Climate change and COVID-19: The double whammy for coastal community in Demak, Indonesia

S Seftiani*, I A P Putri, I Hidayati, L K Katherina, V Ningrum, and D Vibriyanti,
Research Center for Population, Indonesian Institute of Sciences, Jakarta 12710, Indonesia
*Corresponding author: tehsarie@gmail.com

Abstract. In 2020 the coastal community in Demak-Indonesia faced two alarming events of their lives, the COVID-19 Pandemic and tidal flooding (Rob) events with a frequency and duration longer than usual. It is well-accepted worldwide that tidal flooding is one of the consequences of climate change caused by sea level rises. This paper will focus on the impact of a double whammy; climate change and COVID-19 Pandemic are in the coastal community. To analyze and describe the research question, we use the media analysis method of 21 Indonesian news articles from March to September 2020. Data from the media analysis using Discourse Network Analyzer (DNA) and open interview to describe the latest coastal community's condition, including the socio-economic impact and response to the double whammy. The results show that this year's tidal floods are the worst, seen from the duration, and the altitude is getting bigger than previous years. The tidal floods coupled with the economic impact of the COVID-19 Pandemic, which made them economically locked down. Strengthening the resilience of the fisherman community in Demak is essential. It needs government policy support that considers ocean sustainability to improve their welfare and enhance preparedness in facing a double whammy in the future.

1. Introduction
Tidal flooding is getting severe because of sea level rises due to climate change [1-4]. In 2100 it is predicted that the tidal flood will harm 287 million people. The coastal community will experience episodic tidal flooding, and the economic loss estimated at $14.2 trillion or reaches one-fifth of global GDP [4]. In 2020, the impact of climate change will be more severe due to the COVID-19 Pandemic because the government allocated all resources have to deal with the COVID-19 Pandemic [5].

It is well-accepted worldwide that tidal flooding is one of the consequences of climate change caused by sea level rises. Tidal flooding is more severe than before, and it increases in frequency and duration every year. This condition worsened along with the economic growth that drives industrial areas, residential construction, and infrastructure development. Other researchers call the risks from the climate disaster and COVID-19 a double whammy [6-9].

The coastal community faces a double whammy, the COVID-19 pandemic lockdown, and coupled with coastal flooding that is getting worse. The coastal community in Demak experiences this situation. From March to December should be the high season on the northern coast of Java or called Pantura [10]. However, in 2020 the contrary situation will occur compared to other years and the early month of the COVID-19 Pandemic impacted fishers because of declining international and regional fish production market demand. When the impact of COVID-19 on the fisheries sector in Pantura Demak has not finished yet, there was an intense tidal flood at the beginning of the Pandemic, which worsened the
socio-economic conditions of the fisheries sector workers. This paper aims to understand the impact and coping strategies of the double whammy for coastal communities in Pantura Demak and formulating policies and regulations to reduce these double impacts in the future and strengthen the vulnerable fisheries sector workers.

2. Method
This paper describes the impact of the double whammy in the coastal area of Demak. Media analysis and qualitative approach used to analyze this phenomenon. Discourse Network Analyzer (DNA), developed by Leifed [11], extracted text from newspapers. DNA featuring actor's statement comment and argumentation on the double whammy information, impact, strategy, adaptation, and mitigation coded as 'statements.' Every statement consists of four coded variables: person or actor, organization, concept, and agreement. Only direct quotes from person/actors analyzed, not including the editorial comment. In this paper, all the statements data were taken from 21 online news articles from March to September 2020; 121 statements were made from 24 persons in 18 organizations and produced 96 concepts. We used visone to visualize the network between actors and the variables [12]. Combined with a qualitative approach, we interviewed six informants (two fishermen, two fish processor owners, a fish seller (skipper), and a fish processing worker) in March 2021. The interview focuses on the double whammy impact on the socio-economic status of the coastal community.

3. Result and discussion

3.1. Discourse network analysis of the double whammy impact

Figure 1. Network diagram double whammy problem in Demak Coastal Areas.

Statements from actors that coded from online newspapers related to double whammy shown in fig. 1. We divided the number of people/actors by their organizations into three groups. The hexagon nodes
(●) represent the government (local and national), a triangle node (▲) represent people/communities/villagers, while diamond nodes (◆) represent academics, researchers, and NGOs. Greenline indicates the actor's agreement on a concept, while the red line denotes disagreement on a concept, and the blue line indicates the actor's agreement and disagreement about the concept at the same time. The output network diagram of the actors' statement is related to double whammy issues depicted in Figure 1.

