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NATURE-BASED SOLUTIONS (NBS) IN THE IMPLEMENTATION OF FLOOD POLICIES: INCONSISTENCIES AND IMPACTS IN JAKARTA

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Abstract. The global trend of NbS is a new thing as a reference for government initiatives in determining the flood policies in Jakarta. However, NbS through the concept of river naturalization is considered as a causing of inconsistency in the implementation of flood policies. This research aims to analyze the phenomenon of flood policy inconsistency along with the impacts and obstacles in the implementation of NbS. This research uses a qualitative method by conducting in-depth interviews and document studies. The results of this study conclude that the implementation of NbS in Jakarta has not been optimal with various underlying factors behind it. These factors include the lack of collaboration among the actors involved; the lack of suitability of the topographical conditions of the area; and the lack of suitability of the community and natural ecosystems.

Keywords: inconsistency; implementation; flood policy

I. INTRODUCTION

Jakarta is one of the city in Indonesia with a relatively high potential for flooding disasters. The potential for flooding in Jakarta is demonstrated by the recurring flood events each year. The floods in Jakarta are caused by several factors, including river overflow due to high rainfall in the upstream and downstream areas of the river, Jakarta's low topography, and sea tides (Badan Perencanaan dan Pembangunan Daerah, 2012). Various factors contributing to the high intensity of flooding in Jakarta have drawn attention from various countries, leading to the label "The Fastest Sinking City" (Lin & Hidayat, 2018). The potential of Jakarta as the fastest sinking city is evidenced by several phenomena. First, the continuous subsidence of Jakarta's land surface. This leads to a high level of vulnerability for Jakarta as a coastal city to significant tidal inundation (Andreas et al., 2018). The LiDAR Digital Elevation Model shows an increased potential for Jakarta's submergence in 2025, with an area of 26.68 percent, and in 2050, with an area of 35.61 percent.

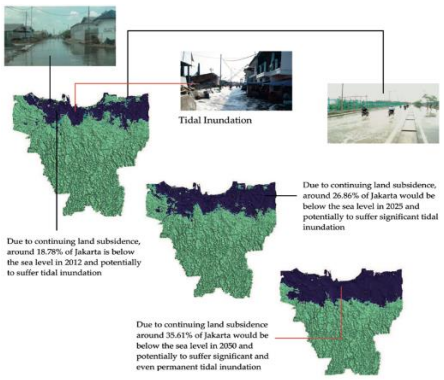

Figure 1. Map of Tidal Flood Inundation and Projection of Tidal Flood Inundation in Jakarta. *Source: Andreas, et al. (2018)*

Second, the limited availability of infiltration areas in Jakarta. Kimmelman (2017) mentions in his article that 97 percent of Jakarta's area is covered by concrete and asphalt. This is a risk phenomenon due to uncontrolled urban development in Jakarta. The lack of infiltration areas, especially during the rainy season, results in a high potential and intensity of flooding disasters in Jakarta. Third, there is a cycle of "five-year floods," which are large-scale floods that occurred in 2002, 2007, and 2013 during the contemporary political regime of Jakarta from 1998-2016 (Octavianti & Charles, 2018). The high potential for flooding disasters in Jakarta has prompted the Jakarta government to undertake various control measures, one of which is the implementation of river normalization programs.

Table 1. Area Affected by Floods in Jakarta

Year	Area (Ha)
1980	770 Ha
1996	2.259 Ha
2002	16.778 Ha
2007	23.832 Ha

Source: The World Bank (2010)

(The table above illustrates the area affected by major flood in Jakarta).

The implementation of the river normalization program has been a policy program since it was included in the Regional Long-Term Development Plan (RPJPD) of DKI Jakarta for the years 2005-2025. In essence, the implementation of the river normalization program is an adaptation of the river canalization program that has been carried out in Jakarta since the Batavia era, through various challenges in the early 20th century (Arsip Nasional Republik Indonesia, 2003). The consistent implementation of the river

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normalization program has made it the main solution for flood policies in Jakarta for several years. However, the implementation of flood policies has experienced inconsistency, marked by the emergence of the Nature-based Solutions (NbS) concept through the implementation of the river naturalization policy in 2017. The river naturalization policy essentially involves the policy's implementation without land acquisition and concrete construction along the riverbanks. This is in stark contrast to the river normalization policy that has been consistently implemented for many years.

