BHUMI: Jurnal Agraria dan Pertanahan *ISSN: 2442-6954*
Volume 9, Number 1, May 2023 *e-ISSN: 2580-2151*

Doi: https://doi.org/10.31292/bhumi.v9i1.619

Evaluating How Tenure Security in Disaster Management Depends on Land Governance Based on Indonesian Case Study

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Received: Januari 12, 2023; Reviewed: January 25, 2023; Accepted: February 13, 2023

Abstract: Tenure security is a critical variable in disaster management, yet is dependent on the rules and regulations of a country with regards to land ownership and use. This study draws on three disasters that occurred in Indonesia as case studies: the tsunami in Aceh in 2004, the Sidoarjo mudflow in 2006, and the tidal flood and permanent inundation in Kabupaten Demak, reported in 1997. Using literature review approach, we compare the government responses in these examples and evaluate how they affected tenure security in each case, and presented it qualitatively. We discovered that there were different responses in terms of the declaration of a national disaster, Central Government support, the presence of a responsible agency, and how the government threatened it as a 'pure natural disaster' or a 'human-induced disaster.' We conclude that the Central Government plays an important role in ensuring tenure security during a disaster in terms of supporting laws and regulations, but the Local Government is also critical in the implementation process in land right reconstruction. Furthermore, for destroyed or lost land due to a disaster, the regulations on disaster management should distinguish between the root and cause of the disaster to ensure land rights protection and justice for the victims.

Keywords: land governance, disaster management, tenure security

INTRODUCTION

One crucial factor in disaster management is tenure security. The ability of individuals to prevent disasters, respond to them, and recover thereafter, particularly for those whose livelihoods depend on the land, is correlated with the security of their land tenure (Reale & Handmer, 2011). The ability of a person to resume their pre-disaster livelihood and reoccupy their land, as well as their access to official government programs such as land right restoration, are all ways in which the amount of tenure security affects a person's vulnerability to disaster (Mitchell, 2010) and (Chagutah, 2013). The society's willingness to invest in disaster-resilient housing and other mitigation strategies before a disaster strikes is also impacted by weak tenure security due to risk of losing investments (Barnes & Riverstone, 2008) and (Mitchell & Garibay, 2011). Disasters also have an impact on the unwillingness of landowners to leave for fear of losing their ownership of the property (Mitchell & Garibay, 2011) and (Reale & Handmer, 2011). This will increase the likelihood of land speculation and land grabbing (Mitchell, 2010).

The country's ability to protect tenurial rights post-disaster depends on the effectiveness of land governance and the quality of a country's land administration system.

A good land record system, for example, as well as the country system's ability to recognize both formal and informal land tenure in Disaster Risk Management (DRM), can reduce people's vulnerability to losing their right over land in the event of a disaster (Mitchell, 2010; Mitchell & Garibay, 2011; Reale & Handmer, 2011). Good disaster-resilient spatial planning and the availability of geospatial data also play important roles in increasing resilience and reducing risks in disaster events, as does the use of technology in decision making in time of disaster (Fleischhauer, 2008), (Greiving & Angignard, 2014) and (Council & Committee, 2007). A government's capacity in disaster management, including prevention, mitigation, and preparedness, is also critical. Such a capacity relies on an adequate policy and an effective legal framework. This institutional capacity translates in an efficient functional organization, sustained financial support, appropriate technology, competent human resources, and adequate leadership (Reale & Handmer, 2011).

In most disaster-prone countries, including Indonesia, it is difficult to incorporate pre-disaster preparedness on land policies and legal framework and quickly improve tenure security sustainably, because in most cases, financial investments in disaster preparedness may clash with the need to invest in economic development. Additionally, disasters may have significant negative economic consequences, which frequently becomes the main reason for a country system's failure to address disasters. Nevertheless, as the embodiment of responsible land governance, a government bears the responsibility of providing tenure security for all citizens.

Many factors influence the country's ability to provide tenure security in the aftermath of a disaster, such as the availability of land record data, the capacity of land agencies to reconstruct land parcel boundaries post-disaster, technological support, and adequate land policy and regulation to deal with tenurial rights in various physical and social conditions. If this is not met, it will result in inconsistencies in responding to tenurial complexity in disaster management, which will have a repercussion on weak tenure security. Nonetheless, this is linked to how the government defines 'disaster' in policy and regulation, as well as how far the government is 'responsible' in the event of disaster. The government's response to disasters has been the subject of numerous studies, many of which also looked at how it related to tenure security. However, because the majority of the study was centered on a single incident, it was challenging to compare the responses in a systematic and thorough manner to determine whether there were any differences in how they were perceived and described, and how this affected how the government responded to the disaster, particularly in terms of tenure security. This work attempted to fill in the gaps in the disaster management study in Indonesia, particularly in connection to its relationship with tenure security, by using the comparison of three disaster events with diverse causes and characteristics as an example. This article evaluates the conditions under which government responses to disaster events are effective for providing tenure security.

We compare different disaster events that occurred in Indonesia based on different characteristics, such as the causes for the disaster, the responses of government, the activities of reconstruction and rehabilitation, and the changes in tenure security. This evaluation aims to address three major questions: (1) To which extent and which type of disaster affect which aspect of tenure security? (2) Are there any differences in how the government handles and manages the (potential) effects of disasters the issues, and how they aim to influence or include the aspects of tenure security? (3) Which motivations and justifications do governments use to formulate their disaster response? By responding to these questions, we identify current gaps in tenure responsive policies and derive improvements for such tenure responsive measures as part of disaster management in Indonesia. These findings contribute to more effective tenure security policies and sustainable disaster management.

METHODS

Addressing each of the questions relies on a literature study approach, followed by an explanatory interpretation heuristic. The basis of our analysis constitutes three disaster events that occurred in Indonesia: (1) Earthquake followed by massive tsunami in Kota Banda Aceh, Aceh Province, in 2004; (2) hot-mud flood in Kecamatan Porong, Kabupaten Sidoarjo, East Java Province, in 2006; and (3) a climate change-related disaster that began almost two decades ago and is still ongoing, tidal rob and permanent inundation in Kecamatan Sayung, Kabupaten Demak, Central Java Province. We chose these cases because they are 'nature-related' disasters with different natures and triggers. Yet, despite the differences, each appeared to have broad implications for land right recognition and its complications.

The first example, the tsunami in 2004 which affected the Aceh Province most severely, is an example of a disaster with significant consequences for land tenure and land rights. It killed over 10,000 people killed, and displaced many more from their homes. This disaster had a wide-ranging impact on neighboring countries. The disaster was also labelled "changing the world's perspective on disaster management" (Tiar et al., 2021). Post-disaster reconstruction and rehabilitation process involving many parties at the local, national, and international levels. The second example is a hot mud flood in Kecamatan Porong, Kabupaten Sidoarjo, which began in 2006 and is still ongoing. There were differing opinions about the cause of this disaster, but many agreed that it was caused by human activity. There were no fatalities in this disaster, unlike the tsunami in Aceh, but many people were unvoluntarily displaced because their land had been inundated by mud and thus could no longer be used. Finally, tidal rob, abrasion, and permanent inundation in the coastal area of Kecamatan Sayung, Kabupaten Demak, which is referred to as a climate-related disaster, has been ongoing since 1997. The tidal flood hits the area at various

elevations twice a day. Compounded by the abrasion, the flood permanently inundated the land, and the community should engage in self-reclamation on a regular basis to keep the land from sinking. The disaster also has an impact on the quality of life, as well as creating a "grey area" regarding the status of ownership over the inundated land.

