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PUBLIC POLICY APPROACH TO DISASTER RISK ANTICIPATION STRATEGIES IN CIVIL ENGINEERING STUDIES IN INDONESIA

B.M.A.S. Anaconda Bangkara
President University, Cikarang Bekasi, Indonesia
anaconda@president.ac.id

Henry Kristian Siburian
Universitas Budi Darma Medan, Indonesia
yustisiimandiri@gmail.com

Ani Heryani
Sekokah Tinggi Ilmu Administrasi YPPT Tasikmalaya, Indonesia
aniheryani248@gmail.com

Adi Mursalin
Universitas panca bhakti, Pontianak, Indonesia
upb2766@gmail.com

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Can Stories;
Anticipation Risk;
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Abstract

This study described a public policy approach to anticipate the impact of natural disasters in Indonesia's civil engineering context. Many studies have reported how public policy approaches anticipate and manage disaster risk strategies. However, few relate to the role of civil engineering, especially the younger generation involved in designing policies and playing their role in natural disaster management. This study has reviewed 50 disaster papers that we analyzed with a phenomenological approach to understanding the role and approach of public policy in dealing with disaster hazards and risks. Our Monalisa system involves data coding, in-depth evaluation, and impotence of data to get the most answers. After a series of studies and discussions, we can conclude that the disaster management policy was originally a policy designed by the state and then directed to the National Disaster Management Agency following presidential regulations so that the law was made an effort to cope with disasters and be responsible to the state. The relationship between civil engineering is that they participate in policy and impact analysis studies closely related to public and private development. We hope that these findings will become an essential friend for further studies.

INTRODUCTION

Naturally, dealing with various natural disasters necessitates practical mitigation efforts aided by funding for prevention, mitigation, preparedness, and non-emergency and disaster impact recovery (Saadi, 2023). As a result, disaster-prone policies and careful prevention must be developed first. The first steps to lessen the impact of the possibility of a disaster are activities aimed at disaster prevention. Naturally, the individual in charge of disaster management is planned in a coordinated and integrated manner at the community level, particularly the government, both at the central and regional levels (Handayani et al., 2019). Indonesia, one of the nation's prone to natural disasters, must safeguard the community against all disaster threats following government regulations. Based on law 24 of 2007, the government seeks to improve the welfare of all citizens through disaster management; The National Disaster Management Agency technically carries out a variety of activities and tasks at the center and the province to help the government deal with disasters. Because Indonesia is prone to earthquakes and other natural disasters, such as volcanoes, tsunamis, and landslides (Amri et al., 2017), disaster management involves the central government and the regional governments. This is due to Indonesia's location in the Pacific ring of fire, which makes it one of the area's most susceptible to land disasters.

In addition to natural disasters, the Unitary State Constitution of the Republic of Indonesia and Law No.24 of 2007 on Disaster Management has also seen increased human-caused disasters (Andi et al., 2022, September). This has a lot to do with the industry's growth, which puts people in danger when technological mistakes and omissions happen. Numerous disasters are brought on by other human activities that destroy the environment and cause imbalances in the environment, which in turn bring about disasters. In addition, several factors contribute to natural disasters, including encroachment, development of settlements without proper planning, critical land, erosion, sedimentation, livestock waste, environmentally unfriendly agricultural cultivation, industrial waste, domestic waste, and management issues (Aryesam, 2019, February). Even the area traversed by the equator in that region has a low incidence of tropical storms and earthquakes. Indonesia is a country in a tropical region that is prone to natural disasters in the tropics. Indonesia is a region and a disaster because it is traversed by the circum-pacific, also known as the Pacific ring of fire. The circum-pacific is where many tectonic plates meet to form approximately 75% of the world's volcanoes (Handayani et al., 2018).

