

Adaptation of climate change and environmental pollution in Cirebon's coastal community

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Abstract. Climate change and environmental pollution are interrelated global phenomena. Communities whose lives depend on natural resources have felt many negative impacts from both. Coastal communities, which mostly depend on the capture fisheries, are a vulnerable group to these threats. The study aims to reveal the adaptation of coastal communities in Cirebon, Indonesia to facing climate change and environmental pollution. This research is located in Gebang Cirebon Regency. Data were obtained from field observations and unstructured interviews which were synthesized to know their adaptive behaviour. We found the adaptation of coastal communities through non-environmentally fishing gears, expansion of fishing areas, burden of debt and capital, not optimal fisherman regeneration, and changes in occupation. Despite changes in mindset, attitude, and behaviour, these adaptations have the potential to threaten a regional and national economy because the fisheries sector is the main contributor of gross domestic product. Declining yield catches and the desire to obtain high economic benefits quickly without paying attention to sustainability, are also the main driving factors for the emergence of maladaptive behaviour in coastal communities. Without serious attention, climate change and environmental pollution will trigger socio-economic impacts that are worse than COVID-19 pandemic.

1 Introduction

Climate change and pollution due to pollutants have become cross-border issues, both of which have inspired the emergence of various environmental management methods [1]. Government, community and society work together to reduce the negative impact it causes [2]. In fact, researchers also contribute as parties who provide scientific information using appropriate environmental management methods [3]. Even though various efforts have been made, the negative impact still exists because the problem is very complex. Increased temperature, rainfall variations, and rapid development at the coastal area trigger the changes in structure of pollutant compounds, making them more dangerous for ecosystems and humans [4,24]. Communities are faced with disasters that occur as a result of changing environmental systems. Tidal flooding as one of the impacts of global warming occurred in several areas near the coast [5,6].

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This condition makes it increasingly difficult for the surrounding community to survive, even less meet the necessities of life. The people most affected are those who are on low-middle income and depend on extractive economies, for example farmer and fishermen [7,8]. The yields they get are influenced by environmental conditions such as weather and water quality, thus the yields obtained are very uncertain. The impact of global warming and pollutants is felt by almost all people who live in cities and villages, highlands and lowlands. Cirebon as a coastal area which is one of the regional fishery commodity centers [9]. This region is able to supply fish needs for other regions. However, currently it is difficult to meet the needs of local communities, even less to supply other areas. Gebang is one of the sub-districts in Cirebon Regency which is also affected by rising temperatures, declining primary productivity, and water quality [10]. The local fishermen admit that it is currently hard to get catch and there are several types of marine life that are rarely found.

As a trigger, the sea waters are polluted by industrial and household waste. Not only that, poor water quality due to excess sediment loading from rivers is not always beneficial. The extreme accretion causing the addition of new land area actually makes fishermen lose money, because more operational costs are needed. [11]. From these various problems and difficulties, the community tries to make adaptive and maladaptive adjustments in order to survive. Based on the background, this article aims to reveal the adaptation of Cirebon coastal communities in dealing with climate change and environmental pollution.

2 Methods

This research is located in Gebang Sub-district, Cirebon Regency, West Java Province, Indonesia (Figure 1) [12]. Gebang is a center for fisheries in Cirebon, fishery products from this area have market export until overseas, such as United States, China, Japan, Korea, and many more. To obtain their adaptation, subjects focused on fishermen aged 30 to 50 years old. Data obtained from field observations, documentation studies, and unstructured deep-interviews during 3 months with five informan. Three informants are senior fisherman who have ship (juragan), while two informants are ship crews. They came from two village are known as fishing village in Gebang and have natural harbors (estuary), ie Gebang Kulon and Gebang Mekar. Then, we synthesize to find out their adaptive behavior with previous studies [13,14]. We classify adaptation into 2 types, adaptive and mal-adaptive behaviour [15]. Adaptive behaviour is signed by pro-environment, resilience, and responsible actions. In our perspective, mal-adaptive behaviour which known as non-environmental friendly, greediness, and non-fair action. This classification is based on the perception of researchers, after matching it with the latest studies about coastal environment.

