using KMO and Bartlett's Test. The sampling technique in the research used simple random sampling. Primary data collection techniques use questionnaires and interviews, while obtaining secondary data is through document review. The analysis data assessment was carried out using a Likert scale. The analysis result show that the independent variables significantly contribute to the dependent variable (The Breach Of Spatial Utilization). The research results show that the nine variables can be form into 3 new factors, namely Economy and Law Factors; Community Education Factors; and Community Involvement in Controlling Space Utilization Factors.

1. Introduction

The existence of rivers has an important role for human life and also nature. Rivers has function as a city service system and environmental carrying capacity [1]. The main problems of rivers in metropolis often occur at river borders caused by interference from human activities. The characteristics of urban areas where the rate of development is so fast, means that need for space is increasing. As a result, the river border, which should have been designated as a buffer area for the river, is now being pushed aside by other uses.

The Cikapundung River is a tributary of the Citarum River which divides Bandung City through 16 sub-districts and 7 sub-districts in Bandung City. This river has a vital role in the lives of the surrounding community and the development of the city of Bandung, because this river is used by the community for drainage, as a tourist attraction and as a provider of raw water. Considering the importance of the Cikapundung River Area, the Bandung City Regional Spatial Planning stipulates that this area is one of the City's Strategic Areas which has strategic value from the point of view of the environmental carrying capacity function.

Along with the development of the City of Bandung, changes in the face of the Cikapundung River are a reflection of the changes occurring in the City of Bandung [2]. The Cikapundung River is usually used for drinking water (PDAM Dago Pakar and PDAM Badak Singa), hydroelectric power (Ahli and Cilengkung), flushing and irrigation [3]. With the number of activities and water uses in the Cikapundung watershed continuing to increase over time, this will affect the quantity and quality of the Cikapundung River water.

In terms of quantity, due to the influence of climate change and land conversion, water discharge can become extreme (change in flow character) so that the threat of flooding and drought increases, which has an impact on the degradation of the function of water resource infrastructure [4]. Apart from that, the Cikapundung River is a type of river that has a very high bank erosion rate, high sediment supply, moderate to steep channel slope, low channel width ratio, high sediment supply, high bed load, and a very high dissolved sediment rate so that it has the potential to cause flooding in the area. surrounding area [5]. Especially in densely populated areas where even river borders are used as settlements. River water can overflow into residential areas if the Cikapundung River's water discharge exceeds its capacity.

It is recorded that there are 1,058 houses located along the Cikapundung River Border which are included in the administrative area of Bandung City [6]. These settlements are clearly a form of violation of space use against the spatial planning that has been determined. This has an impact on river ecology which can even cause disasters that threaten human safety.

Besides that, the pollution in the Cikapundung River to be very worrying. The Cikapundung River, which was originally a source of life for the local community, has now become murky and full of rubbish [7]. The Cikapundung River was recorded as having a heavily polluted status in 2015. However, a year later the river's pollution status decreased to moderately polluted in the dry months and lightly polluted in the wet months [8]. The majority of causes of river pollution in Bandung City come from domestic waste produced by the bathing, washing and toilet (MCK) activities of residents living around the river. Other causes can come from the industrial, agricultural and livestock sectors.

A river basin is a complex system consisting of physical systems, biological systems and human systems which are interconnected and interact with each other. Each component in the system/sub-system has unique properties and its existence is related to other components to form a unified ecological system (ecosystem). Thus, if there is a disturbance or imbalance in one component, it will have a chain impact on the other components [9]. Therefore, violations of space use on river borders need to be addressed so that they do not impact other components. Identifying the factors that cause it is the first step to help in handling environmental problems around the Cikapundung River.

