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SPATIAL ARRANGEMENT BETWEEN RELOCATION AND CHANGE OF RIVER FLOW TO THE JRAGUNG BORDER SETTLEMENT

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Abstract

This study analyzes community organizations located in the buffer zone of the Jragung River in Demak Regency, which is legally a protected area under Indonesian spatial planning and water management regulations. The primary issue discussed is the continued presence of these organizations in the river boundary area despite clear laws, specifically those stipulated in Demak Regency Regulation Number 6 of 2011, Article 83 paragraph (3), which prohibits development within the river buffer zone, and Law Number 1 of 2011, Article 140, which restricts housing development outside the designated community organization area. These regulations stipulate a minimum distance of five meters from river embankments in areas outside the urban zone. This study aims to explore solutions to these problems. It uses an empirical legal method with a descriptive approach. The legal analysis focuses on the laws and regional regulations governing the river buffer zone, while empirical data is obtained through field observations and interviews with residents living along the Jragung River. Findings indicate that organizations in the river buffer zone developed gradually due to inherited land ownership, economic constraints, strong social continuity with the settlement, and weak government oversight and legal dissemination. While relocation provides hydrological and ecological

benefits, it also poses significant social and economic challenges for affected communities. In contrast, river engineering measures, such as river channel straightening and embankment construction, are considered more feasible in the study area because they reduce disaster risk without causing significant social disruption.
Keywords: river boundaries, relocation, changes in river flows.

Introduction

A river is a natural flow of water that moves continuously from one place to another through a certain path. Edward R. Atwater in his book *Rivers: Form and Process of Alluvial Channels* defines a river as *"an organized flow of water moving in one direction from one place to another, forming a distinct channel"*, which indicates that rivers have clear flow directions, channels, and function as a dynamic hydrological system in shaping landscapes. Ideally, rivers function as a source of irrigation for rice fields, fields, and gardens, and can be used as a transportation route. Rivers with clear and consumable water quality also contribute to the creation of a healthy, beautiful, and comfortable environment for the lives of the surrounding community. However, along with rapid population growth, there is an increase in the need for residential land that encourages land conversion, including in riverside areas that are supposed to function as catchment areas and buffer zones. The existence of settlements in the area has reduced the natural capacity of rivers and triggered various disaster risks, such as floods, landslides, and environmental pollution [1].

According to Government Regulation Number 38 of 2011, riverbanks or borders are important buffer zones between river and terrestrial ecosystems, and therefore their use must be limited to maintain environmental sustainability. However, in practice, many settlements are still built due to land limitations or historical factors, such as old buildings that are inherited from generation to generation. This situation becomes more problematic when it is not aligned with the regional spatial plan. The conversion of land along the riverbank eventually leads to a decline in the ecological function of the river, as areas that should have been protected are instead converted into settlements [2].

The formation of settlements on the border line is a social process that takes place gradually and is influenced by various factors, especially historical, social, and economic factors of the local community. This condition is in line with research by Soenyono (2015) which revealed that settlements on the

[1] Anggger Ari Praditya, "Community Participation in Flood Management Efforts in the Tenggang Watershed (Das), Gayamsari District, Semarang City in 2020," 2020.
[2] Erland Raziqin Fatahillah And Abdul Wahid Hasyim, "LEVEL OF QUALITY OF LIFE OF THE COMMUNITY IN THE RIVER BORDER OF KOTALAMA VILLAGE," 14 (2025): 223–34.

banks of rivers generally do not form instantly, but develop over a long period of time through the process of family land ownership, hereditary inheritance, and the purchase of land that has previously been used as settlements. Similar conditions are also found in the border area of the Jragung River, where most residents have settled since decades ago and have a strong attachment to the land where they live.[3]

This research is also in line with the views of Rusdanisari and Herwangi (2023) who stated that people living in riverside areas tend to develop adaptation patterns to flood risk as a form of adjustment to environmental conditions. This is reflected in research on the Jragung River, where even though people are aware of the risk of flooding during the rainy season, they still choose to survive due to the factors of housing needs and social attachment to the surrounding environment.[4]

In addition, aspects of social and historical ties of the community in the river border area also strengthen the resilience of settlements. This is in line with the research of Arifin and Rahman (2020) which emphasizes that the pattern of settlements on the banks of riverbanks is not only influenced by the physical aspects of the environment, but also by culture, social values, and strong kinship relationships in the community. The findings are relevant to the conditions in the Jragung River, where the existence of settlements cannot be separated from family relationships, land inheritance, and the emotional bond of the community to their place of residence.[5]

The border of the Jragung river located in Jragung Village, Karangawen District, Demak Regency, which was supposed to function as a buffer zone, was actually filled with settlements. This condition is contrary to the provisions of the law that prohibit the erection of buildings in the river border area. Demak Regency Regional Regulation No. 6 of 2011 Article 83 paragraph (3) expressly prohibits the construction of buildings on the river border, in line with Law No. 1 of 2011 Article 140 which prohibits the construction of houses outside residential areas, and the minimum distance of river embankments outside urban areas is 5 meters from the river boundary. This is emphasized in Regional Regulation Number 1 of 2020 as an amendment to Regional Regulation Number 6 of 2011, in article 41

[3] Teaching Staff and Wisnuwardhana University, "The Development of Settlements on the Banks of the Surabaya River from a Sociological Perspective by: Soenyono," n.d., 85–101.

