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Securitization of Coastal Defense in The Delta Works Projects: Lesson learned for Indonesia

Maria Chris Lievonne[1], Fauzia Gustarina Cempaka Timur[2], Dr. Muhammad Hadianto[3]

[1] Postgraduate Student, the Republic of Indonesia Defense University (RIDU)
[2] Assistant Professor, the Republic of Indonesia Defense University (RIDU)
[3] Lecturer, the Republic of Indonesia Defense University (RIDU)

Corresponding Author: mlievonne@gmail.com

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Abstract: The phenomenon of sea level rise, attributable to climate change, poses a significant threat to island nations and coastal regions, including Indonesia. Jakarta, a metropolitan area with a population of 10.684.946, is projected to experience substantial flooding, with estimates indicating that by 2050, one-third of the city may be submerged. In response to this impending threat, the Indonesian government has initiated developments in coastal defense. To identify appropriate measures for Indonesia, it is essential to reference the experiences of other nations, notably the Netherlands. The Netherlands was selected due to its extensive experience in coastal defense, particularly through its Delta program. The success of this initiative commenced in 1953 following a catastrophic flood that resulted in significant loss of life and property. The Delta Works project, which was undertaken as the initial response, engaged all societal levels and aimed to safeguard coastal areas and regions below sea level from future flooding incidents. This research employs qualitative methodologies and literature techniques, presenting findings in a descriptively narrative format through the lens of securitization theory. The objective of this study is to elucidate the Dutch measures in implementing the Delta program, with a specific focus on the Delta Works, and to extract lessons applicable to Indonesia, particularly within the Jakarta region, from the successful development of coastal defense initiatives. The

findings indicate that the Netherlands established a national defense framework through the institutions of the Delta program. Key elements necessary for the success of coastal defense projects include community involvement, transparency, and a commitment to long-term engagement in the implementation of these initiatives.

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INTRODUCTION

Climate change has led to the rise of non-traditional threats (Pertahanan, 2015). Sea level rise, extreme weather events such as storms and tidal waves, and increased rainfall intensity are some of the tangible impacts that threaten human life, ecosystems, and infrastructure. The cause of sea level rise is that it is very likely that human activities have an impact on global warming, which in turn leads to accelerated melting of perennial ice and polar ice caps. It is estimated that since 1880, there has been a threat of sea level rise with an estimated increase of 20-30 centimeters (Dickinson, 2024; Swapna et al., 2020). In addition, extreme weather, such as heavy rainfall with short duration, causes potential flooding. Sea level rise, as well as extreme weather such as overflowing seawater due to heavy rainfall threaten countries that are topographically located on the coastline or below sea level. The impact is the potential emergence of various social and economic problems, such as the potential for population migration and conflicts that lead to economic losses due to conflicts.

The Netherlands is an example of a country that has a topographic condition on the coastline and lies below sea level. This puts the country at high risk of inundation. However, the country's ability to adapt causes the Netherlands to be at the forefront in overcoming the problem of sea level rise. Historically, the Netherlands has developed efforts to defend the country by utilizing technology. In the 13th century, windmills for seawater management and land reclamation created dry land. Since the discovery of the steam engine in the 19th century, water pumping machines have been used. This technology continued to be used until the formation of new reclaimed islands. However, in 1953, there was a flood in the North Sea that claimed thousands of lives and caused significant economic losses. This led to the creation of the Delta program. The Delta Works project is one of the phenomenal projects implemented from 1953 to 1997 with the main objective of saving the population in the delta area (Haasnoot et al., 2020; Pierik, 2021; Vrijling, 2019).

Indonesia as an archipelago faces similar problems to the Netherlands. The Jakarta area is the most populous in Indonesia, with a total population of 10,684,946. Researchers estimate that by 2050, one-third of Jakarta will be submerged. Based on the results of the research, the cause of Jakarta's sinking is due to excessive use of groundwater, which causes land subsidence. This has caused Jakarta to be below sea level. Therefore, if sea water overflows, Jakarta will certainly be inundated and cause a threat to millions of Jakarta residents (Fahmi et al., 2024; Keller, 2023; Wright et al., 2021).