2. Method

The method used in this research is a quantitative method. The research was carried out by obtaining data from the results of questionnaires conducted on people living on the Cikapundung River Border and interviews with related agencies, as well as secondary data and literature. The sampling technique used in this research is Simple Random Sampling. This sampling technique is like a lottery technique and can be used by anyone who is a sample from a survey of a population [10]. The population in this study is the number of community families (KK) on the Cikapundung River border, namely 2104 KK. From this population and with a margin of error of 10%, the number of samples taken was 100 samples. The variables studied are the factors that cause space utilization violations which include Institution of Spatial Utilization Control (X1), Instrument of Spatial Utilization Control (X2), Socialization and Information Publication to the Community (X3), Community Participation (X4), Community Understanding (X5), Public Awareness (X6), Economic Factors (X7), Legal Compliance (X8), and Law Enforcement (X9).

Weighting to analyze the factors that cause violations of space use on river borders is carried out using a Likert scale. The Likert scale is used to measure the attitudes, opinions and perceptions of a person or group of people so as to get the right answer for the social phenomenon being studied [11]. Statements of attitudes, opinions and perceptions consist of two types of statements, namely [12]:

1. Favorable statements, which are statements that are positive (support) aspects of the variable.
2. Unfavorable statement, which is a negative statement (does not support) aspects of the variable.

Research subjects responded with five categories and the scoring for each category was described as follows:

Table 1. Scale Rating Weighting Likert

No.	Category	Mark	
		Favorable statement	Unfavorable statement
1	Strongly Agree (SS)	5	1
2	Agree (S)	4	2
3	Disagree (KS)	3	3
4	Disagree (TS)	2	4
5	Strongly Disagree (STS)	1	5

The analysis technique used is factor analysis using the Barlet Test of Sphericity and KMO MSA (Keiser Meyer Olkin Measure of Sample Adequacy).Factor analysis is an analysis used to reduce data or in other words summarize or group data or variables into smaller numbers [13]. Kaiser Meyer Olkin Measure of Sampling (KMO) is an index comparing the distance between the correlation coefficient and the partial correlation coefficient [14]. Meanwhile, the Bartlett Test of Sphericity is used to test the hypothesis that variables are not correlated with each other in the population [15].

3. Result And Discussion

3.1 Cikapundung River

The Cikapundung River is one of 13 main tributaries that supplies water to the Citarum River. The conditions and problems of the Cikapundung River from upstream to downstream can be explained as follows:

a. Upstream of the Cikapundung River

The upstream area of the Cikapundung River is still a protected forest and water springs. Problems that occur in upstream areas include changes in land use and disposal of livestock waste [16].

b. Middle part of the Cikapundung River

The middle part of the Cikapundung River covers the Cikapundung Gandok and Cikapundung Pasir Luyu areas. Based on data from the Bandung City regional development base in 2016, around 12,728.5 hectares or 75.95% of the administrative area of Bandung City is built-up land (buildings and settlements). With such a dense area, one of the problems that arises is waste management.

c. Downstream of the Cikapundung River

The lower reaches of the Cikapundung River are dominated by housing and the textile industry. Some of them treat their waste water using waste water treatment plants, but the rest is discharged directly into the river. The downstream area of the Cikapundung River is also an area prone to flooding because geographically or naturally it is a water habitat area [17] and this condition is increasingly exacerbated by widespread changes in land use which have an impact on increasing runoff flowing into rivers.

3.2 Directions for Utilizing Space at River Borders

The scope of a city and its continuously developing nature are also accompanied by the dynamics of development within it. In general, this development talks a lot about spatial aspects and the development of city infrastructure systems [18]. This development will always be accompanied by increased exploitation of space and water resources. Therefore, protection of water resources, especially rivers, must be a priority in spatial planning in a region. Rivers as flow-carrying systems from watersheds require adequate space to carry out their functions well. Regional development often causes the boundaries between rivers, residential areas and other uses to increasingly shift towards the river [19]. In the context of efforts to protect, use and control the resources found in rivers, the use of river border areas can only be utilized on a limited basis for:

1. water resources infrastructure buildings;
2. bridge and dock facilities;
3. gas and drinking water pipelines;
4. stretches of electricity and telecommunications cables;
5. Other activities as long as they do not interfere with river function include planting vegetables; And
6. electricity buildings [20].