The data consisted of secondary data derived and interpreted from previous observations, documented evidence, formal reports, news items, grey literature and academic literature. We scanned the texts by focusing on how the disaster related to aspects of land tenure and land administration and/or how present (or absent) land data contributed to responding to the disaster. Additionally, the interpretation consisted of highlighting how and where events and observations directly related to recognition of tenure rights, and how and where the use of certain framing directly or indirectly touched upon passages in current land management law and regulation. We structured our research around the government's responses at any level in the immediate aftermath of the catastrophe, as well as reconstruction and rehabilitation programs, particularly those dealing with land tenure issues. We assume that this reflects the government's competence to deal with tenure security in a crisis. We investigate what factors influence the government's response to such disasters, if they are related to the nature and scope of the disaster, and how the country system incorporates them into its disaster laws and regulations. We also look for similar tenure-related disaster scenarios in other countries and compare them to the situation in the study area to see if the reactions have the same effects on tenure security and victim livelihood.

RESULTS AND DISCUSSION

Government Responses, Mitigation and Recovery Effort in Disaster Events

An Axample of National Disaster - Earthquake Followed by Huge Tsunami in Kota Banda Aceh, Aceh Province, 2004

Kota Banda Aceh is located in the northernmost part of Indonesia, directly adjacent to the Indian Ocean to the west. Kota Banda Aceh has long been known as the oldest Islamic city in Southeast Asia. In 2004, a 9.1 magnitude Richer Scale earthquake struck 250 kilometers southeast of Banda Aceh. This earthquake occurred at a depth of 30 kilometers, and was followed by a massive tsunami. The tsunami was reported to have hit the mainland at a speed of 100 meters per second, or 360 kilometers per hour, with a height of 30 kilometers. The flow depths along Banda Aceh's shores exceeded 9 meters, with inundation reaching 3 to 4 kilometers inland (Lavigne et al., 2009). As it passed through the land, the tsunami caused extensive damage. It killed over 150,000 people, destroyed over 200,000 homes, and displaced over 500,000 people in Indonesia alone, not to mention neighboring countries that were also affected by this disaster, including Myanmar, Sri Lanka, Thailand,

and others (Fitzpatrick, 2008). Figure 1 show the extent of tsunami in Banda Aceh after the tsunami.

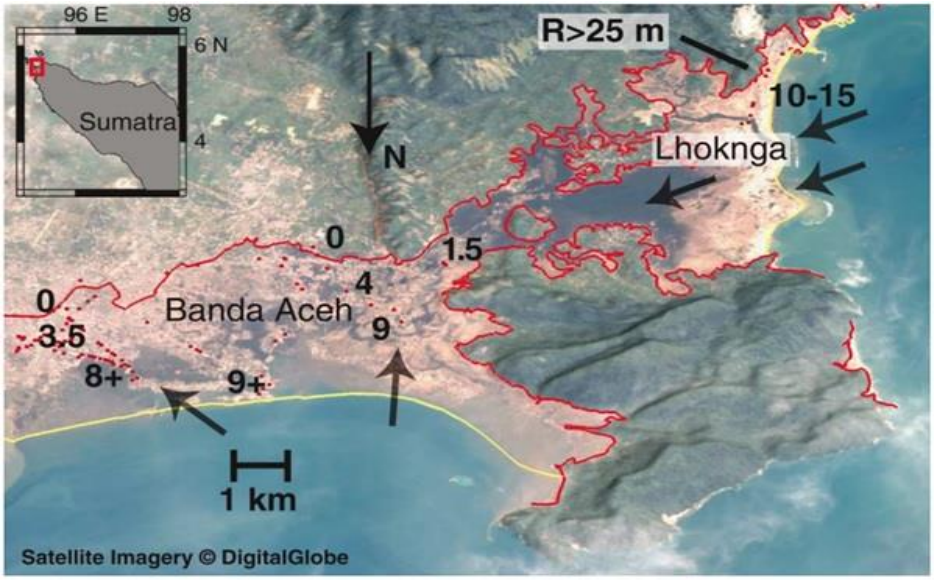

Figure 1. Satellite imagery of Banda Aceh after the tsunami, taken from Borrero (2005). The yellow line indicates the shoreline before the tsunami, while the red line indicates the extent of inundation and its depth, taken from measurement location depicted in red dots Source: (Borrero, 2005).

The city was shut down for days because of this disaster. Public facilities and infrastructure were unavailable, and the city was inaccessible for several days due to damage in the mobility infrastructure. Many local government officials lost their lives or went missing, rendering local government unable to function at the start of the disaster. Soon after, the Government of Indonesia declared this a National Disaster by issuing Presidential Decree Nr.112/2004, with the National Government taking over disaster management at an early stage.

In Kota Banda Aceh, this disaster affected area for approximately 28.483 ha, and for as much as 300,000 land parcels were affected by the disaster – many parcel boundaries were lost or severely damaged, and many lands were inundated. Approximately 90,000 land certificates were damaged, and the majority of land-related records were either damaged or destroyed (Haroen et al., 2005) and (Abidin et al., 2011). The disaster also killed the majority of the key personnel at the local Land Office, making it more difficult to restore land data. There were also land parcels whose owners and family members had died or gone missing. Because land record data were critical during the reconstruction and rehabilitation stages, the Indonesian government, in collaboration with the World Bank and the Multi-Donor Trust Fund (MDF), implemented the Reconstruction of Aceh Land Administration System (RALAS) project. The primary goal of this program was to provide legal certainty and protection for disaster-affected land holders by restoring their land

rights as they existed prior to the disaster. This project also included the reconstruction and rehabilitation of land records for land registration. This program continued for four years, from 2005 to 2009, by a systematic, thorough, and comprehensive land registration in nine districts in Aceh Province, covering nearly 600,000 land parcels in the affected areas (Benny et al., 2006). The government issued Decree of Head of National Land Agency Nr.114-II/2005 as the program's legal foundation and guideline. This project is based on community participation. The community is actively involved in recognizing and reconstructing parcel boundaries, as well as providing land history information and identifying the rightful owner or heirs. All land parcels in the disaster-affected area, whether certified or not, that are physically still present or have been inundated and turned into sea were recorded and reported. This project was also fully funded by the government with the assistance of an external donor, and it was fully free of charge.