Fig. 1, there are a total of 6 statements that link between groups and two statements connecting within one group. One statement connecting the three groups is "The Demak sea wall toll does not solve the problem," from 8 person/actors, five actors agree with the statement, all the four-person/actors at the same group-the academic, researcher, and NGO. In contrast, two actors from the government (Minister of Public Works and Housing/MPWH and MPWH employee) disagree with the statement. When the toll-ready, it will be connected with industrial areas in the future and free from the tidal flood that will revive the local economy and the existing industrial market for goods and services.

Two statements that agreed by two groups are "the tidal floods inundated public roads, village roads, alleys, and residential area" and "The tidal flood height is between 20-110 cm" both of actors from the government (PBPD Jawa Tengah, BPBD Demak and Stasiun Meteorologi Maritim Tanjung Emas Semarang) and People/Communities (Bedono’s villager and Purworejo’s villager). However, the two groups are contradictory on three statements. The "In 2020, the duration of the tidal flood is all day long" statement was agreed by Purworejo’s villagers and disagreed by Stasiun Meteorologi Maritim Tanjung Emas Semarang. The "Tidal flood will recede on May 17, 2020," agreed by BPBD Demak but disagreed with by Purworejo’s villagers. Dinas PU Taru Demak agreed on the "The road in morodemak is elevated up to 1-meter" statement, while the Purworejo’s villager disagree on that.

3.2. Coastal flood in Demak, never ending stories
The northern coasts of Java are physically very vulnerable to tidal disasters [16-19]. Tidal flooding will not be a threat if it does not interfere with residents' activities and is far from residential areas. However, because the coastline has receded and approaching residential areas, tidal flooding is a problem. It is getting worse when build-up areas continue to expand in coastal areas. Many agricultural areas have changed their function to a residential area for industrial areas and infrastructure development [20].

Based on DNA result through statements, "abrasion begins to enter the village in the 2000s", "tidal floods occurred in Demak since 2001", "the sea used to 4 km away", "tidal floods makes their house damage," "the seawater inundated the village in 2004" from the bedono villager, it means tidal flooding has occurred since decades ago. Bedono Village in Sayung District was the first affected village [21]. Currently, the tidal flood has inundated almost all sub-districts north of Demak. The inundation caused various damages not only for housing but also to the livelihood of coastal communities. Many areas have been lost to the economic resources of coastal communities, such as rice fields, ponds, and jasmine gardens [21-22].

Many studies have examined the impact of the coastal flood both physically, socio-economically, and environmentally in Demak [23]. The adaptation strategy is urgent to activate. The implications of the tidal flood disaster include five areas of resilience: geography, natural resources, demography, economy, and socio-culture [24]. The Demak coastal community has made various physical adaptations to overcome coastal flooding, such as raising a house floor and roof and building dikes [21-22]. Meanwhile, for economic strategy, since the coastal area in Demak is a strategic location, this location is surrounded by industrial areas, passed by busy main roads, and also dense housing make many informal activities can be done. As said by the respondent, when people cannot go fishing because of tidal flooding, they can get money from selling food or snacks, as motorcycle taxis (ojek), become temporary household assistants for women, and other odd jobs surrounding environment.

The Demak Regency government has made several mitigation measures to reduce tidal flooding, especially structural mitigation. The road elevation has been repeatedly done, and it makes the road not submerged again when the tidal floods. Unfortunately, the road elevation makes the residents' houses sink even more because they are getting lower than the road. One of our participants narrates that he
always raises his house every 4-5 years with a budget of up to ten million rupiahs. In addition, residents also increase the ceiling of their houses. However, the process of increasing the floor height of this resident's house is an only temporary action. While the road started to get damaged and submerged, the road was increased again. This condition makes houses and roads at the same height and makes the house submerged again, and the floor height needs to be added again. The increase in the height of the house and road will continue repeatedly and never-ending. Fig 2. illustrates the never-ending process of facing the tidal flood.

Figure 2. Villager house that has adapted by raising floor while the tidal flood is getting severe.

Many adaptation strategies have been done by residents to deal with the impacts caused by tidal flooding. Based on the results of DNA and interviews, in general, the pattern of people facing tidal flooding is divided into two groups. The first group is the people who migrate to new locations, and the second is the people who adapt to existing conditions.

This situation will continue until the coastal communities are forced to move from their current location. This stage illustrates that climate change has encouraged environmental migration. The environmental change factors will encourage migration after previously going through a decision-making process involving push factors, personal and household characteristics, also intervening obstacles and facilitators [25]. Migration flows due to climate variability will increase vulnerable people or communities' migration [26]. Out-migration will increase when there is a loss of housing and livelihoods.