The Bandung City Government also regulates the use of space on "Peraturan Daerah Kota Bandung Nomor 18 Tahun 2011 tentang Rencana Tata Ruang Wilayah Kota Bandung Tahun 2011-2031". In this regulation, river borders are included in Local Protection Areas, where construction of buildings is not permitted on river borders which are limited by the outline of the border area [21]. This is because Local Protection Areas are part of Protected Areas which function as protection for a life support system to regulate water management, prevent disasters such as floods and landslides, control erosion and maintain soil fertility.

3.3 Determination of River Boundary Lines

River border lines are virtual lines on the left and right of the riverbed which are designated as river protection boundaries [22]. The determination of river border lines is intended as an effort so that activities to protect, use and control existing resources in rivers can be carried out in accordance with their objectives. The objectives of determining river borders are:

a. Maintain the function of the river so that it is not disturbed by activities developing around it,
b. Increasing the beneficial value of resources in the river and preserving the function of the river,
c. Limiting the destructive power of river water on the environment.

The distance provisions for determining river border lines vary according to conditions, namely:

1. Boundary lines on undamped rivers within urban areas are determined to be at least:
   a. 10 meters from the left and right banks of the riverbed along the river channel, for rivers with a depth of ≤ 3 meters;
   b. 15 meters from the left and right edges of the riverbed along the river channel, for rivers with a depth of 3 meters to 20 meters; And
   c. 30 meters from the left and right banks of the riverbed along the river channel, for rivers that are > 20 meters deep.
2. Boundary lines on unlevered rivers outside urban areas are determined to be at least:
   a. 100 meters from the left and right banks of the riverbed along the river channel, for large rivers with a river basin area > 500 km2; And
   b. 50 meters from the left and right banks of the riverbed along the river channel, for small rivers with a river basin area of ≤ 500 km2.
3. The river border line with embankments in urban areas is determined to be at least 3 meters from the outer edge of the embankment along the river channel.
4. The river border line with embankments outside urban areas is determined to be at least 5 meters from the outer edge of the embankment along the river channel.
5. Determining river border lines that are affected by sea tides is carried out in the same way as determining river border lines above which are measured from the edge of the average high tide level.

3.4 Space Utilization Violations and the Causative Factors

The criteria for violations of space utilization can be [23]:

1. Utilizing space with a space utilization permit in a location that is not in accordance with its intended purpose.
2. Utilizing space without permission to use space in locations appropriate its designation in cross-district/city areas.
3. Utilizing space without permission to use space in a location that is not in accordance with its intended purpose.
4. changes to part or all of the land function.
5. Prevent access to areas declared by law as public property.
6. Violates predetermined boundaries.

7. Violates the specified building floor coefficient provisions.
8. Violates the provisions on the basic building coefficient and green basic coefficient.
9. Make changes to part or all of the building function.
10. Not providing social facilities or public facilities in accordance with the requirements of the space utilization permit.

Regarding the causes of violations of space utilization, according to Eko Budiharjo, one indicator of violations of spatial planning is weak mechanisms for controlling space use [24]. A good urban spatial planning product may not necessarily produce good spatial planning if it is not supported by a clear development control and supervision mechanism. In line with this, in previous research conducted by Bayu Arief Triyanto, the factors that influence the occurrence of space utilization violations were categorized into five, namely Space Utilization Control institutions, Space Utilization Control instruments, Space Utilization Control activities, socialization and delivery of information to the community and community involvement/participation [25].

Another opinion explains that community factors and government assertiveness influence violations of space use [26]. Agri Chairunisa Israd juningtias explained that it was the lack of public understanding, the public's non-compliance with regulations and the government's lack of firmness in enforcing the law that encouraged violations of space use. Economic factors [27] and lack of public awareness [28] are also causes of deviations in space use.