The first step in reconstruction was to identify survivors of land owners, followed by identifying land boundaries on maps and in fields. Identification was also carried out for land that had been inundated with sea water or had changed into swamps. When the land became inundated, boundary was identified on maps, and the results were reported to the National Land Agency (NLA) and the local government. The committee then produced notes on land inventory as well as notes on village deliberation as the basis for village mutual agreements. The villagers were accompanied and facilitated in this process by facilitators from a Non-Governmental Organization (NGO). Following the agreement, the next step was to place agreed-upon boundary markers on the field. Land owners (or their heirs) should place the markers themselves during this process, which should be witnessed (and agreed upon) by the owner of adjacent land and village representatives. The boundary markers were placed with the consent of the owner of adjacent land and village officers in the case of land owners (and their heirs) who were unable to attend or could not be identified because they were missing or died during the disaster. The landowners or heirs, along with the owner of adjacent land, then signed the statement form of boundary marker placement and claim for factual possession of the land parcel. The document was then approved by the village's chief. The next step was to transfer the agreed-upon boundary into the NLA map, as well as to record the the owner into the Statement Letter of Physical Occupation of the Land. The village chief then drew up a list of agreements, which included all land parcels and their owners (or its devisors). The list also included land whose physical location or owner could not be determined (unclear owner, location and/or boundary). The list of agreements was then made public for 30 days. If there were no objections to the list, the lands were then processed by the NLA for legal registration.

The government also issued Government Regulation No.2/2005, which served as the legal foundation for the establishment of the Rehabilitation and Reconstruction Agency (BRR). This agency was in charge of coordinating programs and projects from donors from

various countries, supported by the government, donor agencies, multilateral agencies, non-governmental organizations. Two of the priority programs implemented soon after the disaster events were urban settlement rehabilitation and land consolidation (LC). In the rehabilitation of urban settlement project, the government, in collaboration with the donor, provides housing for victims whose homes have been destroyed or damaged, as well as implements LC in the area. This program was preceded by self-supportive identification and confirmation of parcel boundaries. This process also reported the physical condition of the parcel following the tsunami, such as land surface submerged under water, and represented it on a settlement map (Huda et al., 2007). The community was then permitted to decide the criteria for the recipient of permanent housing, the structure of the house, and the design of the LC in each *gampong* (village). Throughout the process, facilitators from NGOs, universities, UN-Habitat, and government agencies accompanied and assisted the villagers. (Nazara & Resosudarmo, 2007) and (Huda et al., 2007). BRR also facilitated resettlement for victims whose land was destroyed and turned into the sea with the help of donors.

Aside from the residential area, rehabilitation of infrastructure and social facilities was also carried out, and was implemented by community participation. Despite the fact that the rehabilitation process involved many agencies at various levels and various sources of funding, BRR was fully responsible for coordination. Table 1 summarizes the rehabilitation-reconstruction process in Aceh-Nias as of January 2009.

Table 1. *Progress of Rehabilitation and Reconstruction Process in Aceh-Nias, up to January 2009*

	Estimated Needs	Report per January 31, 2009
Housing	120.000 units	122.903 units
School building	2.006 units	1.488 units
Health facility	127 units	1.047 units
Religious facility	11.536 units	3.193 units
Roadway	3.000 km	3.585 km
Bridge	120 units	273 units
Airport	11 units	12 units
Port/harbor	14 units	20 units

Source: BRR Report per January 2009

Despite shortcomings in implementation, we saw that immediate government responses - as well as international community support - play a critical role in the early stages of disaster response, as well as in the subsequent reconstruction and rehabilitation process. With the disaster designated as a national disaster, the central government is responsible for organizing efforts in rehabilitation and reconstruction, including the provision of resources such as law and regulation, financial, technological, and human

resources, that will compensate for the shortcomings of local government in term of organizational resources.

'Human-Induced' Disaster of Hot-Mud Flood in Kecamatan Porong, Kabupaten Sidoarjo, East Java Province, 2006

In May 2006, the people of Kecamatan Porong, Kabupaten Pasuruhan, East Java, were shocked by the sudden emergence of a hot mudflow. The mud continued to leak from the ground with no sign of stopping, inundating the surrounding area with thick mud. This mudflow has been ongoing for some time and is expected to continue for some time (Wibowo et al., 2018) and (Ekawati & Sulistyowati, 2021). In its early days, the outburst rates ranged between 100.000 and 120.000 m^3 per day, with an estimated temperature of 100 degrees Celsius (Sidoarjo, 2020). Soon after, the mud inundated nearby villages. According to the most recent report in 2020, the mudslide affected 16 villages in three districts in Porong, Tanggulangin, and Jabon, inundating more than 6,5 km2 of land with a depth of nearly 25 meters and displacing more than 40.000 people (Kure et al., 2014), (Ekawati & Sulistyowati, 2021) and (Ekawati et al., 2020). The inundated area included industrial estates, agricultural areas, the Surabaya-Gempol toll road, and densely populated residential regions. As a result of the impact, there are significant physical, economic, and ecological losses, such as infrastructure damage, factories that are unable to operate causing many people to lose their jobs, land deformation and ground movement, degradation of groundwater and air quality that lead to health problems (Ekawati & Sulistyowati, 2021) and (Novenanto, 2016).

The causes and triggers of this incident are still being debated (Nurhandoko, 2015), and (Mohsin, 2017). Some suggest that the mudflow was caused by an underground blowout of an exploration well in Banjarpanji, which was operated by a joint venture between two Indonesian oil companies, PT. Medco and Lapindo Brantas (Sarasadi et al., 2021), while others claim that the exerted mudflow was a natural process because the location was prone to mud volcanism and was triggered by another natural event, an earthquake in Yogyakarta a few months earlier (Sawolo et al., 2009) and (Tanikawa et al., 2010). The debates persisted, and there was no clear statement from the government about the exact cause of this disaster; however, based on how the government dealt with the disaster, many parties contended that many political 'alignments' and 'maneuvers' occurred (Novenanto, 2015) and (Farida, 2013). Nonetheless, the government declared afterwards that PT. Lapindo Brantas would be responsible and accountable for this disaster.

Through the Presidential Decree Nr.13/2006, the government established the National Team for Handling Sidoarjo Mud Flow (Tim Nasional PSLS) shortly after the mudflow occurred. This agency was assigned for 6 (six) months and was extended by Presidential Decree Nr.5/2007 until 1 (one) month. By issuing Presidential Decree Nr.14/2007 that same

year, the government established the Implementing Agency for Handling Sidoarjo Mud Flow (BPLS). The President charged PT. Lapindo Brantas, with the support of BPLS, responsible for mitigating the impacts of the mud flood. Then, in 2009, the government issued Presidential Decree Nr.40/2009, stating that mitigation efforts would be partially funded by the state. This responsibility was transferred to the Center of Sidoarjo Mud Control (PPLS) in 2017, which is part of the Directorate General of Water Resource, Ministry of Public Work and Public Housing (Ministry of PUPR). This implementing agency is in charge of carrying out technical, social, and environmental programs to mitigate the effects of the disaster, and still operating until now.

Aside from the establishment of a responsible agency, assistance to the government included the issuance of a Presidential Decree as the legal basis for operational activities related to the mitigation of the Sidoarjo mudflow. The decree was revised several times as the inundated area grew larger, having caused additional problems, mitigation efforts needed to be adjusted or added, and the number of affected people increased. Table 2 depicted how the decrees evolved over time.