Table 2. Number of Districts Affected by Floods in Jakarta (2014-2020)

Year	Period	Number of Districts
2014	January - February	58
2015	January - February	53
2016	March – April	32
2017	February - March	51
2018	February - May	32
2019	March – April	40
2020	January - February	77

Source: Pantau Banjir Jakarta (https://pantaubanjir.jakarta.go.id/data-banjir-lintas-tahun)

(The table above represents the total number of districts in Jakarta affected by flooding over specific periods each year, from 2014 to 2020).

Consistency is a crucial and essential aspect in policy implementation. Consistency has been demonstrated as a factor influencing the formulation of strategies to strengthen and ensure the success of policy implementation (Engen et al., 2018). In opposite, inconsistency often leads to conflicts and disruptions in policy implementation. Moreover, inconsistency results in overlapping and contradictory policy implementations (Perna, 2020). In the case of Indonesia, the impact of inconsistency on policy implementation is elucidated through various forms of conflicts, such as delays in land certificate issuance at the district level (Tobing et al., 2021), and conflicts between online-based and conventional motorcycle taxi drivers at the national level (Gusti, et al., 2021). A deeper exploration of consistency in policy implementation is also exemplified in a research case concerning the chaotic policies in response to the Corona Virus Disease-19 (Covid-19) pandemic in China, caused by inconsistent implementation of a mix of policies (Ciqi Mei, 2020). It is further argued that blending or mixing various policies should align with rooted national policy types to ensure consistent and effective policy implementation. This same reflection can then be applied to the flood policy implementation in Jakarta, involving an analysis of consistency between river normalization and river naturalization policies, along with the ensuing impacts and obstacles. According to Sabatier and Mazmanian (1980), policy implementation is described as the stage of carrying out basic policy decisions, often manifested in the form of laws. The mentioned basic policy decisions identify the issues to be addressed, establish the goals to be achieved, and structure the policy implementation process. Throughout this process, various external variables influencing implementation are also considered.

Based on the explanations, this study, in general, aims to analyze the phenomenon of policy inconsistency in flood policies, along with the impacts and obstacles inherent in the application of NbS. Broadly speaking, this research highlights the root problem stemming from the high potential for flood in Jakarta, which subsequently triggers inconsistencies in the emergence of various policy contents. This, undoubtedly, affects policy implementation, including programs for river normalization and river naturalization with differing and contradictory concepts. The analysis conducted on the policy clash between the river normalization and river naturalization programs in Jakarta focuses on the phenomenon of policy inconsistency along with the resulting impacts and obstacles. The issues related to policy inconsistency, as described above, are similar to those elucidated in various case studies in different countries in previous research (Contesa et al., 2018; Carey et al., 2019; Perna, 2020; Tobing et al., 2021; Gusti, et al., 2021; Engen et al., 2019).

Public Policy

Analysis of public policy can begin with an understanding of public policy itself. In this study, the approach to understanding public policy is based on the definition provided by Thomas R. Dye. Based on various literature quotes in this research, Dye (1972) defines public policy as everything chosen by the government to be do or not to do. William I. Jenkins (1978) explains public policy as a set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them. This emphasizes the government as the primary actor in public policy. In this phenomenon, the government bears the greatest responsibility in determining the consistency and success of a policy. Engen et al. (2018) explain through the phenomenon of the correlation between policy consistency and frontline workers, that it is important for them and other stakeholders to perceive and feel government policies over time. Through the case study, it is explained that policy continuity over time influences the workers. A similar inverse relationship also occurs in the opposite conditions. Various inconsistent and fluctuating policy changes have the potential to create resistance among workers, which then affects the overall policy efficiency, effectiveness, and legitimacy. The crucial role of government involvement in policy consistency is also evidenced by the Indonesian phenomenon in facing Covid-19. Radjab and Fuady (2021) explain that the inconsistent government stance has caused difficulties and suffering for the people in facing Covid-19. The forms of its policy inconsistency begin with inconsistencies in the legal framework applied in related policies. Additionally, policy inconsistency is also evident in conflicts between ministries as well as between the central and regional governments. This then impacts policy implementation in the form of legal uncertainty, leading to the loss of various rights of people in various activities. The various explanations above indicate that the consistency or inconsistency of policies has a direct impact overall, both in terms of policy content formulation and policy implementation.