[4] Anna Rusdanisari, "Bentuk Adaptasi Masyarakat Terhadap Bencana Banjir Di Kawasan Permukiman Tepian Sungai Kelurahan Pahandut Seberang," *Geodika: Jurnal Kajian Ilmu Dan Pendidikan Geografi* 9, no. 1 (2025): 108–17, https://doi.org/10.29408/geodika.v9i1.28215.

[5] Zainal Arifin and Fajri Rahman, "Living in the Riverbanks: Case of the Ogan Malay Community Settlement, South Sumatera," *ETNOSIA : Jurnal Etnografi Indonesia* 5, no. 1 (2020): 33–49, https://doi.org/10.31947/etnosia.v5i1.8467.

number (3) which states that the size and provisions of river boundary spacing are regulated in higher laws and regulations. This rule is emphasized from Government Regulation number 38 of 2011 concerning rivers in article 12, which stipulates the boundary line of rivers outside urban areas and embankments, at least 5 meters apart. This provision is also in line with the Regulation of the Minister of PUPR Number 28/PUPR/M/2015 article 8 which explains that the distance between the boundary of embankments in urban areas is 5 meters [6].

Figure 1. Settlement Conditions in the Jragung Border

Figure 2. Map of Settlement Locations on the Border of the Jragung River

The problem of illegal settlements along the river border does not only occur at the border of the Jragung river, but also occurs in Sokaraja Kulon Village, Banyumas according to research from Candranata (2025). The results of the study show that the spatial planning policy at the river border based on the Regulation of the Minister of Public Works and Public Housing Number 28/PRT/M/2015 has not been implemented optimally. In practice, there is still the use of river boundaries by the community in the form of the construction of permanent buildings on river borders, which is normatively prohibited because river boundaries are supposed to function as protected areas and open spaces to maintain the smooth flow of river water and support river maintenance activities. The existence of these buildings causes the narrowing of river channels, disrupts the function of water flow, and hinders access for officers in carrying out river management and maintenance. Although the relevant agencies have tried to regulate by issuing administrative warning letters, the demolition of the building has not been realized effectively due to budget limitations, supporting facilities, and weak law enforcement at the implementation level. This condition shows that there is a gap between the applicable legal provisions and the reality of the use of space in the field, so that the spatial planning objectives of river boundaries as stipulated in the legislation have not been fully

[6] Muhammad Haidar and Alfin Miftah Rozak, "Analisis Pelanggaran Garis Sempadan Sungai Di Perumahan Wahyu Utomo Ngaliyan Semarang," *Misterius: Publikasi Ilmu Seni Dan Desain Komunikasi Visual*. 1, no. 4 (2024): 52–59.

achieved [7].

According to research from Hidayah (2023), settlements on river borders also occur in the city of Surakarta. In 2007, a major flood caused by the overflow of the Bengawan Solo River submerged 1,571 illegal houses located along the riverbank, covering an area of approximately 38 hectares. This incident shows how great the catastrophic risk posed by illegal development along the river border is. In response, the Surakarta City Government took decisive action through a relocation program, moving residents to safer areas in Mojosongo. This program is a successful example in dealing with illegal settlements while reducing the risk of flooding [8].

Settlement management on river borders can not only be done through relocation, but can also be pursued through several policy and other technical engineering options that complement each other. One alternative is the application of krib can be carried out to strengthen the riverside structure through the construction of embankments, gabions, or retaining vegetation, so that the existence of settlements around the river border can be safer in a certain period of time. In addition, changes in river channels or the manufacture of sodetan, which aims to control the discharge and direction of water flow so that the risk of flooding and erosion in residential areas can be reduced. This approach is seen as more adaptive in certain conditions because it does not necessarily move people out of their living space, but still seeks to reduce disaster risk.

The development of settlements along river borders has various environmental impacts, such as erosion and sedimentation due to the loss of supporting vegetation that maintains soil stability, and the decline in water quality due to contamination by domestic waste and surface runoff. The conversion of riverbanks into residential areas also increases the risk of flooding, especially if adequate drainage systems are not in place. Field observations in the Jragung River revealed that houses were built only about two to three meters from the riverbank, a practice that clearly violates regulations and threatens the safety of residents by increasing the potential for flooding and landslides, while also damaging the ecological function of the river's border area [9]. This situation illustrates a significant gap between regulation and practice, which is influenced by weak government oversight

[7] Sabhan Candranata, "KEBIJAKAN PENATAAN TATA RUANG SEMPADAN SUNGAI BERDASARKAN PERATURAN MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT NOMOR 28/PRT/M/2015 TENTANG PENETAPAN GARIS SEMPADAN SUNGAI PERSPEKTIF FIQH LINGKUNGAN (Studi Kasus Di Desa Sokaraja Kulon, Kecamatan Sokaraja," 2025.