PT Lapindo Brantas is responsible for any installation of technology and infrastructure to prevent and reduce overflow, as well as setting mitigation strategy to reduce the impact of the mudflow. The company was also required to purchase the mudslide-affected land and property. The land was valued at market price and should be done based on an agreement between two parties. This transaction was then registered by the local Land Office, and the purchased land became state property. Nonetheless, it is difficult to verify legal proof of land ownership during the transfer of land rights because many of the affected land has not been registered and has no land certificate, and attempts at boundary reconstruction have been difficult due to the muds. Land record data from the local Land Office (BPN Kabupaten Sidoarjo) served as the primary source of verification. As supporting data, they also used a taxation map, land data from the village office, and verification from local authorities at the village level. The issue arose when the landowner lacked sufficient proof of possession of the land. In this case, village officer verification was required. The victims objected to this arrangement, arguing that the company should be held accountable for their social losses and loss of livelihood, and that compensation should cover it. The victims also complained about the company's late payment and a lack of assistance for social rehabilitation (Farida, 2013) and (Novenanto, 2015). Others argued that the physical, social, and environmental losses go far beyond what the regulation assigned in the affected-area boundary, despite the fact that many people outside the boundary were affected by the disaster.

Table 2. Presidential Decrees Related to Handling of Sidoarjo Mudflow with Additional Adjustment

No.	Government Regulation	Total Affected Area (hectares)	Key Points
1	Presidential Decree Nr.14/2007	632,50 hectares	PT. Lapindo Brantas obliged to buy affected land and property at market price Any social cost outside the defined area will be covered by state budged. PT. Lapindo Brantas responsible for the construction of main embankment to prevent mudflow spread outside the defined affected area. The government responsible for any expenses related to supporting infrastructure to prevent mudflow, including provision of land through land acquisition.
2	Presidential Decree Nr.48/2008	Addition of 95.80 hectares, with the total area of 728,30 hectares	PT. Lapindo Brantas obliged to buy affected land and property at market price. However, as this was considered as specific case, and any regulation related to compensation for public interest cannot be implemented. The land then converted into state property. PT. Lapindo Brantas responsible for the construction of main embankment to prevent mudflow spread outside the defined affected area. The government responsible for any expenses related to supporting infrastructure to prevent mudflow, including provision of land through land acquisition.
3	Presidential Decree Nr.68/2011	Addition of 46.40 hectares, with the total area of 774,70 hectares	Any affected land and property will be compensated through the procedure as mentioned in previous decree. To overcome any social problems followed, the designated area should be vacated and the residents must be relocated The relocated residents received compensation due to evacuation process, house rental during the transition (for 2 years), and living allowance for 6 months.
4	Presidential Decree Nr.33/2013	Addition area of 392.55 hectares, with the total area of 1.167,25 hectares	Additional on the purchase of waqf land.

Source: data processing, compiled from many sources

Climate-related Disaster: Tidal Flooding, Severe Abrasion and Permanent Inundation in Kecamatan Sayung, Kabupaten Demak

The coastal area in Kabupaten Demak, Central Jawa Province, Indonesia, has been long suffering from tidal flooding and massive erosion, resulting in severe burdens for the environment, and the livelihood of the community (Hanifah & Alief Noor Anna, 2022). Each season the floods have different intensities, but the trends show to worsening pattern each. During the period of 1997-2015, Kabupaten Demak the total of inundation was 2.116,54 hectares, while the coastline has been shifted approximately 5,1 km land inward within 20 years. This area is also mentioned as the region suffering the worst abrasion in Indonesia (Umami et al., 2019) and (Hanifah & Alief Noor Anna, 2022). Tidal rob is still going on these recent days, covering an increasingly wider area by the year, even some areas in the region were permanently inundated by the sea water. Recent data mentioned that tidal flooding has permanently inundated up to 16 villages for the last 12 years (Astuti et al., 2018) and (Gemilang et al., 2020). In consequences, the people in the area should adapt with the condition by voluntarily moved to other place, or for who choose to keep living in their place, the have to regularly elevate the terrain to avoid the water flooded the houses and other facilities including road access, while some of those whose their land were inundated in high elevation, changes their land into fishpond (Setyowati et al., 2012) and (Sarasadi et al., 2021). The ability of a person to resume their pre-disaster livelihood and reoccupy their land, as well as their access to official government programs such as land (Buchori et al., 2021) and (Syah, 2012).

Even though tidal flooding is a natural phenomenon that occurs in coastal areas, several studies have confirmed that climate change and the rise in seal levels are worsening the phenomenon, and some areas may suffer more than others (Haliza Abdul Halim, 2009) and (Barbier, 2015). As for the coastal area of Kabupaten Demak, this phenomenon is mentioned as being induced by the hydrodynamic flow of waves deflected from the eastern part of the area in Kota Semarang, resulting in the concentration of higher wave energy in the coastal area of Kabupaten Demak (Muskananfola & Febrianto, 2020). Kota Semarang, located in the eastern part of Kecamatan Sayung, Kabupaten Demak, is a rapidly growing city. Kota Semarang done multiple reclamation projects in 1997 to expand its business area, such as Marina Beach for housing and tourism, as well as the expansion of Ahmad Yani International Airport and Tanjung Mas Harbor. Following that, it was reported that reclamation activity in the eastern part of the coastal area was worsening tidal flood and abrasion in the adjacent area. This is exacerbated further by the designation of an industrial area along the coastal area in Kecamatan Sayung, causing significant economic activity as well as rapid infrastructure development, resulting in land subsidence and a decrease in ground water level (Damaywanti, 2013), (Rahmawan et al., 2016) and (Gemilang et al., 2020). Furthermore, climate change factors are contributing to sea-level rise, which has

accelerated abrasion (Andreas et al., 2017). Figure 2 show the change of coastline over the years, depicting the impact of abrasion in the area.

Figure 2. Change of coastal line in the coastline of Kabupaten Demak, overlaid with land use map year 2000.
Source: data processing

Attempts have been made to reduce the impact of tidal flood and abrasion in Kecamatan Sayung, Kabupaten Demak. To reduce abrasion, the government installed Hybrid Engineering (HE) technology in the coastal area in 2013, in collaboration with Diponegoro University and OISKA Japan. This technology uses permeable structures made of wood and bamboo to trap sediment washed ashore or into the sea during tidal events. In addition to reducing the impact of abrasion, HE structures protect mangrove cultivation planted behind them (Gemilang et al., 2018) and (Takagi, 2019). Furthermore, Marine and Fisheries Services, as the government's local representative in the marine sector, implements a community empowerment program and community assistance for income diversification for people living along the coast. Nonetheless, none of the programs were able to effectively reduce floods, improve people's quality of life, or save the land from permanent inundation.