Nature-based Solutions (NbS)

NbS is a concept with solutions that can facilitate and simplify implementation actions in urban landscapes by considering the services provided by nature. This includes urban green spaces such as allocating natural habitat areas in floodplains to reduce flood impacts (Kabisch et al., 2017). The concept of NbS, as defined from the perspective of the International Union for Conservation of Nature (IUCN), aims to protect, sustainably manage, and restore natural or modified ecosystems to effectively and adaptively address societal challenges while simultaneously providing benefits for human well-being and biodiversity (Cohen-Shacham et al., 2016). The European Commission defines NbS as a nature-inspired and supported solution that is cost-effective and simultaneously provides environmental, social, and economic benefits to help build resilience. Related solutions bring more diverse natural features and processes into urban, landscape, and marine areas through locally adapted, resource-efficient, and systemic interventions (European Commission, 2016). In essence, NbS can be summarized as sustainable natural management or restoration actions that concurrently aim to benefit communities and the surrounding

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environment. More specifically, these natural management or restoration actions always involve economic development goals and community resilience effectively and efficiently at the same time. NbS can be considered as solutions or actions to improve environmental and human health based on the use of Urban Green and Blue Infrastructure (UGBI) (Pinto et al., 2023). Green Infrastructure (GI) involves urban designs based on vegetation, while Blue Infrastructure (BI) is water-based solutions. Green and Blue Infrastructure (GBI) has created various opportunities for renewing natural water balance structures in various cities through increased rainwater retention and expansion of permeable areas such as rain gardens, green roofs, and vertical greening systems (Pochodyła-Ducka et al., 2021). Green and blue networks are also said to enhance environmental quality, natural area conditions and connectivity, as well as improve community health and quality of life through the development of related infrastructure that impacts the emergence of various green jobs and economies (European Commission, 2013).

Understanding NbS cannot be detached from its connection to UGBI as one of the tools in implementing NbS in various disaster control policies, especially floods as a common hydrological issue in various cities. Today, GBI has gradually replaced various conventional/gray infrastructures (Grey Infrastructure), which are human-engineered solutions involving concrete and steel. Some examples of GBI use in NbS implementation can be seen in various cities such as Bogota, Colombia, where conservation and landscape restoration activities are undertaken as alternatives to replace conventional water treatment technologies; Ho Chi Minh, Vietnam, choosing mangrove forest restoration activities instead of building seawalls along the coastline to restore storm-damaged areas; and Texas, USA, where a chemical facility in the area chose wetland construction over well injection for wastewater treatment (Talberth & Hanson, 2018).

Specifically concerning flood issues and hydrological problems in Jakarta, the use of GBI is implemented through river naturalization policy programs. This can be seen as an implementation of the reference case of GBI use in Singapore, where from 2009 to 2012, naturalization projects were undertaken on concrete stormwater drains crossing parks to transform them into meandering rivers with lush vegetation along a 3-kilometer stretch (WWF, 2021). Based on the same documents and case studies, NbS is considered cheaper than conventional gray infrastructure, and at the same time, NbS in Singapore serves as an example of solutions that can enhance local ecosystems, beautify landscapes, and have significant impacts on people's lives.

Strategic Planning

Understanding public policy with the characteristics of governance in Indonesia is complemented by Bryson and Edwards (2017) through the perspective of Strategic Planning. The perspective of Strategic Planning further explains various features used in characterizing planning in the public sector, one of which is the focus shifting from broad-scale agendas to more selective actions. In line with the course of flood policy in Jakarta, the formation of policy is based on national-scale regulations through Law Number 24 of 2007 as a reference. This is then followed by the formulation and implementation of further policies through regional-scale regulations, including the Jakarta Provincial Government's Long-Term Development Plan (RPJPD) for the years 2005-2025, which is then further derived into the Medium-Term Regional Development Plan (RPJMD) in five phases as a continuity reference for subsequent policy:

a. RPJMD phase I (2005-2007)
b. RPJMD phase II (2007-2012)
c. RPJMD phase III (2013-2017)
d. RPJMD phase IV (2017-2022)
e. RPJMD phase V (2022-2025)

As the flood policy in Jakarta progresses with similar characteristics, the sustainability and consistency of RPJMD requires full attention to ensure the realization of RPJPD consistency spanning 20 years.