This paper focuses on the potential for flooding caused by sea level rise from a defense perspective. Departing from this, the formulation of the problem to be studied, among others: How does the Netherlands implement Delta Works? and What lessons can be learned by Indonesia specifically for the Jakarta area? The researcher hypothesizes that the Delta program, through Delta Works, has proven to be an effective coastal defense, saving the Netherlands from the threat of flooding caused by sea-level rise while also improving the welfare of the people in the region. The lesson for Indonesia is the need for swift action and comprehensive development of coastal defense, especially in Jakarta, the most populous area. Another important lesson is the need for public participation and trust in the government for the long-term sustainability of the project. The purpose of this research is to analyze the success of the Delta Works program in addressing flooding problems in the Netherlands, identify key factors that contribute to this success, and evaluate the potential for adapting the program in Indonesia, particularly in Jakarta. The research method employed is a qualitative approach, incorporating library research and descriptive narrative.

RESEARCH METHOD

This research employs qualitative research methodologies. Data collection was conducted through library research techniques. The library method was selected due to its capacity to gather information from a variety of sources, including reports, books, scientific journals, newspapers, and additional materials. To refine the search, the keywords "Defense", " Delta Works", and "Indonesia" were utilized. Data interpretation incorporates the perspectives of relevant theories, specifically securitization and environmental security, within the framework of coastal defense. The findings are articulated in a descriptive narrative format.

RESULTS AND DISCUSSION

Dutch success in the Delta Program through Delta Works

The Netherlands is geographically located in Western Europe with the following borders: Germany to the east, Belgium to the south, and the North Sea to the West and North. The Netherlands is a low-lying country. Some areas in the Netherlands are delta areas. Delta, according to Coleman (1986), Scoot, and Fischer (1969), is the deposition of sedimentation formed

from river or estuary activities that produce irregular progradation in the coastline. Elliot (1986) states that a delta is a part of the coast that protrudes more into the sea. Meanwhile, Boggs (1987) states that deltas are deposits formed due to the fluvial sedimentation process entering calm water areas. Delta can be interpreted as an area formed due to sedimentation deposits (Karlitos Yk, 2019).

With the Netherlands bordering the sea and an average of one-third of the country below sea level, sea level rise and flooding are serious threats. In 1953, there was a major flood caused by a combination of storm surges, sea breezes, and spring tides, which resulted in the levee system being unable to withstand the rising waters. The total population of the Netherlands at the time was 10,435,631. As a result, it is estimated that 1,836 people died, 750,000 people suffered losses, and 500,000 hectares of land were flooded (Britannica, 2022; Statista Research Department, 2024; van Buuren, 2019).

According to Barry Buzan's securitization theory, there is a connectivity between society, the state, and fear. Buzan also mentioned that the reason for putting environmental issues into the security agenda is due to the magnitude of the potential threats that arise and the need to mobilize emergencies. Meanwhile, according to Ole Wæver, securitization is a process where there is a shift that was originally an ordinary problem but was upgraded to an urgent security issue. The stages in the securitization process are threat identification, declaration of emergency, and acceptance of the situation by the community. Both securitization experts provide perspectives on understanding securitization. If the problem of sea water and flooding is a security threat, it requires action from the state and participation or acceptance of the community. So efforts are needed from the Dutch government to maintain the securitization of society and the state (Burchill et al., 2022; Eroukhmanoff, 2017).

The floods of 1953 marked the inception of a significant sustainable design initiative in the Netherlands, known as the Delta program. According to information from the official webpage, the Delta program is designed to safeguard the Netherlands from both present and future flood risks as well as to mitigate the impact of extreme weather events. Furthermore, the Delta program engages in various innovations in collaboration with a diverse range of stakeholders, including local communities, the private sector, academic institutions, and non-governmental organizations (NGOs). To oversee the implementation of the Delta program, a government official is appointed called the Delta program commissioner. All information about the Delta program can be accessed by the general public (Ministry of Infrastructure and Water Management and the Delta Programme Commissioner, 2023; National Delta Programme, 2023).