Apart from the adverse repercussions, the government has yet to officially confirm that this is not a disaster event in accordance with Article 1 of Law Nr.24/2007 on Disaster Management. The government of Kabupaten Demak also did not undertake mitigation efforts through revision of Spatial Planning and assigned the area as disaster-prone, with the argument that management of coastal area under responsibility of Province Government. The government is also unresponsive to the situation on the ground, despite the fact that many residents are suffering from tidal floods that occur twice a day, as well as the threat of losing their land due to inundation by sea water. There is no resettlement

program in place due to a lack of resources and capabilities on the part of the local government, as well as community opposition to living away from the coast area. Fearing that their right to land will be revoked, the people refuse to relocate and instead survive by regularly elevating their land to prevent inundation. For those whose land has already been inundated, they use it as fishpond (Sarasadi et al., 2021). They also continue to pay property taxes to the government, despite the fact that the physical condition of the land has changed to sea. They argue that by continuing to pay property taxes on the land, they retain legitimacy over the land's possessions.

After decades of living in this "grey zone," the situation changed when the government announced plans to build a toll road and sea embankment along the coast, connecting Kota Semarang and Kabupaten Demak. This project has been known as Tol Tanggul Laut Semarang Demak (TTLSD), one of the Government's Strategic National Programs (SNP) to support the establishment of industrial estates in the northern part of Java Island. The project began in 2017 and covers an area of 535 hectares. The project is designed to run along the coastal area that connects Kota Semarang and Kabupaten Demak, and is mostly situated on land that has been inundated for a long time and has transformed into sea. There are 273 plots of land in Kabupaten Demak, located in three villages in Kecamatan Sayung, designated as the project's location (Sari et al., 2022). Since the physical condition of the land has changed to sea, land acquisition process is not possible and under Indonesian law, the landowner cannot receive compensation. The argument is that the physical of the land no longer exists, and according to Basic Agrarian Law (BAL) No.6/1960, this is classified as obliterated land, and the property relationship between the land owner and the land has been revoked. Nonetheless, there is no derivate law/regulation, as well as no technical guide, to specify the land into obliterated land. The lack of this regulation then caused the project to be delayed for nearly four years.

Seeing as TTLSD is a Strategic National Project, the government issued Ministry ATR/BPN Regulation Nr.17/2021, followed by Government Regulation Nr.18/2021, as a legal basis to resolve the problem of obliterated land. The project was then reactivated, and 273 land plots were recommended to be designated as obliterated land. The plots were reconstructed using land record data from the local Land Office, taxation data, village land records, and on-field identification. Local Land Office also used UAV-Drone technology in conjunction with information from village officers to reconstruct the project-affected land's boundary (Sari et al., 2022). However, this does not immediately solve the problem. The community has rejected the proposal to stipulate their land into obliterated land. The residents argue that their land physically 'exists,' albeit under water, and that they continue to use it for economic activities such as for fishpond. Furthermore, the residents argue that they still pay property taxes, demonstrating that they actively use the land.

The necessity to stipulate the land into obliterate land is, to some extent, unfavorable to the landowner. They lost possession of the land once it was officially designated as obliterated land, and the government was not responsible to pay compensation. When land acquisition was implemented the owner was not compensated. This became the primary reason for the community's rejection, as they believed that they should receive compensation for their loss rather than only 'mercy money' offered by the government, that has been considered as insufficient (Batubara et al., 2020). While the amount of compensation for regular land acquisition is calculated based on market price and social and historical loss, obliterated land will only receive'mercy money' equal to 25% of its sales value of taxable object. For example, the tax value of inundated land in the project area is IDR.2000.- per square meter (USD. 0.13,-), and with an average of 1000 square meters, the owner will receive IDR. 500.000,-(USD.32,-) . This has been considered as insufficient by the owners. Rejections also come from people whose land is permanently flooded but is not part of the project. They argue that they are in the same situation and have been for many years, but that neither the government nor the project proponent is responsible for their predicament.

In this example, we argue that when it comes to disaster management, the government prioritize development over vulnerability. The regulation of obliterated land was not in favor of the victims, and the government did not provide sufficient ordinance to review the cause of the obliterated land - whether it was caused by human activity, as in the case of mudflow in Kecamatan Porong, Kabupaten Sidoarjo, or failure of previous regional planning and development activities. Furthermore, the absence of updated land record data for the affected area, as well as social and economic data for the affected community, contributes to disaster management inefficiency. The lack of a responsible agency also contributes to the inability to deal with the disaster comprehensively. We argue that the government's actions in responding to the problem of land acquisition in SNP and tidal rob are inconsistent. While the government is able to expedite legal ratification to resolve the status of obliterated land for SNP, there is a lack of mitigation effort to deal with the impacts of tidal flood and inundation, as well as to protect the rights of landowners whose land has been inundated by sea water. The government's strategies give the impression of hastening infrastructure development rather than securing tenurial rights for those living in the affected area.

What's Different? The comparison of the Government Responses on Disaster Management and its Effect on Tenure Security

Table 3 compares the government responses to the three disaster events, focusing on the rehabilitation and recovery stages. We noticed that the government reacted differently in each of the three disasters. In the case of the tsunami in Aceh, the government declared

it a national disaster shortly after it occurred, and soon after, the central government taking responsibility for any recovery and rehabilitation efforts. The government also established the Reconstruction and Rehabilitation Agency (BRR) as the institution in charge of post-disaster recovery. Regardless of the obstacles and problems encountered on the field during the rehabilitation process, the presence of a responsible agency provides an advantage in more systematic disaster management with a clear target, sharing responsibility, authority, and resource distribution, as well as coordination among institutions with varying levels of authority. For example, with so many international and national donors involved, there should be government representatives to manage and organize recovery and rehabilitation programs, such as aid distribution, social rehabilitation, and resettlement, and to ensure that all victims have been covered. The presence of an organization in charge also provides a more transparent and accountable recovery program, with clear objectives and targets, as well as monitoring and evaluation. As rehabilitation programs require coordination among stakeholders at various levels, this also aids in multi-level decision making.

We also discovered that as the disaster gained international attention, there were numerous organizations, both national and international, involved in the rehabilitation process, providing various supports. The presence of these organizations has a significant impact on the government's performance in disaster management, including land administration and tenure security. For example, the implementation of RALAS was based on the logic that if reconstruction and rehabilitation projects are to be carried out, there must be a clear land status and legal record. International organizations' assistance helped to overcome problems such as a lack of capacity in human resources, technology, finance, and institutions. This also encouraged the government to establish disaster management regulations and to adapt current regulations to disasters, such as in spatial planning.