II. RESEARCH METHOD

This research is descriptive and employs qualitative data collection techniques consisting of primary data including in-depth interviews and secondary data including various relevant literature studies and document studies. In-depth interviews are conducted in a planned manner with various research questions regarding the related research theme prepared for the informants. The in-depth interview process is then conducted face-to-face with informants having the freedom to answer various prepared questions. The informants selected for this study include the Jakarta Provincial Government's Water Resources Agency (SDA); the Governor's Team for Accelerating Development (TGUPP) during the tenure of Governor Anies Baswedan; as well as residents in affected areas.

Document studies are conducted based on the collection of various documents accessible online or obtained directly from the informants. Document studies in this research include various government regulation documents related to regional development plans, various regional regulations, gubernatorial regulations, and relevant literature studies related to the research including research journals and briefing papers. Data processing is then conducted using the Flow Model analysis technique, which includes data reduction, data presentation, and conclusion drawing (Miles and Huberman, 1994).

III. RESULT AND DISCUSSION

This research is descriptive and employs qualitative data collection techniques consisting of primary data including in-depth interviews and secondary data including various relevant literature studies and document studies. In-depth interviews are conducted in a planned manner with various research questions regarding the related research theme prepared for the informants. The in-depth interview process is then conducted face-to-face with informants having the freedom to answer various prepared questions. The informants selected for this study include the Jakarta Provincial Government's Water Resources Agency (SDA); the Governor's Team for Accelerating Development (TGUPP) during the tenure of Governor Anies Baswedan; as well as residents in affected areas. Document studies are conducted based on the collection of various documents accessible online or obtained directly from the informants. Document studies in this research include various government regulation documents related to regional development plans, various regional regulations, gubernatorial regulations, and relevant literature studies related to the research including research journals and briefing papers. Data processing is then conducted using the Flow Model analysis technique, which

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includes data reduction, data presentation, and conclusion drawing (Miles and Huberman, 1994).

Table 3. Directions and Programs of Flood Policy in Jakarta

RPJPD	RPJMD I-III	RPJMD IV
• The massive and structured sea water protection system through the development of seawalls along the coast of Jakarta Bay • A combination of polder and canal systems tailored to the physical characteristics of the area • Development and management of drainage channels hierarchically from local areas to citywide scales	• Development of lakes, reservoirs, and retention ponds • Improvement of drainage systems • Development of polder systems • River and canal normalization • Strengthening of embankments • Construction of infiltration wells and biopore holes • Construction of multifunctional underground tunnels	• Construction of coastal embankments and river estuaries • Dam construction • River naturalization and normalization • Improvement of water governance • Construction of integrated or multipurpose tunnels

The phenomenon of inconsistency is then demonstrated through the direction and implementation of river naturalization policies carried out amidst the river normalization policy implementation process. The change in policy direction and implementation has shifted the focus of the Provincial Government from Grey Infrastructure (GI) to Green-Blue Infrastructure (GBI). This has led to various new problems, such as the hindrance of river normalization processes in the major Ciliwung River, which contributes to creating other issues. Moreover, the hindrance of river normalization can clearly occur due to significant differences in the characteristics of GI and GBI. Through interviews with the Flood Control and Drainage Planning Group, Jakarta Provincial Water Resources Department, flood policies have undergone changes due to a shift towards multifunctional and integrated policy focus. GBI as a global trend has become one of the triggers for the direction and implementation of policies towards river naturalization. Through interviews with the Governor's Team for Accelerated Development (TGUPP), there are several advantages in implementing GBI for flood, including the lesser land acquisition for river naturalization compared to river normalization; fulfilling natural factors by restoring the river's nature; and optimization through supporting facilities such as infiltration wells. However, implementation amid the river normalization process has become another source of problems.