[8] A R Hidayah And W Astuti, "The Impact Of Mojosongo Resettlement Development On The Spatial Changes Of The Surrounding Area" 18 (2023), Https://Doi.Org/10.20961/Region.V18i1.53437.

[9] Emiro Restu, "PENEGAKAN HUKUM TERHADAP PENDIRIAN BANGUNAN DI GARIS SEMPADAN SUNGAI PERSPEKTIF SIYASAH DUSTURIAH (Studi Kasus Di Bantaran Sungai Amen Kabupaten Lebong)," 2021.

and low public legal awareness. If not addressed immediately, these violations will further worsen the quality of the environment, disrupt the function of the river as state-controlled land, and cause losses to local residents.

This study offers solutions to settlement problems along the Jragung River through two alternative policies, namely settlement relocation and river engineering in the form of river flow diversion. This study has novelty compared to previous research because most studies on settlements on river borders only discuss the legal or technical aspects of the river separately. This study combines these two approaches in the same research location, namely the Jragung River in Demak Regency. Through an empirical juridical approach, this study not only assesses the suitability of space use based on laws and regulations, but also examines the social conditions of the community and the risks of disasters faced. In addition, this study specifically compares the advantages and disadvantages of settlement relocation policies and river channel changes as the basis for formulating a more realistic and applicable river boundary arrangement policy. Therefore, the author formulates two main research questions, namely how can settlements occur on the border line of the Jragung river, Demak Regency, and what are the advantages and disadvantages of relocation and changes in river flows to settlements on the border of the Jragung River.

METHODS

This study uses an empirical juridical method with descriptive specifications, which aims to describe and analyze the application of legal provisions regarding river boundary lines based on the factual conditions of settlements in Jragung Village. The juridical approach is used to examine laws and regulations related to river boundaries, while the empirical approach is carried out through field observations and interviews with people living on the banks of the Jragung River. Based on the observations, there are around 15 residents' houses that are less than 5 meters away from the riverbank and are in the river border area. The sample determination was carried out by purposive sampling technique, referring to the opinion of Gay & Diehl (1992) who stated that in descriptive research, the minimum sample used is 10% of the population, so 5 houses were designated as the research sample. The data obtained is then analyzed qualitatively by relating field facts and the provisions of applicable laws and regulations.

Result and Discussion

1. How can there be settlements on the border line of the Jragung river

The Jragung River is geographically located in the northern part of Central Java and crosses several administrative areas, namely Semarang Regency, Demak Regency, Grobogan Regency, and Semarang City. In this study, the focus of the discussion is directed to the Jragung River segment located in Jragung Village, Karangawen District, Demak Regency. The Jragung River headwaters in the hilly area of Pringapus, Semarang Regency, then flows north through rural areas until it empties into the North Coast area of Central Java and is included in the Jratunseluna River Area. The Jragung River Watershed has an area of about 94 km² which covers the areas of Semarang, Demak, Grobogan, and Semarang City. Topographically, the Jragung River watershed area consists of hilly areas in the upstream part and lowlands in the central to downstream parts, especially in the Karangawen District area which is dominated by rural areas and surrounded by teak forests and river [10]flows. The Jragung River has an important role as a source of water for the local community and has the potential for natural tourism that is quite developed, such as Jati Park, Sendang Wuluh, and Sunut Bridge which are often used as tourist locations and community activities. However, the relatively low geographical conditions of the area, especially in the middle to the lower part of the river, as well as the existence of residential areas around the river border line cause various problems, especially the increased risk of flooding in the rainy season when the river water discharge increases. In addition, the existence of settlements in the river border area also has the potential to conflict with the provisions of laws and regulations that regulate the use of space and the protection of river borders.

Settlements on the border line of the Jragung River were formed as a result of a process that lasted quite a long time and was influenced by various social, economic, and historical factors. Based on the results of observations and interviews with local residents, it is known that most of the residents have lived in the riverbank area since decades ago, even since the 1980s. Several respondents, such as informant 1 who has been living since 1983 and informant 2 since 1997, stated that the existence of settlements in the location began from family land ownership or hereditary inheritance. This condition shows that settlements on the border of the Jragung River are not a new phenomenon, but are developing gradually without clear spatial planning.

The process of forming settlements on the border line of the Jragung River is also closely related to the limited choice of housing for the local community. Based on the results of the interviews, most of the respondents stated that the main reason they settled in the riverbank area was because they only had land or houses in that location. Family inheritance is the most dominant reason, as conveyed by several respondents who have lived in the

[10] Muhammad Fauzi et al., "Review Desain Bendungan Jragung Kabupaten Semarang Provinsi Jwa Tengah," 2024.

area for decades. This hereditary land ownership makes people have a strong attachment to their place of residence, both economically and emotionally. In addition, there are also residents who occupy the river border area through the process of purchasing land that has previously been used as a settlement, so that the existence of houses in the area continues from time to time.