The Delta Works constituted a large-scale initiative that spanned from 1954 to 1997 and is situated in the southern region of the Netherlands. Its primary objective was to safeguard the Netherlands from flooding, particularly in the delta areas of the Rhine, Meuse, and Scheldt rivers. The Delta Works functioned as a coastal defense mechanism, developed through the application of advanced technology. This comprehensive project

comprises thirteen dams, seawalls, pumps, coastal reclamation efforts, and additional infrastructure, all aimed at protecting the densely populated delta region. The actions undertaken by the Dutch government in the execution of the Delta Works involved meticulous planning, which included the conduct of feasibility studies, simulations, and community engagement to secure support and gather input. Financing is obtained through the state budget and cooperation with the private sector (Britannica, 2022; Goemans & Visser, 1987; van Buuren, 2019; van den Brink, 2021).

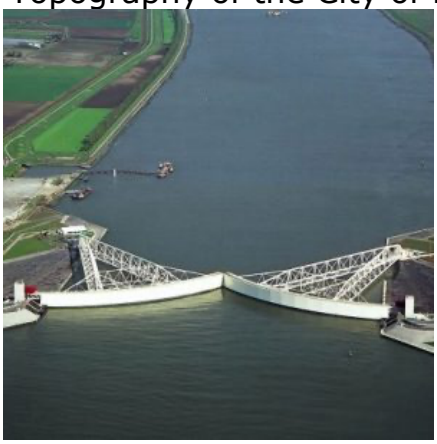
The Delta Works project was implemented in stages starting in 1954 to 1960, with the main focus on building embankments as a barrier to the *Hollandse Ijssel storm*, *Zandkreer dam*, and *Veerse Gat Dam*. From 1960 to 1970, the project was expanded to include dams and the construction of 17 sluices. From 1970 to 1980, adjustments were made to the project design to accommodate the needs of nature conservation and seawater exchange. 1980 to 1997 saw the final construction of the dam and storm surge barrier. The entire 43-year process of building the Delta Works was a major success for the Netherlands. The benefits of the project were flood protection, economic development, especially for the Dutch coastal areas, engineering innovations that followed the conditions on the ground, and civil engineering. Some of the lessons learned from the successful implementation of this project are that community involvement had a positive influence on the development of the project, sustainable funding, public-private collaboration, and long-term commitment (Disco & Toussaint, 2014; Middendorp, 2020; Van Loon-Steensma & Vellinga, 2019).

Figure.1 Topography of the City of Rotterdam

Source: topographic-map (n.d.-b)

The effective development of the Delta Works is evident in the protection built in the coastal areas of the Netherlands. One of these is the city of Rotterdam, which was affected by the great flood of 1953. Seen in Figure 1 the topography of the city of Rotterdam is located in a river delta, flat, and low areas that are vulnerable to flooding. Rotterdam also serves as a port city for the European region. The construction of Maeslantkering on reclaimed land has given hope to the city of Rotterdam. The function of Maeslankering is to defend against floods and storms (Nguyen & Brzuska, 2022; topographic-map, n.d.-b; World Population Review, 2024).

Figure.2 Topography of the City of Rotterdam



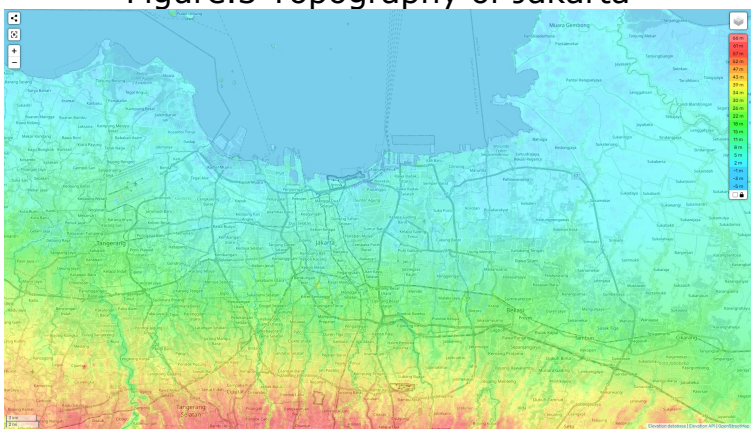
Source:Holland - Land of water (2024)

Figure 2 is the shape of the Maeslantkering as a movable storm surge barrier. It resembles two giant doors with dimensions of 210 meters long, 22 meters high, and 15 meters thick, made of strong and sturdy steel. In addition, there is an automatic open-close operating system utilizing a hydraulic mechanism. In the open position, ships can use the Nieuwe Waterweg as a traffic lane. However, if there is a threat of flooding from rising seas or storms, the Maeslantkering will automatically close. In 2007, the Maeslantkering closed for the first time and successfully protected the Rotterdam area from flooding (Goorden et al., 2022; Nguyen & Brzuska, 2022). Based on this, it can be understood from a securitization point of view that the Dutch government's efforts in defending the delta area through Delta Works have produced positive results, especially in terms of defense.