According to one member of the Governor's Team for Accelerated Development (TGUPP), Usamah Abdul Aziz, it is stated that the problems that have existed with river normalization as GI in flood policy are the reasons behind the urgency of the river naturalization policy program. River naturalization as GBI is carried out by minimizing or not freeing up land along the river as an effort to concrete it as in river normalization. The river naturalization policy program then began to be implemented, marked by the issuance of Jakarta Provincial Regulation (Pergub) No. 141 of 2019. This ultimately hindered the ongoing river normalization process. The hindrance experienced subsequently creates various impacts, such as the minimal progress in flood in Jakarta.

Impact of Nature-based Solutions Policy Implementation

The consistency of Grey Infrastructure (GI) implementation that has been ongoing cannot be denied to have significantly impacted flood in Jakarta, although the potential for flood has not completely disappeared. This is also supported by several local communities such as those in Kampung Pulo and Bukit Duri. Through interviews with several local communities, there is various support for the river normalization efforts that have been ongoing. This support is based on the significant differences felt by the local community, such as the decreasing frequency of flood, especially during the rainy season. Nature-based Solutions (NbS) through Green-Blue Infrastructure (GBI) implemented amidst the stages of RPJPD have become one of the differences that create the phenomenon of inconsistency as explained earlier. Through the various advantages and disadvantages of implementing GBI in flood policy, the inconsistency that ultimately occurs triggers conflicts that cannot be separated among key actors including the Provincial Government and the Ministry of Public Works and Public Housing (PUPR). In the process of implementing flood policies, river normalization is one of the policy programs that involve two key actors. The involvement of the Provincial Government and PUPR occurs in efforts such as river widening and dredging, as well as the construction of embankments and concrete structures. The collaboration includes technical implementation of land acquisition by the Provincial Government and dredging to canalization by PUPR. The implementation of NbS/GBI in flood automatically separates their roles by eliminating massive land acquisitions of riverside settlements and the cessation of PUPR's role in canalization due to land unavailability. The differences in interests then impact the actualization of related policy actors' roles, which are not optimal.

The decrease in optimization of actor roles is one of the impacts of NbS implementation that becomes increasingly evident in the field. The Provincial Government's authority in implementing NbS, which hampers river normalization in the middle of the process, serves as an indicator for PUPR not to continue its role. The implementation of NbS accompanied by minimal collaboration between the two actors affects the stalled river normalization process to the less-than-optimal naturalization process. Nevertheless, the implementation of NbS in flood has several other positive impacts in certain implementation areas. Through interviews with the same sources, this is confirmed, such as the functional implementation of river naturalization in Pos Pengumben, West Jakarta; and Brigif, South Jakarta. The technical success of NbS implementation in these areas is exemplified by the integration of social, economic, and natural ecosystem functions. This is also supported by the success of riverbank arrangement activities, including planting and greening efforts.

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Challenges in the Implementation of Nature-based Solutions Policy

In the process of river naturalization implementation, the application of NbS faces several obstacles, one of which is the same barrier encountered in river normalization, namely land acquisition. Although it has been previously stated that river naturalization does not require land to the same extent as river normalization, land acquisition remains a crucial issue in flood policy implementation. According to Ir. Maman Supratman, S.T., M.Sc, Chair of the Sub-Group for Flood Control and Drainage Planning, Jakarta Provincial Water Resources Department (SDA), river naturalization is a policy program that cannot currently be carried out at all points in Jakarta. This is based on the dependence of river naturalization on the water quality of each river in Jakarta. In addition to the mentioned challenges, obstacles to the implementation of NbS are also evident through various missteps in the implementation of river naturalization policy programs. These errors are directed at the location of river naturalization as areas that are not prone to flooding. The inaccuracies that occur can be assumed to result from the lack of suitability of the topographic areas in some river points in Jakarta for river naturalization. Topographical issues in Jakarta ultimately become a real hindrance to the implementation of NbS policy. Although NbS conceptually demonstrates harmonious integration between 'green' and 'blue' aspects in a region, especially in many areas in Europe, the implementation carried out in Jakarta shows a series of obstacles created by the resulting domino effects. Topographical issues and the impacts on surrounding communities indicate that the implementation of NbS seems to require further adjustment and study. The perspective of the Jakarta Provincial Water Resources Department (SDA) sees flood in Jakarta as a complex issue that cannot be solved with just one solution, whether river normalization or river naturalization, but with various integrated flood control concepts. In addition to the issues mentioned, conflicts among actors as a result of the implementation of river naturalization policy should also be considered as obstacles to the implementation of NbS in Jakarta. Essentially, harmonious collaboration among government roles, suitability of river topography conditions, and the compatibility of community and environmental ecosystems are important for the successful implementation of flood policies, including river naturalization as NbS.