3.5 Analysis

3.5.1.Validity Test and Reliability Test Results

Based on the number of questionnaires distributed as many as 100 with an error rate of 10% and degrees of freedom (dk) n-2 (100-2=98), the r table value was found to be 0.1654. The results of the validity test on the nine variables are declared valid because r count > r table as seen in the following table:

Table 2. Validity Test Results of Variables Causing Violations of Space Utilization

Code	Variable	R count	R table	Information
X1	Institution of Spatial Utilization Control	0.167	0.1654	Valid
X2	Instrument of Spatial Utilization Control	0.441	0.1654	Valid
X3	Socialization and Information Publication to the Community	0.244	0.1654	Valid
X4	Community Participation	0.311	0.1654	Valid
X5	Community Understanding	0.264	0.1654	Valid
X6	Citizen's awareness	0.674	0.1654	Valid
X7	Economic Factors	0.388	0.1654	Valid
X8	Legal Compliance	0.416	0.1654	Valid
X9	Law Enforcement	1	0.1654	Valid

Meanwhile, for the Reliability Test Results in this research, the Cronbach's Alpha value was 0.707. this value have qualified because > 0.6 [29].

3.5.2 Factor Analysis

This research used exploratory factor analysis techniques which are called Principal Components Analysis (PCA). This analysis technique reduces data from initial variables into new variables or factors whose number is smaller than the initial variables with the following stages:

1. *Kaiser Meyer Olkin Measure of Sampling* (KMO) and Barlet test of sphericity

The required KMO value must be above 0.5 and the significance value of *the Bartlett Test of Sphericity* must be below 0.05 (5%) [30]. The KMO and Bartlett's Test values in this research can be seen in the following table:

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.713
Bartlett's Test of Sphericity	Approx. Chi-Square	176,652
	df	36
	Sig.	0,000

From the results of the analysis, the KMO MSA (*Keiser Meyer Olkin Measure of Sampling Adequacy*) value was 0.713 and the Bartlett's Test of Sphericity value was 176.652 with a significance of 0.000. So it can be concluded that the instrument is quite feasible and the analysis process can be continued because the KMO MSA (*Keiser Meyer Olkin Measure of Sampling Adequacy*) value exceeds the required limit, namely 0.50 and the Bartlett's Test of Sphericity (sig) value is less than 0.05.

2. *Measure of Sample Adequacy* (MSA)

Variables can be analyzed further if the MSA value is above 0.5 and if it is less than 0.5 then the variable cannot be analyzed and must be eliminated. The MSA value of each variable can be seen from the following Anti-image Matrices table:

Table 4. Anti-image Matrices

Anti-imageCovariance	X1	0.877
	X2	0.740
	X3	0.818
	X4	0.842

	X5	0.803
	X6	0.508
	X7	0.737
	X8	0.782
	X9	0.387
Anti-imageCorrelation	X1	0.731a
	X2	0.721a
	X3	0.563a
	X4	0.597a
	X5	0.741a
	X6	0.756a
	X7	0.776a
	X8	0.768a
	X9	0.683a

In the Anti-image Matrices table, the MSA value of each variable can be seen in the Anti-image Correlation section in the number marked (a). From the results of this analysis, it can be concluded that all variables have an MSA value above 0.5 so that no variables are eliminated and the analysis process can proceed to the next stage.

3. Number of Factors Formed

To find out the number of factors formed in this research analysis, you can see the Total Variance Explained table by referring to the Eigenvalue which must be more than 1. Eigenvalue describes the importance of each factor in calculating the variance of the total existing variables. More details can be seen in the table below:

Table 5. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings
	Total	% of Variance	Cumulative %	
1	2,839	31,547	31,547	2,839
2	1,334	14,818	46,365	1,334
3	1,153	12,806	59,171	1,153
4	0.834	9,271	68,441	
5	0.778	8,644	77,085	
6	0.707	7,856	84,941	
7	0.608	6,759	91,700	
8	0.480	5,328	97,028	
9	0.267	2,972	100,000	

Based on the Table 4, it can be concluded that there are 3 factors formed from the 9 variables analyzed. The variance that can be explained by Factor 1 is 2.839/9 x 100% = 31.54%, Factor 2 is 1.334/9 x 100% = 14.82%, Factor 3 is 1.153/9 x 100% = 12.81%, so that the total of the three factors is able to explain the variable by 31.54% + 14.82% + 12.81% = 59.17%.