This condition shows that the formation of settlements on the border line of the Jragung River is not solely driven by the choice of strategic location, but rather due to the limited access of the community to decent and affordable residential land outside the river border area. The basic need for housing, coupled with economic limitations and the unavailability of alternative housing locations, encourage people to stay in the area even though the river border is an area that should be protected. Thus, settlements on the border of the Jragung River were formed as a result of a social process that took place gradually, where the needs of the community were more dominant than compliance with the applicable spatial planning regulations.

The findings are in line with research on community survival in the Silugonggo River area, which states that the longevity factor of hereditary residence and kinship relationships are the main reasons why people continue to live in riverbank areas. The similarity of these factors shows that the resilience of settlements in the river border areas, including in the Jragung River, is not only influenced by physical and economic aspects, but also by strong social and historical ties within the community [11].

According to Soerjono Soekanto, the success of the law is not only determined by the existence of written rules, but also by the extent to which the public and law enforcement officials have legal awareness. Legal awareness is not singular, but includes people's knowledge of the law, people's attitudes towards the rules, and daily behavior patterns that reflect the level of legal obedience [12]. On the other hand, weak socialization, coaching, and law enforcement by the government also contribute to the emergence of law violations in society. This condition reflects the problems that occur in Jragung Village, which not only originate from community behavior, but also related to the lack of consistency of government officials in carrying out the function of control and law enforcement [13].

This is in line with the results of interviews with informant 3 which showed

[11] Emma Luthfiana Fajrin, "Kebertahanan Masyarakat Dalam Bermukim Di Kawasan Tepi Sungai Silugonggo Kecamatan Juwana," 2024.

[12] Wahid Zainal Mustofa Ahmad, *TINJAUAN SOSIOLOGI HUKUM ISLAM TERHADAP PEMBAGIAN WARIS SUAMI PADA ISTRI (Studi Kasus Di Desa Jetak Kecamatan Sidoharjo Kabupaten Sragen)*, 2024.

[13] Farras Bongso et al., "HUKUM PIDANA DALAM PERSPEKTIF ADMINISTRASI PUBLIK : KAJIAN ATAS PENEGAKAN HUKUM TERHADAP" 2, no. November (2023): 161–74.

that there was a lack of information and socialization related to river boundaries and the risks of living in the area. And almost all respondents also stated that when building or starting to occupy a house, they never received an explanation from the village or the government regarding the provisions of the river boundary limit, the function of the river protected area, and the potential dangers that can arise, such as the risk of flooding in the rainy season. In fact, some residents admitted that they did not know at all that the location of their residence was included in the river border area, so house construction activities were carried out without considering spatial planning and environmental safety aspects. This lack of information shows that the process of using space in the area on the banks of the Jragung River takes place without adequate supervision and assistance from the local government.

Furthermore, this condition reflects the weak role of village governments and local governments in controlling the use of space and socializing spatial planning policies to the community [14]. The absence of affirmation of river boundaries and lack of education about environmental risks causes people to tend to consider riverbank areas as legitimate spaces to be used as settlements. As a result, settlements on the border of the Jragung River continue to develop informally and sustainably. This situation not only increases the vulnerability of the community to flood disasters, but also has the potential to cause environmental problems and violations of the provisions of laws and regulations governing the protection of river borders.

From the explanation above, it can be concluded that the results of this study strengthen and confirm the findings of previous research on settlements in the river border area. Settlements on the border line of the Jragung River were formed as a result of the complex interaction between historical, social, economic, and cultural factors, as well as weak control and socialization of spatial planning policies. The harmony between the results of this study and previous research shows that the phenomenon of settlements on the banks of rivers is a structural problem that occurs not only in the Jragung River, but also in various other regions in Indonesia.

2. What are the advantages and disadvantages of relocating settlements on the border of Sungai Jragung

a. Legal basis for handling river-border settlements

[14] Abdul Karim Adam, Fenty U Puluhulawa, and Dolot Alhasni Bakung, "Mekanisme Pemberian Hak Pengelolaan Dan Penguasaan Tanah Sempadan Sungai Bone: Perspektif Hukum Agraria Dan Perlindungan Ekosistem Sungai," *Al-Zayn: Jurnal Ilmu Sosial & Hukum* 3, no. 5 (2025): 7963–81.

The river boundary line is an imaginary line located on the left and right sides of the riverbed, which is designated as the boundary of the river protection. This line serves as the outer boundary of the river protection, restricting human activities, particularly the construction of buildings, in the riverbank area. The purpose of determining the river boundary line is to preserve the river so that it can continue to carry out its natural function in a sustainable manner. In practice, the boundary line of a river is often mistaken for a riverbank. However, the riverbanks only cover areas that were flooded during flooding. Meanwhile, the river boundary line covers a wider scope, covering the riverbank and surrounding areas that are prone to landslides. Therefore, the river demarcation line not only serves as a physical boundary but also as a safe zone against disaster risks around the river [15].