Urgency of Coastal Defense Project

From the perspective of environmental security theory, it is evident that environmental change can pose significant risks to national security, contribute to armed conflict, and threaten human security in a broader context. As articulated by Jessica T. Mathews, the maintenance of environmental security necessitates the careful allocation of financial resources, comprehensive planning, and enhanced cooperation among nations. Indonesia faces similar threats of sea level rise and flooding as those confronted by the Netherlands; hence, the need for robust coastal defense mechanisms is paramount. However, it is important to note the geographical distinctions between Indonesia and the Netherlands. Indonesia is a coastal nation situated between two oceans and continents, namely the Pacific and Indian Oceans, as well as the Asian and Australian continents. Given Indonesia's geographical conditions, which link it to both oceans, the rise in sea levels and potential flooding pose substantial threats to the nation. For example, the city of Jakarta in 2007 experienced a major flood that brought all community activities to a halt (Mathews, 1989; Riyadi, 2020; Taufan Maulana & Andriansyah, 2024).

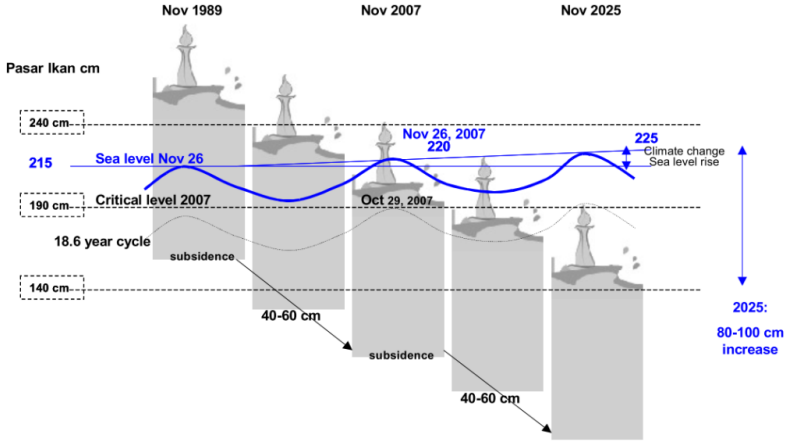
Figure.3 Topography of Jakarta



Source: topographic-map (n.d.-a)

Jakarta, a metropolitan city boasting a population of 10,684,946 residents, is classified as one of the fastest-sinking cities globally. Figure 3 illustrates the topography of Jakarta, characterized as a lowland area. Certain regions of Jakarta, denoted in blue, are situated below sea level. Consequently, during periods of high tide, these areas are at risk of flooding. Although Jakarta possesses rivers and canals that serve as conduits for water flow, these canals also risk overflow during substantial rainfall, leading to flooding in low-lying areas (BPS Provinsi DKI Jakarta, 2024; topographic-map, n.d.-a).