4. *Component Matrix* and Factor Rotation

After knowing the number of factors formed, the next process is the distribution of the nine variables on the three factors by paying attention to the factor loadings contained in the component matrix table. Factor loadings show a large correlation between variables and the factors formed. The greater the value of factor loadings, the closer the relationship between these variables is to the factors formed. The process of determining which variable will be included in which factor is carried out by large comparison of the correlation for each row. The factor loadings values can be seen in the table below:

Table 6. Component Matrix[a]

	Factor		
	1	2	3
X1	0.369	0.379	0.512
X2	0.545	-0.311	0.384
X3	0.329	0.661	-0.061
X4	0.304	-0.570	0.405
X5	0.489	0.447	0.335
X6	0.788	-0.052	-0.127
X7	0.576	0.165	-0.510
X8	0.527	-0.271	-0.429
X9	0.859	-0.168	-0.052

From the Table. 5, it can be seen that the distribution of factor values are still not evenly distributed, only having the highest value for factor 1. Therefore, it is necessary to rotate the factors so that the factor values can be distributed evenly and the results are clear enough to be interpreted. Factor rotation was carried out using the varimax method and the results can be seen in the following table:

Table 7. Rotated Component Matrix

	Components		
	1	2	3
X1	-0.057	0.708	0.194
X2	0.225	0.232	0.661
X3	0.233	0.600	-0.366
X4	0.048	-0.058	0.759
X5	0.139	0.724	0.085
X6	0.703	0.276	0.264
X7	0.748	0.135	-0.202
X8	0.702	-0.160	0.129
X9	0.724	0.264	0.417

The results obtained show that the factor loading values between a variable and several factors can be clearly differentiated and can be interpreted. Each variable has high factor loadings on one factor and has small factor loadings for the other factors. A factor loading value of 0.55 is considered significant for a sample size of 100 respondents, so all variables that have a factor loading value of more than 0.55 can be distributed into the factors formed. The following are the results of grouping variables into factors:

Table 8. Results of Grouping Variables into Factors

Factor	Variable
1	Citizen's awareness (X6) Economic Factors (X7) Legal Compliance (X8) Law Enforcement (X9)

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2	Institution of Spatial Utilization Control (X1) Socialization and Information Publication to the Community (X3) Community Understanding (X5)
3	Instrument of Spatial Utilization Control (X2) Community Participation (X4)

5. Factor Naming

The final stage of factor analysis is naming the factors that have been formed. There are no special provisions for this naming, it's just that it would be better if the naming could describe the entirety of the variables that make up the factor.

a. Factor 1
   There are 4 (four) variables forming factor 1, namely Public Awareness (X6), Economic Factors (X7), Legal Compliance (X8), and Law Enforcement (X9). By generalizing these four variables, factor 1 is then called the Economic and Legal Factor.
b. Factor 2
   There are 3 (three) variables forming factor 2, namely Space Utilization Control Institutions (X1), Socialization and Delivery of Information to the Community (X3), and Community Understanding (X5). By generalizing these three variables, factor 2 is then called the Community Education Factor.
c. Factor 3
   There are 2 (two) variables forming factor 3, namely Space Utilization Control Instruments (X2) and Community Involvement/Participation (X4). By generalizing these two variables, factor 3 is hereafter referred to as the Community Involvement Factor in Controlling Space Utilization.

4. Conclusions

As a result of factor analysis, three factors were formed that cause violations of space utilization, namely (1) Economic a8nd Legal Factors, where there are 4 (four) factors forming variables, namely Public Awareness (X6), Economic Factors (X7), Legal Compliance (X8), and Law Enforcement (X9); (2) Community Education Factors, where there are 3 (three) factors forming variables, namely Institution of Spatial Utilization Control (X1), Socialization and Information Publication to the Community (X3), and Community Understanding (X5); (3) Community Involvement in Controlling Space Utilization Factors, where there are 2 (two) factors forming variables, namely Instrument of Spatial Utilization Control (X2) and Community Participation (X4).