The mitigation that has become the center of attention is the construction of the sea highway and the embankment that stretches between Semarang and Demak. This construction is expected to prevent traffic disruption due to flooding and prevent seawater from entering settlements. This policy has drawn much criticism because of the threat of negative impacts, ranging from the threat of land subsidence, environmental damage, and disruption to the activities of fishers. From DNA statements, experts are concerned that the existence of a sea highway will worsen land subsidence due to additional burdens on
the land surface. It is also concerned that the mangrove ecosystem will be disrupted due to the sea toll because the highway will pass through the mangrove. However, MPWH has promised to prepare a mangrove allocation program to deal with any damage that may arise. Concerns from residents also arise about whether the existence of the toll road will interfere with their fishing activities.

3.3. Climate change and COVID-19 pandemic: the double impact

COVID-19 Pandemic in the fisheries sector resulted in the falling prices of seafood products due to decreasing market demand. Interviews with a fish distributor in Purworejo Village-Demak showed that the government's large-scale social restriction (PSBB) had blocked the distribution chain. Trucks carrying seafood products from Demak are blocked in the middle of their trip and cannot continue their deliveries. The consequences were that the product had to be discarded because it perished and damage. The Pandemic disrupted the seafood distribution chain and caused the fisheries sector worker/entrepreneur financially to fall to 25 percent. Knock-on economic effects from the pandemic COVID-19 have a terrible impact on the coastal community in Demak, particularly the collapse of price caused by market demand reduction. At the same time, the data shows that Demaks’s fish production in 2020 reached 2,052.7 tons and a production value of around 57,978 billion rupiahs [28]. As a result of COVID-19 during 2020, fresh and salted fish price dropped dramatically due to decreasing demand. Even though March was the high season for fisheries, the conditions worsened when the seasons enter a low season, and they do not have any fund for fishing. Challenges in the market and changing seasons have made fishers the most vulnerable group during the COVID-19 Pandemic. Informant emphasized that the COVID-19 Pandemic and tidal floods have seriously disrupted the economic resilience of their families. Tidal flooding as climate change's impact and government's large-scale social restriction due to COVID-19 has restricted the mobility of the coastal communities and the distribution of marine products. Nevertheless, the fishermen informant said that the worst impact of pandemic COVID-19 is only at the beginning of the Pandemic. After the critical month passed, this situation, in fact, was not that worst because they have regular buyers.

Another situation is different for seafood processors (salted or crab). The pandemic COVID-19 caused the decreasing of demand significantly, particularly on overseas demand for crab. The fishers that catch crab have to undergo a significant drop in price from Rp. 100,000 to Rp. 30,000/kg. The informant that works as salted processors said that their income shrink to 25 percent compared to their average income. Moreover, the tidal flood that simultaneously comes with the COVID-19 Pandemic disrupts their income because many of their buyers do not want to take the salted fish on the location due to tidal floods that can damage their vehicle (motorbike or car). The DNA statement from Purworejo villagers showed that "transportation costs for delivering fish were higher due to the tidal flood." The only way is using a tricycle called 'becak,' yet it will raise their transportation cost, which means their profit will diminish. The informant said that she was in "double lockdown" moments.

3.4. The wake-up calls

The double whammy, climate change impact, and COVID-19 Pandemic pose the welfare of coastal communities both directly or indirectly. Many mitigation projects focus on grey infrastructure as the best solution without considering the nature and environmental problems. Furthermore, it may create another problem like the disruption of the fisheries sector due to limited access to the natural resource and environment because it degraded.

The COVID-19 Pandemic and climate disaster give us the "wake-up calls" to invest in resilience [28], helping the most vulnerable people, such as poor coastal communities, to build and increase their resilience to multiple risks that may happen in the future. Ocean Panel (High-Level Panel for Sustainable Ocean) is estimated in return, and we can gain a $5 benefit for every $1 we spent invested in sustainable ocean solutions [29]. The lesson learned from this double whammy is that we need to invest more in preparedness for coastal communities. It will save human lives and economic returns [30]. Engström et al. mentioned that to boost economic recovery, we can apply labor-intensive green infrastructure projects, planting trees, and pricing carbon coupled with reduced labor taxation [31]. Moreover, invest
in coastal and marine ecosystem restoration and protection as a cost avoided a severe economic loss in the future [32].

4. Conclusion
Climate change impact and COVID-19 Pandemic happened in Demak’s coastal area almost at the same time. The coastal communities have to face multiple risks that affect most fisheries workers in the northern part of the Java sea, particularly in Demak. They have to be able to “walk and chew gum” simultaneously. It means that they have to be more resilient in the future to cope with such an event (the double whammy). It is crucial to build coastal communities’ resilience and to build long-term policies that consider the multi-risks. Building up the community resilience to face multi-risks and spending more on marine resource recovery could be the best solution. Prefer the green infrastructure compared to the grey infrastructure may not be profitable in the short term. However, it will give benefit, particularly for coastal communities, in the long run.

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