Figure.4 Illustration of the sinking of Jakarta



Source: Octavianti & Charles, 2018

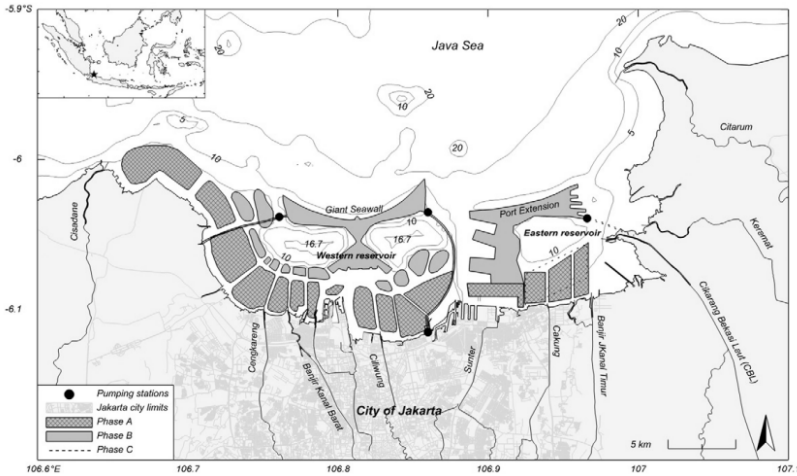
The sinking of Jakarta, according to Octavianti & Charles (2018) is caused by land subsidence of about 25 centimeters per year and exacerbated by the existence of an annual surge of up to 200 centimeters. Figure 4 shows the decline in the land surface of the Pasar Ikan area from November 1989 to 2007. There was a decrease of 40-60 centimeters and an increase in sea water of 5 centimeters. From November 2007 to November 2025, it is predicted that there will be a decrease of 40-60 centimeters and an increase in sea water of 5 centimeters. Thus, it is

estimated that there will be a difference in height between land surface and sea level rise in 2025 of 80-100 centimeters. Land subsidence below sea level will have an impact on the potential for flooding in the Jakarta area (Octavianti & Charles, 2018, 2019; Setiadi et al., 2023).

The cause of land subsidence is the massive and uncontrolled use of groundwater, especially in coastal areas. This is although the State has Law No. 7 of 2004 on Water Resources. Efforts to control groundwater use continue through Government Regulation Number 43 of 2008 concerning Groundwater, Decree of the Minister of Energy and Mineral Resources Number 291.K/GL.01/MEM/G/2023 concerning Standards for the Implementation of Groundwater Use Approval, and also Governor Regulation Number 93 of 2021 concerning Water Free Zones. However, land subsidence continues to occur, especially in the groundwater basin (CAT) area, making the area vulnerable to flooding due to tidal surges. The impact of this flooding is damage to infrastructure and key facilities. For example, flooding in the Tanjung Priok port area in North Jakarta with a height of about 30-50 centimeters disrupted loading and unloading activities (Chairani et al., 2024; Yusuf, 2023).

By the year 2050, it is projected that approximately one-third of Jakarta will be submerged. Nevertheless, under a scenario of a 3-4 degree Celsius increase in temperature, it is anticipated that by the year 2030, Jakarta will confront the repercussions of sea level rise and flooding, which pose a threat to approximately 1.8 million individuals. The regions impacted by sea level rise and flooding include North Jakarta, West Jakarta, and certain areas of Central Jakarta. This situation threatens the residents of these areas with the possibility of mass migration, loss of livelihoods, particularly for local fishermen, damage to infrastructure, and potential social conflicts among communities. Heri Ariadi (2023) the book Dynamics of Coastal Areas explains the potential conflicts that arise are social friction, personal interactions, and natural resource conflicts. For this reason, efforts to defend coastal areas are needed.

Figure.5 Indonesia NCICD Project



Source: van der Wulp et al. (2016)

The government's effort to address sea level rise that also threatens Jakarta's coastal areas is the implementation of the National Capital Integrated Coastal Development (NCICD) program. The NCICD program, which began in 2014, has made efforts to defend the coast. Figure 5 is a map of the NCICD development plan which consists of 3 phases (A, B, and C). Based on the official page of the Commission for the Acceleration of Priority Infrastructure Delivery, phase A is the construction of a 30-kilometer embankment in the coastal area and the development of 17 artificial islands in Jakarta Bay. The cost required is around 3.044 trillion rupiah, which is obtained from the state budget (APBN), regional budget (APBD), and state or regionally-owned enterprises (Komite Percepatan Penyediaan Infrastruktur Prioritas, n.d.; Simorangkir, 2024).

The execution of Phase A was carried out through a collaborative effort involving state-owned enterprises and the private sector. Nonetheless, this endeavor has elicited a spectrum of opinions from various stakeholders. Proponents of the National Capital Integrated Coastal Development (NCICD) initiatives argue that reclamation serves as a viable solution for coastal protection and the expansion of new territories. Furthermore, the benefits of seawalls have the potential to safeguard human settlements, infrastructure, and the economic framework. Conversely, opponents of the NCICD assert that the implementation of reclamation activities along the northern coastline leads to the depletion of certain mangrove forests, which act as natural barriers protecting terrestrial areas from tidal incursions. In addition, the consequences of converting coastal areas that were originally mangrove forests into reclamation land impact the vulnerability of coastal regions, particularly in North Jakarta (Asari et al., 2021; Saputra, 2023; Suriadi, 2023).