In the context of spatial and environmental planning, river boundary lines play a strategic role as a buffer between rivers and human activities. The river boundary line plays a role in maintaining the smooth flow of water, especially when the river discharge increases, and reduces the risk of flooding. In addition, river borders also serve to protect the stability of river banks, prevent erosion and landslides. Based on the Regulation of the Minister of Public Works and Public Housing Number 28/PUPR/M/2015 Article 9, if there is a flood control embankment within the river boundary, then the space between the edge of the river trough and the inner edge of the embankment foot is called the riverbank. The riverbank functions as a flood channeling room, so its existence must not be disturbed by residential buildings or other activities that can hinder the flow of water. Regulations regarding river boundaries have been regulated in stages in various laws and regulations. Law Number 1 of 2011 concerning Housing and Residential Areas, especially Article 140, prohibits the construction of houses outside the designated residential area, including areas that have a protective function such as river [16]borders.

At the regional level, Demak Regency Regional Regulation Number 6 of 2011 Article 83 paragraph (3) expressly prohibits the erection of buildings in the river border area. This provision was then reaffirmed through amendments to the Demak Regency Regional Regulation Number 1 of 2020 as an amendment to Regional Regulation Number 6 of 2011 which contains Article 41 paragraph (3) stating that the size and provisions of the river boundary distance are regulated in accordance with higher laws and regulations. Where it is regulated in Government Regulation Number 38 of 2011 concerning Rivers in Article 12 stipulates that the river boundary line outside urban areas with embankments is set at least 5 meters from the river

[15] Agus Maryono, *Pengelolaan Kawasan Sempadan Sungai* (Gadjah Mada University Press, 2014).

[16] Hamzah Siregar, "Penerapan Peraturan Menteri Nomor 28 Tahun 2015 Tentang Penetapan Garis Sempadan Sungai Dan Garis Sempadan Danau (Studi Kasus Kelurahan Timbangan) Kota Padang Sidempuan," 2023, 100.

bank. This provision is in line with the Regulation of the Minister of PUPR Number 28/PUPR/M/2015 Article 8, which also stipulates that the distance between embanked rivers in urban areas is at least 5 meters. Thus, there is harmony between rules at the legal level, government regulations, ministerial regulations, and regional regulations in regulating river boundaries. The prohibition of settlement development in riverside areas has a very important purpose. First, to protect the function of the river so that it can continue to flow water optimally and not be disturbed by permanent buildings. Second, to prevent natural disasters such as floods, erosion, and landslides on the banks of rivers, which can endanger the safety of the community [17].

In addition, the prohibition of settlements along the riverbanks also aims to maintain the balance of the river ecosystem, including the preservation of the biodiversity that lives around the river. From an environmental perspective, the riverbank serves as a buffer zone that filters waste and prevents river water pollution. From a social perspective, this policy is intended to ensure the safety, health, and comfort of the community by keeping settlements away from disaster-prone areas [18].

b. Advantages and disadvantages of settlement relocation

Settlement relocation cannot be understood solely as an act of land clearance, but rather as a strategic step to restore the hydrological and ecological function of rivers. The existence of buildings on the riverbank physically narrows the wet cross-section of the river so as to inhibit the flow of water and increase the water level when the discharge is high. Through relocation, the government obtains adequate space to normalize the river, such as sediment dredging and channel widening without being constrained by permanent buildings. Relocation also improves community safety by moving residents from high-risk zones to areas that are topographically and geotechnically safer, so that potential casualties and property losses due to flash floods or embankment failures can be minimized [19].

In addition to the hydrological benefits, relocation provides ecological and technical advantages. The emptying of river boundaries allows the re-establishment of riparian ecosystems through green pathways that serve as natural filters for pollutants, stabilizers of river banks, and habitats for biodiversity. At the same time, the building-free border facilitates access to

[17] Muhammad Amin et al., "Ketidaksesuaian Penggunaan Kawasan Sempadan Sungai Sebagai Pemukiman" 2, no. 6 (2025): 8485–95.
[18] Amin et al.
[19] Toni Setiawan, "Efektivitas Peraturan Daerah Kota Metro Nomor 5 Tahun 2016 Tentang Ruang Terbuka Hijau Menjadi Lapak Pedagang Kaki Lima Perspektif Maslahah Mursalah" (IAIN Metro, 2024).

river infrastructure maintenance, such as mud dredging and regular embankment repairs. This open access makes maintenance activities more efficient in terms of time and cost, and supports the sustainability of river functions in the long term [20].
However, the relocation of settlements also has a significant sociological and economic impact on the affected communities. Many riverbank residents do not have a Certificate of Ownership or Letter C, even though they have long occupied land on the basis of physical possession and payment of Land and Building Taxes, so that in the relocation process they often receive minimal compensation or only in the form of rental rights in the rusunawa. Relocation also disrupts the informal economy that is integrated with housing, causing the loss of business space, livelihoods, and increased expenses due to the obligation to pay rent, electricity, and clean water. Furthermore, forced displacement has the potential to cause psychological trauma and eliminate social capital in the form of long-established community ties, thereby weakening the social support system between citizens [21].

c. Advantages and disadvantages of changes in river flow

River channel engineering, both through channel straightening and sodetan, is a technical effort to control the speed and direction of water flow to protect certain areas from flood threats. In the Jragung River system, this kind of engineering has been carried out through the Jratunseluna project, but its implementation shows various technical problems that deserve attention. One prominent example is the sodetan to the Cabean River, which was originally designed to divide the flood discharge with a composition of 60% flowed into the Jragung River and 40% into the Cabean River. In practice, the design suffers from hydraulic failure because the water flow tends to follow a natural flow and does not fully turn as planned. As a result, the Cabean River actually receives the main discharge load that exceeds its capacity, so that the approximately 10-kilometer embankment is in critical condition and often breaks [22].