In the second example, even though it was not designated as a national disaster, the government responded quickly to the disaster. The sudden outburst with immediate severe economic, social, and environmental consequences compelled the government to act quickly and institutionalize disaster management. Concerns that the impact will be widespread and last for a long time prompted the establishment of a disaster management institution. This disaster also occurred in a densely populated area. Many national and multinational industries were also operating near the outburst, making this area economically strategic. Furthermore, Porong Sidoarjo was designated as a Surabaya-satellite area and a part of the Surabaya mega-industry area, with numerous economic interests. Failure to deal with the aftermath of the mudflow will result in significant economic loss, as well as social and environmental consequences. As a result, while PT Lapindo Brantas bears the burden of several components of the mitigation effort, the government also participates in mitigation efforts in the pursuit of national interest in the economic sector. This evidence is also supported by the government's strategy of

constructing supporting infrastructure to prevent further bursts overflowing to a larger area using national funds. Concerning tenure security, the government also issued a Precidential Decree (with several revisions) requiring PT Lapindo Brantas to purchase the land from the victims, despite the fact that the victims did not receive compensation for non-physical loss under this arrangement. In addition, the government also implemented land acquisition for the construction of this supporting infrastructure.

In the third case, a tidal flood in Kecamatan Sayung, Kabupaten Demak, we revealed that the government did not classify the event as a disaster, but rather as a natural phenomenon. Compare to the first two examples, there is no single agency in charge of dealing with the disaster. There were attempts to mitigate the effects, as well as economic, social, and environmental adaptation programs implemented by organizations such as government agencies, non-governmental organizations, and research institutions. Nonetheless, the programs were implemented separately, and there was a lack of coordination among the institutions. Most programs are also only implemented in a limited area partially. For example, the installation of Hybrid Engineering to reduce the effect of abrasion only covered a specific area, whereas livelihood diversification to assist affected households was only implemented for members of the fisheries group and did not include all community members. We also discovered a lack of coordination between the central, provincial, and local governments in dealing with the disaster. There were also inconsistencies in coastal management regulations. In fact, spatial planning and coastal area planning are governed by separate laws. While spatial planning is governed by Law Nr.26/2007, coastal and small island planning is governed by Law Nr.27/2007. The previous regulation stated that coastal management is the responsibility of the provincial government, which impacted the inflexibility of local governments in establishing mitigation efforts through spatial planning. For example, because this area is considered disaster-prone, the Local Government did not revise the Spatial Planning to correct the situation, despite the fact that this should have been under the authority of the Provincial Government. However, because dealing with tidal floods and abrasion in this area necessitates significant resources, the Provincial Government of Central Java argued that this should be handled by the Central Government. Nonetheless, because there are no significant economic losses (from the standpoint of the Central Government), the government did not recognize the need to solve this problem until the TTLSD project was announced. Furthermore, the lack of records on the extent to which this disaster impacted the community hinders the design and assignment of mitigation and adaptation programs. Local Land Office, for example, has no record of the exact number of lands affected by tidal flooding or the number of lands permanently inundated. When the TTLSD project was announced and the Government Regulation on Obliterated Land was ratified, the Local Land Office only did land boundary reconstruction for project-affected land, which covered

a small area compared to the entire inundated area. We also contend that the ordinance did not allow for an investigation into the root cause of the obliterated land, instead treating it as a pure natural disaster with no obligation of any party to compensate the land. In contrast to the mudflow in Kabupaten Sidoarjo, it is difficult to link tidal flooding to development activities, as well as to prove who is to blame for the disaster other than climate change and sea level rise. The government also failed to recognize that, regardless of how the physics of the land had changed, there were social and historical ties between the land and its owner that should be rewarded. Furthermore, because this is a national project, it is reasonable that those affected receive fair and just compensation.

Table 3. Comparison of the Responses of the Government in Disaster Management

	Earthquake – tsunami in Aceh	**Hot mudflow in Porong Sidoarjo**	**Tidal rob and Abrasion in Demak**
Nature and the extent of the disaster			
Nature of the disaster	Natural disaster	Still on debates, but many confirmed that this is a natural event triggered by human activities (oil drilling)	Climate-related natural disaster. nonetheless, many confirmed that the impact was exacerbated by development activities outside the area
Extent of the impact	28.482 hectares	1.167,25 hectares, covering 16 villages in 3 districts and still continuing until now.	2.116,54 hectares, covering 16 villages and still continuing until now.
Effect on land record and tenure security	- Most of land record data were destroyed - Many lands were destroyed, inundated or cannot be used/occupied - Many people loses their land because their land was destroyed or inundated by	- Many lands were destroyed, inundated or cannot be used/occupied - Many affected lands did not have land certificate, but local Land Office has land record data and it is possible to collect the data	- Many lands has been inundated, but there is no exact record on the number of affected parcels

	sea water post-disaster	from other source such as village record, taxation record and confirmation from the landowner	
Responses related to rehabilitation and recovery			
Status of the disaster	National disaster	Not specified as national disaster, but under management of central government.	Not specified as disaster
Responsible institution	National government through Rehabilitation and Reconstruction Agency (BRR) for Aceh-Nias disaster recovery.	BPLS, later changed into PPLS under Ministry of Public Work.	Not specified.
Finance	National budged and other donors	Responsible company (PT. Lapindo Brantas) and National budged.	Multi-agency, but not organized.
Recovery and rehabilitation activities related to tenure	- Resettlement and land consolidation for affected person. - Implementation of RALAS to reconstruct land administration system (boundary reconstruction and land certification for affected parcels)	- All affected land were purchased by the company (PT. Lapindo Brantas) and become state asset - Any land for the construction of supporting infrastructure to prevent the mudflow were released through land	-

		acquisition process.	
Policy and regulation specified on rehabilitation and recovery process.	Yes	Yes, and has been updated several times to keep up with the ever-increasing impacts.	No (only covering status of obliterate land to accelerate SNP).
Multi-sector collaboration	Yes (International and national organization, NGO)	Between national and local government and responsible company (PT. Lapindo Brantas)	Yes, but partial

Source: data processing from many resources

Support from National Government and the Existence of Responsible Agency – Is It the Key Point?

The main differentiator in the three-disaster example was intervention from the Central Government and the existence of a specific responsible agency in charge of disaster management. In the case of the Aceh tsunami and the Sidoarjo mudflow, national authorities established agencies to implement reconstruction and rehabilitation programs that are still in place years after the disaster. The presence of a responsible agency capable of bridging structural gaps in coordination among various stakeholders at various levels of authority, as we discovered in Aceh. The key to RALAS's success in reconstructing land records data and conducting systematic land registration after the disaster in Aceh was good coordination and support from parties with diverse backgrounds and expertise. National government, with greater institutional capacity and with technological and financial support from international organizations, collaborated with local government for community participation and worked together to implement RALAS. In terms of resettlement and land consolidation, BRR, as the project's lead institution, plays an important role in coordinating the various organizations involved. Concerning the mudslide in Sidoarjo, the Central Government has delegated authority to BPLS to take the necessary actions in addressing the impacts, as well as mobilizing resources and coordinating with related stakeholders. Regulatory support also provides a foundation for the agency to make decisions while also requiring the responsible company (PT Lapindo Brantas) to take actions to mitigate the effects, including how to treat affected land parcels.