Based on morphological conditions, the cause of the flooding is due to the very varied relief of Indonesia's landscape, and many rivers flow between them (Zulyadi, 2017). These flood-prone areas are exacerbated by deforestation or land use changes that do not pay attention to water catchment areas. This is why Indonesia is a country that is prone to earthquakes. Based on the model and the kinds of disasters, Indonesia has many active volcanoes caused by volcanic activity or the active bowels of the earth, including earthquakes and volcanic eruptions (Kusumasari & Alam, 2012). Now,

suppose people are wondering why Indonesia is one of the countries with many earthquakes. In that case, the answer is that Indonesia is where the Earth's Pacific, Russian, and Indo-Australian plates come together. The movement of these three plates, which can lead to an earthquake, typically depends on the event's magnitude. On the amount of pressure produced by the plate's movement. The first reason that caused Indonesia to become a disaster-prone area is that it is traversed by the Pacific Circum, the Pacific Ring of Fire (Hapsari & Zenurianto, 2016). The Pacific Circum is a seismic belt where many tectonic plates meet. So, the correct answer to this question is to make a map of geological, climatological, and biological disaster-prone areas, provide counseling or disaster mitigation to people who live in natural disaster-prone areas, and create disaster-resistant infrastructure (Kusumastuti et al., 2014).

Our observations of the Aceh tsunami disaster and a series of disasters in the country show that stakeholders are involved in more post-event activities, such as emergency response and recovery, than pre-event activities, such as disaster reduction/mitigation and preparedness (Chang et al., 2012). Potential hazards and losses that may occur during a disaster can be reduced if we pay less attention to previous activities. Education to raise awareness of disasters, disaster drills, the development of disaster-resistant technology, the development of disaster-responsive social systems, and the formulation of management policies are examples (Luetz, 2020). Activities can be carried out before a disaster occurs (disaster management policy). Disaster management activities can generally be divided into three main categories: Preparation, mitigation, preparedness, and early warning activities before a disaster occur; When a disaster occurs, activities such as search and rescue (SAR), emergency assistance, and evacuation are examples of emergency response efforts to relieve temporary suffering (Ray, 2017). Post-disaster activities include recovery, rehabilitation, and reconstruction. Whereas activities at the pre-disaster stage are critical because what has been prepared at this stage is the capital for dealing with disasters and post-disasters, most of which have been forgotten.

Both the public and private sectors, let alone the government, do not think much about the actions to deal with disasters or reduce their impacts. The government, the private sector, and the community will pay full attention to activities carried out immediately after a disaster to reduce its impact, especially those involving the rescue of victims and property and subsequent evacuation (Sobel & Leeson, 2010). Many people usually pay attention to disasters and reach out for energy, moral support, and material assistance. The amount of assistance received is a benefit that needs to be adequately managed to be effective, targeted, helpful, and efficient. Activities at the post-disaster stage include restoring infrastructure and facilities to pre-disaster conditions to improve community conditions. At this point, it should be remembered that the rehabilitation and reconstruction that will be carried out must follow the rules set after the disaster (Birkmann et al., 2010). In addition to physical rehabilitation, they should also pay attention to psychological rehabilitation, such as dealing with anxiety,

traumatic events, or depression. As can be seen from the previous description, the pre- and pre-disaster stages of the disaster management cycle are weak links. This stage needs to be increased to avoid or minimize the impact of disasters (Hopkins, 2012).

RESEARCH METHOD

This section describes the study's management to understand the public policy approach in anticipation and strategy of natural disaster risk in civil engineering lessons (Hafstad et al., 2012). By reviewing some books and academic work in the field of disaster and policy strategies. as well as. The analysis involves in-depth data coding, critical data evaluation, and interpretation to obtain relevant security answers to problems. This study relied entirely on secondary data from books and academic journal articles released between 2010 and 2012 (Van Kessel et al., 2015). The data search was carried out electronically, and we pinned keywords on Google Scholar through the available literature. A descriptive qualitative study report is compiled with section problems, then data search and the last section is the closing (Ainehvandet al., 2019).