On the other hand, changes in flow and sodetan still have a number of advantages if planned and managed properly. The straightening of the river

[20] Yuliarti Nurul Kusumawardani, Prabawa Eka Soesanta, and A. Hadian Pratama Hamzah, "Permukiman Tepi Sungai Ilegal : Dampak Kondisi Sosial-Ekonomi , Ketidakstabilan Ekonomi , Ketidakadilan Spasial Perkotaan Dan Kebijakan Pemerintah" 4, no. 9 (2025): 2068–80.
[21] Ardiansyah Ardiansyah, Bruce Anzward, and Hasan Basri, "Polemik Ganti Rugi Pengadaan Tanah Atas Kepemilikan Lahan Di Kawasan" 16, no. 19 (2024): 71–88.
[22] Lien W Lestari et al., "Mitigasi Bencana Banjir Melalui Normalisasi Daerah Aliran Sungai Beringin Dan Pemanfaatan Flood Early Warning System Di Kelurahan Mangkang Wetan," *Region: Jurnal Pembangunan Wilayah Dan Perencanaan Partisipatif* 19, no. 1 (2024): 211–28.

channel that was originally winding increases the slope of the channel and the speed of the flow, so that flood water can flow faster to the estuary and reduce the length of inundation in the upstream and central areas. In addition, sodetan can serve as a protection for strategic infrastructure, such as national roads, bridges, or dense settlements that are threatened by cliff erosion and do not allow for comprehensive relocation. A straighter river channel also simplifies border management and monitoring, as it is more stable than a winding channel that naturally moves due to erosion and sedimentation [23].

However, river channel engineering also brings risks and losses that are not small. Increasing the flow speed in the straightened segment will increase the flow energy, which when it reaches the downstream part has the potential to trigger more intensive erosion of the bottom and cliffs, so that the problem of flooding and environmental damage only changes locations. From an ecological perspective, the straightening of the groove removes the variation of natural habitats such as lubuk and riam, increases the water temperature, and damages the spawning habitat of fish and other aquatic organisms. Changes in the flow can also reduce the quality and sustainability of traditional irrigation systems due to the disconnection of channels and the drop in river water levels, so that water can no longer flow gravitationally to agricultural land. In addition, the development of sodetan often raises legal problems in the form of conflicts over the acquisition of new land and ownership disputes in the former river channel between the state and the surrounding community [24].

d. Comparison and policy options in the Jragung River

Efforts to handle settlements on the border line of the Jragung River do not always have to be carried out through the relocation of residents, considering the large costs required and the complexity of social and legal issues related to land rights. Therefore, the handling can be directed first to area-based rearrangement through river technical engineering, while still considering aspects of community safety and environmental sustainability. However, relocation still has urgency and is an inevitable step if technical restructuring efforts are not able to eliminate the risk of disasters and violations of the provisions of the river boundary line [25].

[23] Salsabila Rifdah Taufik et al., "Analysis of the Influence of Krib Building on Flow Speed at the Outer Bend of the Kalibuntu River Using Numerical Modeling," *Journal of Hydraulic Engineering* 16, no. 1 (2025): 49–60.

[24] H Nanang Hermansyah and Arida Mahmudyah, "Juridical Analysis of the Granting of Land Rights in the River Border Area of Barito Kuala Regency (Study at the National Land Agency of Barito Kuala Regency," *Wasaka Law* 11, no. 2 (2023): 1–18.

[25] Candra Yuliana et al., "Planning of Sodetan Kuranji-Sungai Panggung, Cempaka District," *MY FRIEND: A JOURNAL OF COMMUNITY SERVICE* 5, No. 1 (2022): 46–52.

Based on input from the Demak Regency Public Works and Spatial Planning Office, the strategy that is considered more realistic to be applied at the research site is the straightening of the river channel and the construction of river krib. This technical engineering or sodetan aims to direct the flow of the Jragung River so that it does not turn towards settlements, but is straightened to the east side of the river which is still in the form of open land and rice fields. The length of the river segment that is planned to be straightened reaches around 351 meters, which is expected to reduce current pressure on river banks in residential areas and reduce the potential for landslides and overflows.

The approach to river arranging through technical engineering is considered more efficient than relocation because it does not require large-scale land acquisition and does not cause new problems related to the transfer of community property rights. In addition, the technical handling of the river has an empirical basis, considering that in the early 2000s Jragung Village had experienced similar flood problems that were successfully handled through the diversion of the river channel without moving residents' settlements. Although the locations are different, the experience shows that river management can be an effective solution if supported by mature and sustainable technical studies.