Various impacts resulting from the implementation of river naturalization policy programs raise assumptions about the need for further studies and evaluations regarding their suitability with the natural and social conditions in Jakarta. Additionally, the implementation of NbS, which is relatively new in flood policy programs, requires further adjustment to various previously implemented policies. Essentially, this is done to minimize conflicts of interest and roles among the involved actors so that the optimal relationships that occur can have a positive domino effect on policy implementation, particularly in the case of NbS. Frantzeskaki (2019) outlines seven points to consider in NbS planning in cities. First, NbS is described as a concept that must be aesthetically appealing for the community to appreciate and protect it. Second, NbS can create a new green city, supported by its nature-based application, which creates a sustainable new ecosystem. Third, NbS experiments require and can build trust between the city and its community. Fourth, NbS requires various forums for its creation, with urban social innovations expected to be included and learned from. Fifth, NbS requires a collaborative governance approach. Sixth, there needs to be an inclusive narrative about the NbS mission to provide knowledge and agendas across various city sectors, aiming to minimize sectoral disputes. Last, NbS needs to be designed at the appropriate scale for effectiveness and easy replication in various locations. In addition to focusing on NbS itself, the role of the involved actors is also crucial. The effectiveness of various actors involved (co-creation) is interconnected with decision-makers (co-governance) as both evolve and are inherently related to policy-making and broader societal order. Furthermore, GBI as a significant contributor to urban resilience requires a comprehensive understanding of the institutional infrastructure for governance (Bixler, et al., 2020). Based on these considerations, NbS implementation cannot overlook the role of optimal actor involvement. Synergy and collaboration among actors remain necessary. The alignment and compatibility of NbS implementation with various factors described are expected to maximize flood in Jakarta with various positive impacts that can be felt by the local community and continue to be sustained.

IV. CONCLUSIONS

The phenomenon of inconsistency and various impacts resulting from the implementation of NbS through river naturalization policy presents a challenge for the Jakarta Provincial Government initiative. Based on the research findings and discussions, NbS as a new reference for the government in implementing flood policies in Jakarta has not yet found synergistic suitability among the government's roles, the suitability of river topography conditions, and the compatibility of the community and natural ecosystems. This is evidenced by the timing inconsistency of the change in direction and implementation of river naturalization policy amid the river normalization policy process. This phenomenon is a manifestation of NbS implementation as a form of inconsistency in flood policies in Jakarta, which have traditionally focused on using GI as the primary flood solution. The impacts arising from the described policy inconsistency include hindered implementation of river normalization policy programs, leading to suboptimal and insignificant flood control. Furthermore, the impact of NbS implementation as flood policy includes clashes of interest among the involved actors, including the Jakarta Provincial Government and the Ministry of Public Works and Housing. This has led to suboptimal collaboration in the formulation and implementation of flood policies. However, there are various positive impacts of NbS implementation evident in several areas of Jakarta. This success is demonstrated through the emergence of activities in riverbank arrangement and the functioning integration of social, economic, and natural

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ecosystems. Obstacles in the NbS implementation process include the ongoing need for land acquisition, errors in the placement of implementation locations for river naturalization policy programs, and conflicts among the involved actors. These issues are also rooted in the complex flood problems in Jakarta, leading to successful NbS implementation in other countries like Europe encountering domino and complex issues in Jakarta. Practical recommendations from this research include: 1) Further studies, analysis, and evaluation by the government on NbS implementation through river naturalization are needed to minimize existing NbS problems and obstacles; 2) Consistency is needed for the government in formulating the direction and content to the implementation of flood policies. This can be achieved by implementing NbS without hindering the ongoing GI process; 3) Optimization of collaboration among related actors, including the government and the community, in implementing NbS.

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