However, reviewing the documentation, there is no evidence which suggest that regulatory support existed in the third example. This lack of assigning a responsible agency and National Government support appears to be the main bottleneck in handling the effects

of the tidal flood in Kabupaten Demak. This disaster involved far more complex and broader issues than local and natural events, and local government lacked the resources and capacity to respond comprehensively. Mitigation programs, which were partially implemented, were found to be ineffective in reducing the impact of tidal flood and abrasion. This also affected the lack of protection against the loss of ownership rights to permanently inundated land, as well as the ability to conduct relocation to provide a safer environment for the community. At the time the National Government issued an ordinance on the handling of obliterate land (which was initially intended to solve the problem of land acquisition in this region), there was no involvement from the local government during the decision-making process, nor was there any affiliation interest from the victims regarding their tenure right. It is clear that the government's main priority in the TTLSD project was to hasten land acquisition.

The presence of a responsible agency, as well as national government support, determines the ability to respond to a disaster (Coppola, 2006). This includes ensuring tenure security and how the authority decides on the status of the land when land records are destroyed (as in the case of the Aceh tsunami) or when the land itself is destroyed, inundated, or vanished (from the example of mudflow and tidal flooding). Dealing with disaster entails dealing with uncertainty, with no policy or legal guidance available in time for decision making. As a result, the presence of central authorities, as well as supporting responsible agencies, will be critical for effective disaster management. The importance of this agency including its clear structure, roles, and responsibilities, as well as its relationship with all other levels of involved stakeholders (Kusumasari & Alam, 2012). Furthermore, as confirmed in the third example, we argue that tenure security and the legal relationship of land and its ownership are under the authority of the central government, which extends beyond the authority of local governments. We discovered that lack of national authority and responsible agencies in handling the tidal flood resulted in a lack of capacity to deal with the disaster. Local governments have no authority to determine the status of inundated land caused by abrasion or to compensate landowners. Furthermore, the local government lacks the capacity to carry out relocation, purchase land and convert it to state land, as in Sidoarjo mudflow, or carry out concurrent reclamation to prevent inundation.

Nonetheless, centralization in disaster response may result in inefficiency, as experiences in other countries have shown. As we saw in Nigeria, the necessary alignment of activities and policies among three tiers of governance in the country - Federal, State, and Local - leads to redundant and overlapping actions as well as great delays in effective assessment, relief, rehabilitation, and refugee management. The greatest burden placed on NEMA as the main disaster agency of the country has resulted in inefficiency in disaster response in Nigeria (Mashi et al., 2019). This is also evident in the cases of the Aceh tsunami

and the Sidoarjo mudflow. In both cases, there were critics of the organization's structure and the unclear division of responsibilities, which increased the burden on the state budget. (Masyrafah & McKeon, 2008). As a result, we posit that, despite the importance of responsible agency, effective organization's structure, sharing responsibilities and coordination among stakeholders are critical. Yet, at all times, land related information must be directly accessible, for all parties concerned. Despite the fact that the Law Nr. 24/2007 on Disaster Management explicitly defines the allocation of duties between the central and local governments, its implementation is challenging because of the disparity in power, coordination, and resources (Kusumasari et al., 2010). Additionally, each local government has a distinct capacity to handle the crisis, which presents difficulties like regulatory discrepancies, a lack of resources and capacity, and a significant reliance on the federal government (Putra & Matsuyuki, 2019).

Another aspect concerns the role of local government in disaster management. Local government are closest to the immediate activities which need to be done, and are therefore the most active in protecting the community and mitigating disaster effects (Kusumasari et al., 2010). Reports from countries, such as Canada, describe that the jurisdiction over emergency situations is delegated to the local government (Raikes & McBean, 2016). Nonetheless, the role of municipal government is often constrained by provincial and national statutes, making it difficult for the local government to act appropriately and independently (Raikes & McBean, 2016). Furthermore, local governments typically lack institutional, human resource, policy and regulatory capacity, financial, technical, and leadership resources (Kusumasari & Alam, 2012)(Kusumasari et al., 2010) ,as confirmed in Kabupaten Demak, that will also influence response during a disaster event. We believe that sharing responsibilities based on capacity and resources at each level of authority will be critical, and that there should be a clear division of authorities in post-disaster management. Concerning tenure security and the protection of land rights and ownership that may be damaged or lost as a result of the disaster, we argue that this should be under national authority with clear policy and regulation in favor of the affected community. Meanwhile, local governments are responsible for providing relevant data as well as facilitating community participation in decision-making processes that benefit the community. Local governments tend to lack however direct access to land related information, as this is channeled through vertical administrative structures rather than horizontal structures.

Placing Environmental Justice when the Disaster Occurred: Nature-Driven and Human-Induced Disaster

In this section, we compare two disasters that were allegedly caused by anthropogenic activities: mudflow in Kabupaten Sidoarjo and tidal flood in Kabupaten

Demak, to a natural disaster in the case of the Aceh tsunami. In both cases, the government did not explicitly declare that the disaster was caused, or triggered, by human activity, despite evidence confirming a link between human activity and the disaster. Furthermore, the 'human activities' mentioned in the two examples were closely related to national development interests. These events have the same impact on land tenure: the majority of the affected community has lost their land or is unable to function their land due to physical changes.

There were some examples of human-induced disasters that had an impact on tenure rights. As an example, consider the Fukushima nuclear disaster in 2011, when a massive earthquake and tsunami struck eastern Japan, displacing thousands of people. Many of them, who lived in the third zone of radiation, were 'forced' evacuated and resettled, and they were not permitted to return to their homes for more than five years after the accident due to the risk of radiation (Hasegawa, 2013). It is estimated that approximately 320.000 people lived in government-provided temporary housing even years after the disaster (Devlin et al., 2013). In comparison to the effort expended in dealing with the same disaster in other areas, the handling of the Fukushima nuclear accident was more political, owing to its relationship with Japan's energy policy, which involved far more complex interests (Devlin et al., 2013). As a result, we contend that dealing with human-induced disasters is far more complex than dealing with natural disasters, because it involves broader interests that extend beyond political, economic, social, and environmental concerns. As a result, we bring this up in the context of the long-promoted discussion of environmental justice in disaster management.

The first environmental justice concept focuses on toxic waste and undesirable land uses in relation to racism (Walker, 2012). However, current trends include a broader range of social and environmental dimensions, such as industrial activities and climate change (Walker, 2012) and (Sze & London, 2008). Even though the definition of environmental justice evolves by the time, but the closest definition with the context of this paper is from the United States Environmental Protection Agency (EPA) – as "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies" – while "fair treatment means no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies" (EPA (United States Environmental Protection Agency), 2022). This concept was then used as the foundation for environmental activism in order to demand environmental justice. Furthermore, the movement introduces the concept of climate justice in terms of local impacts and experiences, inequitable vulnerabilities, community participation, and demands for community sovereignty and functioning (Schlosberg & Collins, 2014).