Technical efforts and post-structuring supervision, the active role of the community and the village government are the initial factors that greatly determine the success of handling. Until now, the problem of the flow of the Jragung River at the research site has not been fully addressed because there has been no official report submitted to the Public Works and Spatial Planning Office. Therefore, the community and village officials need to proactively submit reports and proposals for handling, both through the village deliberation mechanism and official submission to the relevant agencies, so that these problems can be included in regional planning and budgeting [26].

Structured and field-data-based reporting will make it easier for the Public Works and Spatial Planning Office to conduct technical studies, determine handling priorities, and formulate appropriate solutions, both through the technical arrangement of rivers and limited relocation in zones that cannot be maintained. Thus, the synergy between the community, village government, and local government is not only conceptual, but is manifested in real administrative and technical steps and oriented towards environmental safety and sustainability.

[26] Agus Maryono, *Pengelolaan Kawasan Sempadan Sungai* (Gadjah Mada University Press, 2020).

Conclusion

Based on the results of the research and discussion, it can be concluded that the existence of settlements on the border line of the Jragung River is juridically a form of space utilization that is contrary to the provisions of laws and regulations, both at the level of laws, government regulations, ministerial regulations, and regional regulations. The prohibition of building in the river border area has been strictly regulated and tiered with the aim of protecting the function of the river as a protected area and ensuring the safety of the community from disaster risks. However, these violations occurred as a result of historical factors in the form of hereditary land tenure, economic limitations of the community, and weak supervision, socialization, and control of space use by local governments. This condition shows that there is a gap between legal norms and practices on the ground, which results in the river border area being used as a sustainable settlement. In the context of handling settlements on the border of the Jragun
River, the policy that is considered the most realistic and proportionate to be implemented is the arrangement of the river through technical engineering in the form of straightening the river channel and the construction of a krib, as recommended by the Demak Regency Public Works and Spatial Planning Office. This policy can legally be seen as a preventive and corrective effort to reduce disaster risk without necessarily causing as much social impact as a blanket relocation. Therefore, the success of handling the border of the Jragung River is highly dependent on the synergy between technical policies, consistent law enforcement, and the active role of the government and the community in maintaining the function of river protected areas.

DAFAR PUSTAKA

Adam, Abdul Karim, Fenty U Puluhulawa, and Dolot Alhasni Bakung. "Mekanisme Pemberian Hak Pengelolaan Dan Penguasaan Tanah Sempadan Sungai Bone: Perspektif Hukum Agraria Dan Perlindungan Ekosistem Sungai." *Al-Zayn: Jurnal Ilmu Sosial & Hukum* 3, no. 5 (2025): 7963–81.

Ahmad, Wahid Zainal Mustofa. *TINJAUAN SOSIOLOGI HUKUM ISLAM TERHADAP PEMBAGIAN WARIS SUAMI PADA ISTRI (Studi Kasus Di Desa Jetak Kecamatan Sidoharjo Kabupaten Sragen)*, 2024.

Amin, Muhammad, Fachrul Gunawan, Program Studi, Magister Ilmu, Program Pascasarjana, Universitas Riau, Program Studi, et al. "Ketidaksesuaian Penggunaan Kawasan Sempadan Sungai Sebagai Pemukiman" 2, no. 6 (2025): 8485–95.

Ardiansyah, Ardiansyah, Bruce Anzward, and Hasan Basri. "Polemik Ganti

Rugi Pengadaan Tanah Atas Kepemilikan Lahan Di Kawasan" 16, no. 19 (2024): 71–88.

Arifin, Zainal, and Fajri Rahman. "Living in the Riverbanks: Case of the Ogan Malay Community Settlement, South Sumatera." *ETNOSIA : Jurnal Etnografi Indonesia* 5, no. 1 (2020): 33–49. https://doi.org/10.31947/etnosia.v5i1.8467.

Bongso, Farras, Arif M Ibrahim, Fakultas Hukum, Universitas Bina, and Taruna Gorontalo. "HUKUM PIDANA DALAM PERSPEKTIF ADMINISTRASI PUBLIK : KAJIAN ATAS PENEGAKAN HUKUM TERHADAP" 2, no. November (2023): 161–74.

Candranata, Sabhan. "KEBIJAKAN PENATAAN TATA RUANG SEMPADAN SUNGAI BERDASARKAN PERATURAN MENTERI PEKERJAAN UMUM DAN PERUMAHAN RAKYAT NOMOR 28/PRT/M/2015 TENTANG PENETAPAN GARIS SEMPADAN SUNGAI PERSPEKTIF FIQH LINGKUNGAN (Studi Kasus Di Desa Sokaraja Kulon, Kecamatan Sokaraja," 2025.

Fajrin, Emma Luthfiana. "Kebertahanan Masyarakat Dalam Bermukim Di Kawasan Tepi Sungai Silugonggo Kecamatan Juwana," 2024.

Fatahillah, Erland Raziqin, and Abdul Wahid Hasyim. "TINGKAT KUALITAS HIDUP MASYARAKAT DI SEMPADAN SUNGAI KELURAHAN KOTALAMA ," 14 (2025): 223–34.