RESULTS AND DISCUSSION

Public Policy Strategy for natural disaster response

A strategy is a holistic approach that addresses long-term activities' concept, planning, and implementation. A good strategy focuses on identifying the supporting factors that follow the principles of implementing rational ideas, funding efficiency, and effective goal-achievement strategies (Chen et al., 2013). The overall actions of the organization to achieve its objectives are described in the strategy. This strategy is an effective and expansive plan—for any organization to achieve its goals. Strategy is a plan to achieve the organization's vision, mission, and goals (von Detten, 2011). The means-ends and means are the three most essential components of a strategy. It is knowing and understanding the goals that need to be achieved by looking at the organization's resources and routes. Since this strategy is an effective and essential plan, it involves looking at the environment, creating a strategy, implementing it, and evaluating and controlling it. Even if not explicitly stated, every well-managed organization has a strategy. Several definitions will be discussed regarding the following strategy definition.

Alfred Chandler defines *strategy* as setting goals, determining actions, and allocating the necessary resources to achieve these goals (Bibri, 2018). Kenneth Andrew defines *strategy* as a sequence of goals, objectives, or objectives of plans and policies.

The essential plans for achieving these goals are stated in a way that defines the business and the type of organization to be followed. Buzzell and Gale say that strategy is the central policy and decisions made by management that significantly affect how well the company is financially (Kano & Verbeke, 2015). These decisions and policies

often require significant resources and are difficult to replace. Natural disasters can be interpreted in a variety of ways, both according to accepted standards and expert judgment. A disaster is an event or series of events threatening or disrupting the life of 6 Agustinus Sri Wahyudi on December 24, 2007. Strategic Management in Jakarta: Following the research of Binarupa Aksara from 1996, natural and artificial factors have an impact on the means of subsistence society, causing human death, damage environment, property loss, and psychological effects. Severe disruption to society that causes widespread and felt the damage to society, various materials, and the (natural) environment when the impact exceeds human capacity to cope with available resources is how the Asian Disaster Reduction Center defined disaster in 2003. Jha (2010) also defined *disaster* as an unusual event caused by nature or human activity. This definition includes the impact of a technical error that evokes an enthusiastic response from society, the community, and the environment. UNDP reports an event or series of events that causes more deaths, damage, or loss of property, infrastructure, essential services, or life means than would usually be considered a disaster (Baker, 2012).

Disaster Management

Preparedness is an effort to anticipate the occurrence of a disaster so as not to cause loss of life and property. Examples of preparedness actions include disaster prevention plans, communication facilities, evacuation locations, personnel training, and the provision of facilities and infrastructure (Veenema, 2018). Early warning signifies that disaster is imminent. A legitimate organization or business provides it. It consists of activities designed to inform the public of a potential disaster immediately and what happens during a disaster when an emergency response is carried out. Emergency response is a series of actions taken immediately after a disaster to overcome its adverse effects. Rescue and evacuation of victims and property, fulfillment of basic needs, handling of refugees, and rescue and restoration of facilities and infrastructure are among these actions (Anderson, 2010). The emergency response system is implemented by forming a special team responsible for controlling and handling situations in an emergency, such as fire, explosion, or accidents in the workplace. c. What followed the disaster? 1) Recovery is a series of efforts to rehabilitate facilities, infrastructure, and institutions to function normally again (MN RN et al., 2010).

Normalization of all aspects of government and community life in post-disaster areas through rehabilitation, repair, and restoration of all aspects of public or community services at an adequate level (Rifai & Sarwono, (2021). 3) Reconstruction is the continuous reconstruction of all infrastructure, facilities, and government and community institutional systems. As previously stated, Indonesia is a country that is very vulnerable to natural disasters. People often become unprepared to face today's threats because of this phenomenon. This is most likely due to the lack of awareness

and concern of the community on the impact of the disaster. Fires, landslides, and floods are disasters that often occur in most parts of Indonesia (Baarimah et al., 2021). Disasters caused by man are increasing in addition to natural disasters. This has a lot to do with the industry's growth, which puts people at risk when technological errors and omissions occur. Other human activities are to blame for many disasters, resulting in imbalances and environmental damage. In addition, several factors contributing to flooding in Bandung Regency include encroachment, settlement development without good planning, critical land, erosion, sedimentation, livestock waste, agricultural cultivation that is not environmentally friendly, industrial waste, domestic waste, and management problems (Rouhanizadeh et al. al., 2022).