Even though the Sidoarjo mudflow was not officially declared a man-made disaster, it is quite simple to link this event to PT Lapindo Brantas' drilling activity as the basis for the government to demand accountability from the company. However, in the case of inundated land in Kabupaten Demak, the effects of (what was suspected to be) reclamation in the adjacent area, which occurred years after the reclamation was completed, will necessitate further investigation. Because this disaster has been linked to climate change, which includes far more complex factors, it is difficult to solely blame development activities for the phenomenon. When we bring this into further discussion on the climate justice issue, it will exacerbate the difficulties in determining who suffers the most, who causes the problem, who is expected to act and take responsibility, and who has the resources to do so (Mohai et al., 2009). Looking deeper into Indonesian law and regulation on disaster management, including the most recent regulation on obliterated land, we find that the regulation does not enable for a review of the causes of the disaster or environmental advocacy in favor of the community. Furthermore, it is difficult to examine 'injustice' in an environmental context, as Sze and London (2008) state that environmental injustice is "a complicated history of political, social, and economic interactions leading up to, and continuing beyond" a single harmful event or action. As a result, when we look at the case of inundated land in Kabupaten Demak, we argue that it was exacerbated by inappropriate spatial planning, lack of control over land use in coastal areas, exploitation of industrial activities, and disaster response that is not in the best interests of the community, for which the government should be held accountable.

CONCLUSIONS

Disaster events influence tenure security in a variety of ways. The loss of physical land records makes it impossible to recreate parcel boundaries and offer direct evidence of land rights. The physical modifications or even disappearance of the land may create uncertainty in land tenure claims. . The alteration may also reduce the land's ability to support the livelihoods of those living in the nearby area. The disaster may force individuals to leave their land, and without secure tenure system, the relocation process may result in the loss of land ownership. On the other hand, tenure recognition is generally defined by legal-formal land right proven by land certificate, whereas in many disaster events, there is a lack of land record data, and the victims have no adequate proof of ownership, resulting in tenure vulnerability for those who cannot provide formal evidence of land right, implying uncertainty of the land status. Available land record data is also required as a baseline for an efficient post-disaster relocation and reconstruction program.

Not just during the disaster, but also in the aftermath, both in the short and the long term, might undermine tenure security. As seen in the case of the Sidoarjo Mud Flow, the mud outpouring continued for decades after the initial commencement, with the impacted

area expanding over time and not expected to halt anytime soon. Given this scenario, persons who live in the mudflow's vicinity face the possibility of losing their land as well as other economic losses such as a decrease in land value. The persistent impact, particularly those that occurred long after the accident and are not too severe, frequently goes unrecognized by authorities.

The manner in which disasters occur, regardless of whether it occurs rapidly or gradually, has an impact on how and how fast governments can response, particularly with regard to the protection of tenure rights. While it is easier to notice and respond to the impact of a sudden-onset disaster, a slow-onset disaster that is not recognized as such may result in the failure of the authorities to respond in terms of disaster management, including land ownership protection. A slowly emerging disaster, such as a tidal flood in Kecamatan Sayung, Kabupaten Demak, is not recognized as a disaster, but rather as a natural event, which leads a failure for governments to undertake appropriate disaster management.

Furthermore, there is no process in place in existing legislation to investigate the cause of the accident, whether it was a purely natural disaster, a man-made disaster, or a development-impact disaster. While national regulations state that land whose physical condition has changed, been damaged, or lost will lose its right of ownership, and the government is not responsible for providing compensation once the land has been designated as obliterated land, it is unfair if the regulation does not look further into the cause and trigger of the disaster, and the victims should bear the consequences for things they did not do. Comparison of the cases of mudflow in Kabupaten Sidoarjo and permanent inundation in Kabupaten Demak, demonstrating opposing responses by the government in terms of tenure right protection. In the first case, the government agreed, though not explicitly, that there was a human-induced component that precipitated the disaster, and named PT. Lapindo Brantas as the responsible party, with the obligation to compensate people who were directly harmed by the mudslide. In the case of prolonged inundation in Kabupaten Demak, however, we saw a distinct reaction. Even though we believe it is difficult to prove a link between human activities and the presence of inundation, we believe the government should be held accountable for providing a suitable mitigation effort for the victims, such as relocation for people whose land can no longer be used, livelihood adaptation for affected people, the establishment of coastal zonation of spatial planning, and the construction of infrastructure to reduce the impact of tidal flooding and abrasion in the area. The stipulation of obliterate land over land that was permanently inundated in this area was too hasty, as it did not consider the possibility of human-induced factors that could contribute to worsening the effect of climate change, and instead threatened it as a natural disaster. The designation of regulations on obliterate land also appears to promote national development over the needs of the community living in the surrounding area.

We also discovered that a quick response from the government in the case of a disaster is influenced by economic interests that may be harmed by the calamity. In terms of the mudflow, the majority of the afflicted area has a substantial economic role that has an impact on national interest. As a result, the government moves fast to cope with the crisis, and the Central Government becomes the central authority in disaster management. The opposite was confirmed the in the case of a tidal flood; because the area was previously not economically significant, the flood was ignored for years, and the status of the land with permanent inundation was left uncertain. When this place is designated as a Strategic National Project, the Central Government then take part and accelerate the stipulation of regulation related to obliterated land.

Following that, we posit that maintaining tenure security in disaster management structures and processes remians difficult, because it frequently involves multiple stakeholders with conflicting interests and points of view, which cannot be reconciled. This leads to inefficiencies in both land governance and in disaster management. Even though local governments play the most crucial role in operational part of disaster management, an active central government is critical, particularly in bridging authority and coordination gaps among parties, as well as gaps in technological, financial, and human resource capabilities. The documented evidence of the three cases demonstrate that local governments lacked appropriate power and authority in making decisions or stipulations relating to land right status after a disaster, necessitating higher jurisdiction from the Central Government. Nonetheless, local governments are accountable for supplying reliable land record data, actively participating in parcel boundary reconstruction and its possession, and providing appropriate spatial planning for mitigation and adaptation efforts.

Next, the participation of organizations, both worldwide and national, plays a significant role in disaster management efforts, including attempts to protect tenure rights. For example, in the aftermath of the tsunami in Aceh, the presence of international organizations not only filled technological, financial, and technical deficiencies, but also improved government capacity building in disaster management. The World Bank's engagement in the RALAS project post-tsunami in Banda Aceh was greatly useful in the attempt to restore parcel boundary and land record data through technological and financial assistance. Nonetheless, a distinct outcome was observed in the instance of abrasion in Kabupaten Demak. There were parties involved in the endeavor to lessen the impact of tidal flooding and abrasion, such as a non-governmental organization (NGO), a research institute, and a university, but none of the initiatives produced long-term outcomes, and the activities appear to have been carried out partially. We contend that this occurs due to a failure of local government to detect problems and coordinate among stakeholders.

The protection of tenure rights against disaster events needs to be highlighted more in national law and fall under the jurisdiction of the national government. To assess to what extent the government should be liable for providing compensation for people who suffer from the disaster, regardless of government responsibilities in that area, it is vital to look into the trigger and cause of the disaster in more detail. When offering compensation to those affected by a calamity, it is equally crucial to consider social historical roots of the victims with their land. While fast onset disasters may make damage estimates simpler, they frequently develop slowly and are not immediately felt, making it difficult to classify them as natural disasters. Yet, every community member has the same right to have their tenure rights protected in the event of a calamity.

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