Fauzi, Muhammad, Adiwidya Bagas Priyandra, Andi Abdul Gafur, Syahman Mansur, and Kaygo Fajar Muharram. "Review Desain Bendungan Jragung Kabupaten Semarang Provinsi Jwa Tengah," 2024.

Haidar, Muhammad, and Alfin Miftah Rozak. "Analisis Pelanggaran Garis Sempadan Sungai Di Perumahan Wahyu Utomo Ngaliyan Semarang." *Misterius: Publikasi Ilmu Seni Dan Desain Komunikasi Visual.* 1, no. 4 (2024): 52–59.

Hermansyah, H Nanang, and Arida Mahmudyah. "ANALISIS YURIDIS PEMBERIAN HAK ATAS TANAH DI KAWASAN SEMPADAN SUNGAI KABUPATEN BARITO KUALA (STUDI DI BADAN PERTANAHAN NASIONAL KABUPATEN BARITO KUALA." *WASAKA HUKUM* 11, no. 2 (2023): 1–18.

Hidayah, A R, and W Astuti. "Dampak Perkembangan Permukiman Relokasi Kelurahan Mojosongo , Kota Surakarta Terhadap Perubahan Spasial Kawasan Sekitarnya The Impact of Mojosongo Resettlement Development on the Spatial Changes of the Surrounding Area" 18 (2023). https://doi.org/10.20961/region.v18i1.53437.

Kusumawardani, Yuliarti Nurul, Prabawa Eka Soesanta, and A. Hadian Pratama Hamzah. "Permukiman Tepi Sungai Ilegal : Dampak Kondisi Sosial-Ekonomi , Ketidakstabilan Ekonomi , Ketidakadilan Spasial Perkotaan Dan Kebijakan Pemerintah" 4, no. 9 (2025): 2068–80.

Lestari, Lien W, N Dhea Madinah Al Qibtiyah, Indra Cahya Nugraha, Mariyatul Qibtiyah, and Salmaa Shafira. "Mitigasi Bencana Banjir Melalui Normalisasi Daerah Aliran Sungai Beringin Dan Pemanfaatan Flood Early Warning System Di Kelurahan Mangkang Wetan." *Region: Jurnal Pembangunan Wilayah Dan Perencanaan Partisipatif* 19, no.

1 (2024): 211–28.
Maryono, Agus. *Pengelolaan Kawasan Sempadan Sungai*. Gadjah Mada University Press, 2020.
———. *Pengelolaan Kawasan Sempadan Sungai*. Gadjah Mada University Press, 2014.
Pengajar, Staf, and Universitas Wisnuwardhana. "PERKEMBANGAN PERMUKIMAN DI BANTARAN SUNGAI SURABAYA DARI PERSPEKTIF SOSIOLOGI Oleh: Soenyono," n.d., 85–101.
Praditya, Anggger Ari. "PERAN SERTA MASYARAKAT DALAM UPAYA PENANGGULANGAN BANJIR DI DAERAH ALIRAN SUNGAI (DAS) TENGGANG, KECAMATAN GAYAMSARI, KOTA SEMARANG TAHUN 2020," 2020.
Restu, Emiro. "PENEGAKAN HUKUM TERHADAP PENDIRIAN BANGUNAN DI GARIS SEMPADAN SUNGAI PERSPEKTIF SIYASAH DUSTURIAH (Studi Kasus Di Bantaran Sungai Amen Kabupaten Lebong)," 2021.
Rusdanisari, Anna. "Bentuk Adaptasi Masyarakat Terhadap Bencana Banjir Di Kawasan Permukiman Tepian Sungai Kelurahan Pahandut Seberang." *Geodika: Jurnal Kajian Ilmu Dan Pendidikan Geografi* 9, no. 1 (2025): 108–17. https://doi.org/10.29408/geodika.v9i1.28215.
Setiawan, Toni. "Efektivitas Peraturan Daerah Kota Metro Nomor 5 Tahun 2016 Tentang Ruang Terbuka Hijau Menjadi Lapak Pedagang Kaki Lima Perspektif Maslahah Mursalah." IAIN Metro, 2024.
Siregar, Hamzah. "Penerapan Peraturan Menteri Nomor 28 Tahun 2015 Tentang Penetapan Garis Sempadan Sungai Dan Garis Sempadan Danau (Studi Kasus Kelurahan Timbangan) Kota Padang Sidempuan," 2023, 100.
Taufik, Salsabila Rifdah, Bagas Nathaniel, Elkayoan Radita, and Ririn Rimawan. "Analisis Pengaruh Bangunan Krib Terhadap Kecepatan Aliran Pada Tikungan Luar Sungai Kalibuntu Menggunakan Pemodelan Numerik." *Jurnal Teknik Hidraulik* 16, no. 1 (2025): 49–60.
Yuliana, Candra, Arya Rizki Darmawan, Elma Sofia, and Muhammad Hafizhir Ridha. "Perencanaan Sodetan Kuranji-Sungai Panggung, Kec. Cempaka." *ABDIMASKU: JURNAL PENGABDIAN MASYARAKAT* 5, no. 1 (2022): 46–52.