The problem of the Citarum River, the main point of water flow in West Java, cannot be separated from the flooding in Bandung Regency. This problem is challenging to solve because it is constrained by several things, including the handling being still sectoral, budget constraints, the handling cannot be done alone at the district level, and does not involve the community and the private sector. The Bandung Regency Government has implemented it. Several policy strategies to anticipate vulnerability to natural disasters (Rouhanizadeh et al., 2022). The following article provides additional clarification on this topic regarding pre-disaster (Article 39 describes scenarios in which a disaster does not occur, and Article 51 describes scenarios in which a disaster may occur), Article 57 on emergency response, and Article 69 on post-disaster (Chandra & Paras, 2021), even though the results of interviews with seven general informants showed that there were still some aspects of the implementation that were not optimal, especially in the pre-disaster stage which had an impact on the disaster response stage and post-disaster situations related to improving human resources through education and disaster training in Indonesia as instructors who are supported by expertise (James & Paton, 2015).

However, from the perspective of the Pre-Disaster Stage, which includes activities related to prevention, mitigation, preparedness, and early warning, the government has carried out the practical aspects of anticipation by providing evacuation facilities, updating disaster maps, and repairs (Raikes et al., 2019), quality and quantity of facilities. These efforts are then supported by synergistic efforts that are always carried out with other agencies in anticipating the vulnerability of natural disasters, especially landslides and floods in Bandung Regency. Preventing disasters (by eliminating threats whenever possible) is the goal of preventing mining from digging in steep areas, littering, and burning forests (Wood et al., 2013; Shi et al., 2020).

Taking appropriate and efficient action, preparedness is a series of actions to prepare for a disaster. The following are some examples of what can be done to prepare: test and develop plans for managing disasters and emergencies; build, install, and assess early warning systems (Miller et al., 2013); prepare goods to meet basic needs and distribute them; methods for organizing, counseling, training, and responding to emergencies; preparation of evacuation locations; prepare accurate

data and information and keep emergency response procedures up to date; and the provision of materials, goods, and equipment for the restoration of facilities and infrastructure as well as the preparation of these goods for use (Gumelar et al., 2020). Early Warning is a series of actions taken by the competent authority (Law 24/2007) to inform the community as soon as possible about the possibility of a disaster occurring in a location or to signal that a disaster is imminent. Prior notice should: Reach out to communities in an easy-to-understand, rapid and consistent manner after a disaster (Shah et al., 2020). This stage includes activities such as emergency relief and evacuation to relieve suffering as part of the emergency response temporarily.

Disaster risk anticipation strategy

We are in a reasonably high-risk location; Therefore, Indonesia is in dire need of disaster risk mitigation, preparedness, and management. What should we do before a disaster, and how do we manage risk (Chatfield & Brajawidagda, 2013, January)? Indonesia is vulnerable to natural disasters such as earthquakes, tsunamis, and volcanic eruptions because it is an archipelago on three main active tectonic plates: Eurasia, the Pacific, and the Australian Indies. Hydrometeorology is the root cause of 98% of natural disasters in Indonesia. Because Indonesia is also an archipelagic country located on the equator, it is vulnerable to floods, landslides, flash floods, forest and land fires, extreme weather, and waves (Malawani et al., 2021).According to Silbert & Useche (2012), a disaster is an event or series of events that cause death, injury, damage, or property loss—or, on a larger scale, damage to development outcomes, the end of socioeconomic life, and environmental degradation.

Not every natural disaster occurs.Climate change is also to blame.The earthquake had a significant impact on infrastructure as well due to its inadequateness. The structural damage that is dangerous, not catastrophic, kills people. As disaster prevention is multidisciplinary and multisectoral, it will undoubtedly require contributions from various fields of study in the future, such as the one in Itenas (Fletcher et al., 2010). Because of Indonesia's position, natural disasters must occur, but how to avoid damage or casualties is unknown. The following presentation comprehensively describes disaster risk management topics such as the Indonesian Disaster Risk Index (IRBI), Security System through a Disaster Risk Management Approach, General Methods of Disaster Risk Assessment, and Structural and Non-structural Disaster Mitigation in Indonesia (Chan, 2015).