References

1. Kepala Sub Direktorat Pengendalian Pemanfaatan Ruang Wilayah II, Dr. Andi Renald, ST, MT. Rapat Koordinasi Strategi Kebijakan Pengelolaan Sumber Daya Air dan Penataan Ruang di Jawa Tengah (23 Juli 2018).
2. S. Bachrein. (2012)
3. S. Merinda, S. Wahyuni, E. Afiatun. JCBEEM (2018).
4. H. Pradiko, Arwin, P. Soewondo, Y. Suryadi. Procedia Engineering 125 (2015)
5. Rohmat, A. Baehaqi, J. Akbardin, J. Maknun. (2021)
6. E.K. Tambunan, S. P. Eni, M. M. Sudawarni, R. Pasaribu. Proceedings Temu Ilmiah IPLBI 2021, Jakarta (2021).
7. R. Maria. J.G.M.R (2008).
8. Y. Rahayu, I. Juwana, D. Marganingrum. JRH (2018).
9. A. Susetyaningsih. J.C. (2012).
10. Eriyanto. Teknik Sampling; Analisis Opini Publik (LKiS, Yogyakarta, 2007).
11. Sugiyono. Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif Dan R&D (Alfabeta, Bandung, 2018)
12. S. Azwar. Metode Penelitian (Pustaka Belajar, Yogyakarta, 2015)
13. J. Sarwono. Metode Riset Skripsi (Elex Media Komputindo, Jakarta, 2012)
14. Simamora Bilson. Analisis Multivariat Pemasaran (Gramedia Pustaka Utama, Jakarta, 2005)
15. Naresh K. Malhotra. Riset Pemasaran: Pendekatan Terapan, Jilid 2 (Indeks, Jakarta, 2006).
16. S.A. Janetasari, U. Hamidah, Widyarani, N. Sintawardani. IOP Conf. Series: Earth and Environmental Science 483 (2020) 012040.
17. F. Yulianto. Int. J. Penginderaan Jauh Ilmu Bumi. 15 131–40 (2018).
18. I.Y. Hadinata, B.N. Muchamad. J.D.P, Vol. 13, No. 1, (2018).
19. M.C. Endarwati, W. H. S. Widodo, A.H. Imaduddina. J.R.C.P, Vol.17, No.1, (2021).
20. Peraturan Menteri Pekerjaan Umum Dan Perumahan Rakyat Republik Indonesia Nomor 28/PRT/M/2015 Tentang Penetapan Garis Sempadan Sungai Dan Garis Sempadan Danau.
21. Peraturan Daerah Kota Bandung Nomor 18 Tahun 2011 tentang Rencana Tata Ruang Wilayah Kota Bandung Tahun 2011-2031
22. Peraturan Menteri Pekerjaan Umum Dan Perumahan Rakyat Republik Indonesia Nomor 28/PRT/M/2015 Tentang Penetapan Garis Sempadan Sungai Dan Garis Sempadan Danau.
23. Kasubdit Pertanahan dan Penataan Ruang, Ditjen Bina Bangda, Kemendagri, Ir. Tavip Rubiyanto, MT. Workshop Bimbingan Teknis Perencanaan Tata Ruang dan Pemanfaatan Ruang Daerah (22 Mei 2017).
24. E. Budiharjo, E. 2011. Penataan Ruang dan Pembangunan Kota (PT. Alumni, Bandung, 2011)
25. B.A. Triyanto, J.S. Setyono. J.R.C.P, Vol. 4, No. 1, (2015).

26. A.C, Isradjuningtias, AC. Veritas et Justia, Vol. 3, No. 2, (2017).
27. Alimansyah. Thesis (Gadjah Mada University, Yogyakarta, 2011).
28. M.I. Budhianti. Supremasi Hukum, Vol. 16, No. 2 (2020).
29. Sugiyono. Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif Dan R&D (Alfabeta, Bandung, 2018)
30. S. Santoso. SPSS Statistik Multivariat (PT. Elexmedia Komputindo, Jakarta, 2004).