Phase B is the plan to build the garuda-shaped giant seawall design (Figure 5) and Phase C focuses on building the giant seawall in the east. However, there has been opposition from the Greenpeace organization highlighting the construction of the giant seawall because it requires a large budget of 650 billion US dollars (Pusvitasary, 2024). The reflecting on the current situation where sea water and land surface rise is ongoing, and a major threat to the people of Jakarta. The target of this construction is to provide regional protection for all and can become an area for port development, tourism, regional development, and other benefits.

Regional protection lessons for Indonesia, especially Jakarta

Defense white paper (2015) states that climate change includes sea level rise and flooding as non-military threats that still require defense efforts, according to Makmur Supriyanto, defense science constitutes the study of the management of national resources and military forces in times of peace, conflict, and post-conflict scenarios, to address both external and internal threats- encompassing military and non-military challenges- to national territorial integrity, sovereignty, and the overall safety of the nation, thereby achieving national security. The issues of sea level rise and flooding are recognized as significant threats to the state. In the context of non-military threats, the main components of defense are ministries or

government agencies outside the defense sector (Sulistiyanto, 2024; Supriyatno, 2014).

Indonesia has a universal defense system known as *sishankamrata*. The definition of *sishankamrata* has been stated in the Law of the Republic of Indonesia Number 3 of 2002 concerning State Defense Article 1 (2) states that "The national defense system is a universal defense system that involves all citizens, territories, and other national resources, and is prepared early by the government and organized in a total, integrated, directed, and sustainable manner to uphold the sovereignty of the state, territorial integrity, and the safety of the entire nation from all threats. Sea water rise and flooding are threats to the nation's safety (Supriyatno, 2014).

The Netherlands is a country that started the development of territorial defense through the Delta program after a major flood in 1953. Rotterdam, the second most populous city in the Netherlands, has been protected thanks to the Delta Works project. Jakarta, the most populous city in Indonesia, has experienced flooding threats such as in 2007 and the threat of tidal flooding in some areas of Jakarta.

Table.1 Comparison of Rotterdam and Jakarta

Criteria(s)	***Rotterdam***	***Jakarta***
Total population	764.227 people (estimated)	10.684.946 people
Area	325,79 km^2	662,33 km^2
Topography	Low-lying land, below sea level, prone to flooding, canals and rivers.	Low-lying, flood-prone, canals and channels.
Environmental issues	The great flood of 1953	The great flood of 2007
	Sea level rise	Sea level rise
Territorial defense	Reclaimation island Canal	Reclamation island Canal
	Maeslantkering (Delta Works)	Giant Seawall (NCICD) [in progress]

Based on the results of table 1 comparison between Rotterdam and Jakarta with the criteria of population in 2023, area, topography, environmental problems, and regional defense. The estimated population in 2024, according to the World Population Review, is 764,227 people with an area of 325.79 km^2, while the population of Jakarta, according to the DKI Jakarta Provincial Statistics Agency, is 10,684,946 people with an area of 662.33 km^2 (BPS Provinsi DKI Jakarta, 2024; jakarta.go.id, 2024; World Population Review, 2024). The similarities lie in their geographical locations, as both cities are situated in low-lying areas susceptible to flooding. Additionally, the presence of rivers and canals is notable. Both

municipalities have encountered challenges related to flooding and rising sea levels. Furthermore, there are ongoing initiatives to establish regional defense mechanisms, particularly in coastal regions. The differences are that Jakarta's population and area are larger; Rotterdam's defenses through *Maeslantkering* (part of the Delta Works) have functioned to protect the area, while Jakarta is still under construction.