Passionate students continue to ask questions about disaster mitigation and solutions and what can be learned in lectures. The work or research developed can focus on risk management and mitigation. The reason why Indonesia's readiness is still inadequate is another matter. Dr. Raditya suggests that cultural and collective consciousness issues may have an impact. Compared to Japan, for example, whose society tends to be more homogeneous, Indonesian society tends to be heterogeneous,

which means that delivery strategies and methods for protecting communities from disaster threats will be different (Tashiro, 2020).

The Role of Civil Engineering in Disaster Anticipation

Civil engineering focuses on creating, constructing, and maintaining manufactured structures (Chen et al., 2011). As God's perfect creation, God created man in the best possible form, as stated in the Qur'an in Surah 95 in Tin in Verse 5, which is less critical. According to Sarwidi (2013), one of the proofs is that humans have worked for more than 4000 years to build various magnificent civil engineering structures (Yudelson, 2010). Everywhere, a nation is built by its citizens in the hope that it will protect their lives and support them financially to prosper. Of course, this protection also includes security against disasters. The severity and type of disaster threat vary from country to country. For example, the Indonesian government has a wide variety of hazards or sources of disasters that have the potential to cause disasters, according to historical data and scientific analysis. Currently, three choices of actions can be prioritized to reduce disaster victims and losses (Herawati & Santoso, 2011), where the cost, quality, and time of civil engineering building projects are used to evaluate performance. The building must be of high quality to ensure its resistance to failure during construction and use. The failure of a building can bring disaster or make it worse. As a result, disaster management efforts rely heavily on civil engineering. The role of civil engineering in natural disaster management will be briefly discussed in this Paper (Macdonald et al., 2012).

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Disaster Management

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National Disaster Management Agency) Moreover, Regional Disaster Management Agency coordinates the management of disaster victims and losses in Indonesia according to Presidential Regulation no. Currently, three options can be prioritized in tackling the dangers of natural disasters. The first is to keep people away from the source of the disaster and maintain local wisdom that still makes sense or is still adequate to be applied (Malm, 2020). The first step is to keep the community away from the source of the disaster, which means keeping the settlements away from the source or the threat of disaster. Live in harmony with the threat of disaster by utilizing and developing science and technology. Moving a settlement to another location with a much lower disaster risk is usually referred to as relocation if an area has a very high disaster risk. However, the community is unwilling to build there (Pearson & Mitroff, 2019).

The second step is to keep the causes of disasters away from people, such as keeping high-risk industries or nuclear power plants away from cities. Implementing this step is challenging for earthquake disaster management (Tarlock, 2012). This step can be taken for flood disaster management by building flood barriers and creating new streams or rivers far from the city and carried out strictly by using science, technology, and practical local wisdom that is still being used effectively (White et al., 2018). Settlements and other artificial structures remain or are built in locations close to the source of the disaster in this third step. Threat reduction, vulnerability reduction, and capacity building are needed to make buildings or settlements usable. The threat cannot be reduced for disasters caused by earthquake shocks (Hegger et al., 2014). However, the vulnerability of buildings and their communities can be reduced, and the capacity of disaster management agencies and communities can be increased

by educating the general public about seismic issues and the construction community about earthquake-resistant buildings (Sanquini, 2015).

Disaster Management System

Indonesian Law Number The document 24/2007 (UUPB) serves as the foundation for Indonesia's system building of a disaster management system (Rachmawati, 2017, June). For Indonesia's disaster management efforts to yield the best possible outcomes, the National Disaster Management System must guide all of them. Disaster risk reduction or management is not a consumption activity; instead, it is an investment activity. Because, in essence, disaster management activities are attempts to save much larger assets in the future by making use of existing resources. Law, institutions, funding, planning, science and technology, and aspects of maintenance are just a few of the subsystems or components that make up the disaster management system (Djalante & Thomalla, 2012). Other subsystems include legality, institutionalization, funding, planning, and implementation.