The insights derived from the Delta program, implemented through Delta Works in the Rotterdam area for Indonesia, particularly Jakarta, reflect the government's commitment to executing national defense initiatives. The Delta program is continuously developed with careful consideration of environmental conditions and the aspirations of the Dutch community. The dedication exhibited by all sectors of society, encompassing governmental, private, civil, and non-governmental organizations (NGOs), in advancing coastal defense development in the Dutch region, especially Rotterdam, yields beneficial effects not only for regional defense but also for the enhancement of community quality of life. Indonesia, as a country that has a universal defense system (*sishankamrata*), can use the efforts of the Dutch government as a source of learning. The Dutch state implemented the national project delta program and its actualization in the Delta Works project by involving all components of the nation. The lesson learned is the importance of community participation and all levels, especially in the implementation of long-term projects. For this reason, the government needs to take the same approach as the Netherlands in order to achieve national development goals. The community can also play an active role in providing constructive input, like the Dutch did. Other components such as the private sector and non-governmental organizations (NGOs) can help the project implementation process so that there is a harmonious synergy and the achievement of coastal area defense in Indonesia, especially in a densely populated city like Jakarta.

CONCLUSIONS AND RECOMMENDATIONS

Countries around the world are experiencing environmental problems, such as rising seas and flooding due to tidal surges. Among many countries, the Netherlands is at the forefront of defenses against sea rise and flooding. For centuries, the Netherlands has developed many defense technologies, ranging from the use of windmills, steam water suction machines, the use of canals, land reclamation, and civil engineering with the use of technology. As a result of the massive flooding that hit the Netherlands due to overflowing water from the North Sea. The Dutch government initiated a delta program aimed at preventing the tragic floods from happening again in the Netherlands. The first project implemented was the Delta Works (1954-1997). This project was developed in the southern part of the Netherlands. The city of Rotterdam, which is the second most populous city and port in Europe, was one of the places where the Delta program was implemented. Maeslantkering is a dike that can operate open and closed so that underwater ecosystems such as marine animal mobility are not

disturbed. The success of the Delta Works project from a securitization perspective is that the state has succeeded in securing the population from the threat of sea rise and flooding. The way this is done is not only by maintaining the budget during the project, but also based on the awareness of the Dutch community, the openness of government information, and the willingness of all components (private sector, non-governmental organizations, and academics) to collaborate in the implementation of the Delta Works project.

Indonesia, as an archipelago, shares similar concerns with the Netherlands. Jakarta stands as the most populous metropolitan area, housing over 10 million residents. Given the analogous topographical characteristics and challenges faced by Rotterdam and Jakarta, Indonesia may consider implementing coastal defense strategies similar to those used in the Netherlands. Nonetheless, Indonesia must tailor its coastal defense system development to the specific ecological conditions of the project sites, taking into account the state of infrastructure and readiness. Considering the extended timeline and substantial expenditures involved, it is crucial to evaluate the long-term financial sustainability and public acceptance of this initiative.

It is essential to emphasize that the subsidence of Jakarta will significantly affect the lives of approximately one-third of its residents. If this issue is not addressed promptly, it may lead to potential social conflicts and resource scarcity in the future. Accordingly, the government has initiated coastal defense measures through the National Capital Integrated Coastal Development (NCICD) program. Although the necessary funding for the project is available, a diversity of opinions remains among community members, academics, and non-governmental organizations. Nevertheless, Indonesia possesses a universal defense system (*sishankamrata*) aimed at safeguarding the region by leveraging existing resources. To achieve this objective, the support of the Indonesian Army (TNI) is crucial, particularly in non-military operations, to effectively address the implications of rising sea levels that threaten community welfare and social stability.

Drawing upon the insights and reflections regarding the Dutch success exemplified in the Delta program through the Delta Works and applying the *Sishankamrata* perspective, several key lessons emerge. First, it is imperative to ensure participation at all societal levels, including non-governmental organizations, in the execution of the National Capital Integrated Coastal Development (NCICD) program. Additionally, there must be collaborative efforts to understand the implications of sea level rise and the threat posed by tidal flooding in the Jakarta area, as well as to recognize the advantages of the NCICD program for local communities. Furthermore, it is crucial to allocate adequate funding for the execution of the NCICD implementation plan, ensuring accessibility for all stakeholders involved. Lastly, providing transparent access to information regarding the progress of the NCICD project is essential. Moreover, the active engagement of all societal levels is necessary for the implementation process, as constructive feedback is vital to ensure the completion of the NCICD project.

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