The world of civil engineering is related to the construction of buildings, both public buildings and private buildings. These buildings are then processed through several stages, with the interaction of several related parties—the construction project manager, where the project is measured (Park & Ock, 2016). The role of civil engineering in disaster management figure 8 (Master of Civil Engineering, Islamic University of Indonesia, 2012) depicts performance based on cost, quality, and time. The role of civil engineering in disaster management demonstrates the connection between the construction of public and private buildings and the field of civil engineering. It is processed through several stages with the involvement of several related parties, including the development project's managers, as shown in, where the construction project was evaluated based on performance in terms of cost, quality, and time, as depicted in the field drawings (Doloi et al., 2012).

The construction consists of two public buildings and two TB buildings, each of which must consider the existing threats. Similarly, when it comes to building construction, the concept of a general plan and a unique plan should be the first thing that comes to mind. After that, a feasibility study should be conducted to determine the in-depth construction planning. After that, construction supervision, use, and maintenance should be implemented (Bilal et al., 2016). All processes, one through three, should include six development concepts. The UUPB explicitly mentions, for instance, in article 79, how the following is the owner of the implementing building and how planning and monitoring must be coordinated based on national development, components of civil engineering building legislation are related to the building in which the building must be adopted in its environment, for example for construction whose costs or the environment is prone to disaster threats. The quality of the construction, the amount of time spent on it, and the costs incurred are all factors that

should be considered as indicators of development project performance (Gbadamosi et al., 2020).

According to Article 77, it has had an impact on civil engineering in the same way that it has had an impact on civil engineering-related organizations in the past (Nguyen & Aiello, 2013). In addition, the sentence stipulated in paragraph 3 of Article 75 is a minimum of eight years in prison for any offense committed by the individuals in the death of the criminal. Regulations and their connection to parallel world Civil engineering actors in Indonesia must be able to personally respond to challenges in Indonesian society, which is increasingly advanced and transparent, even like modern countries. Determinants of the implementation of development laws related to the world of civil engineering (Miller et al., 2015).

For the civil engineering works they produce to be as efficient and effective as possible, the relationship between the world of science and technology and PB implementation is that engineering and technological innovations related to civil engineering need to continue (Yuan et al., 2018). In addition, civil engineering projects can be customized as much as possible to meet the end user's needs, taking into account the specifications of the user's environment. Technologically advanced societies are undoubtedly more aware of improving disaster preparedness. Education-based disaster preparedness and construction or civil engineering training programs should continue to be promoted. Since 2004, the author has spearheaded a series of specialized training courses for earthquake-resistant housing supervisors, which led to the formation of Paman Bataga, the Association for Earthquake Resistant Building Foreman (Aziz & Hafez, 2013).

CONCLUSION

After a series and discussion of the data findings, we can finally conclude that the public policy approach to anticipating strategies to reduce disaster risk in the context of civil engineering has resulted in several understandings, among others, that public policy strategies to respond to natural disasters are holistic approaches which have a clear concept of planning, implementation, and evaluation. In designing policies, of course, think about how natural disaster management has a comprehensive strategy that is directly related, quickly, firmly, and accurately so that it can reduce casualties and losses due to natural disasters. Likewise, in carrying out natural disaster response governance, of course, there is an approach that involves the government's language community in rehabilitation efforts, repairs, and restoration of all aspects of the affected public after the disaster. This is done because the problems felt due to this disaster are substantial impacts that require the state to work optimally through laws and disaster prevention and management agencies. Furthermore, we also get strategies for anticipating natural disasters, among others; we must understand that Indonesia is one of the countries that are in the ring of fire where it is prone to

disasters; the most appropriate strategy is to prepare as early as possible what will happen so that when it happens, humans and the government are ready.

Regarding the role of civil engineering, of course, it is vast, where engineering is a job that focuses on capabilities and constructs development and its momentum; their role is enormous because they participate in designing and analyzing every impact of the development results being carried out. By understanding the concepts and the correct approach, these rings that work in the development field can design, plan and evaluate every development carried out with an insight into the anticipation of natural disaster management so that it does not become a disaster without preparation. We realize that this finding is not perfect. Therefore we hope there will be improvements and suggestions for the findings and shortcomings we describe.

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