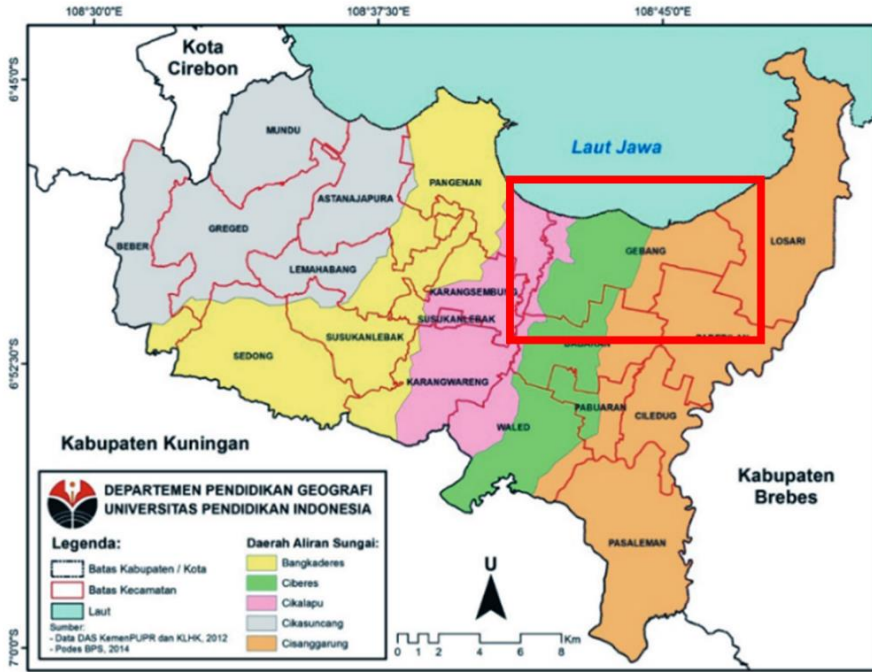


Figure 1. Research location, a red box shows the border of Gebang [12].

3 Result and Discussion

Climate change and pollution have changed the structure of employment, shifting livelihoods from the capture fisheries sector to manufacturing and service industries, in addition to urbanization and industrialization factors in Cirebon Regency [16,17]. Many fishermen's children (the younger generation) are not interested in continuing their parents' business, both for fishing, buying and selling fishery, and processing fishery products. They prefer to be employees, providers of transportation services, trade (non-fishing), and Indonesian migrant workers (Japan, Korea, Taiwan). Although the interest in continuing to vocational schools in the fisheries sector is still high, they have a dream to become migrant workers. In foreign country, they are able to earn a net income of between IDR 9 million to IDR 20 million per month. In fact, if we pay attention carefully, income as a fisherman and the fishery sector is still quite high. However, climate change and pollutants cause fishermen to spend more than hundreds of millions of dollars in fishing capital.

Many fishing families are trapped in non-banking debt and cooperatives with high interest rates between 25 and 50 percent. Climate change and pollution of the coastal environment have encouraged the emergence of business competition among fishermen, such as increasing the size (tonnage) of vessels, using prohibited fishing gear, increasing capital, overfishing, and catching protected animal species [18]. Even so, fishermen are also able to diversify their catches, many species that were previously not valuable have become high economic value (such as teripang 'Holothuroidea', kepiting arus-arus 'Podophthalmus vigil', kepiting gompel 'Scylla paramamosain', kepiting wideng 'sesarma spp', and many more). In fact, various navigation technologies and processing fishery products have been introduced to them through various programs from the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia, the Fisheries Service, non-governmental organizations, and universities. The variety of commodities and the high economic value of the catch have not

been able to significantly improve their socio-economic situation [23]. Poor financial management, the absence of a priority scale, and the assumption that they always get big sustenance every day actually often lead to serious economic problems, especially being in debt and not having an adequate investment scheme (Table 1).

Table 1. Adaptive behavior vs. mal-adaptive behavior in Cirebon’s Coastal community.

Adaptive behavior	Mal-adaptive behavior
<ul style="list-style-type: none"> ● Livelihood changes (trading, construction workers, motorcycle taxis “ojek”). ● Catching range becomes longer and takes more time (ship size increases). ● Diversification of fishing gear, mostly using capital and cooperative assistance. ● Diversification of catches that are worth selling. ● The entry of navigation and processing technology (use of GPS, radiotelephone, fish-pit smoker). ● Built a small dam and increasing elevation in the house. 	<ul style="list-style-type: none"> ● The regeneration of fishermen has decreased, the demographic structure has changed. ● In debt to non-banking institutions and cooperatives, the interest is very high. ● Overfishing. ● Using non-environmentally friendly fishing gear (trawl and <i>garok</i>). ● Hunting for fishery species with high conservation status. ● Uncontrolled garbage/waste. ● Increasing the horizontal settlements to the beach

The emergence of the “tragedy of the common” is evident from their low concern for the coastal environment and even tend indifferent and continue to pollute the waters [19,20]. The fishermen feel not guilty when they catch various protected species and damage coral reefs. They still regard rivers and seas as shared property or no one owns them, seas and coasts are finally landfills. Various actions such as dredging rivers, planting mangroves, and fencing riverbanks remain ineffective in preventing this behaviour. Climate change has actually changed the frequency of tidal flooding, it appears higher amid the threat of accretion and abrasion [21]. They adapted by raising buildings, creating embankments, and dredging waterways. Pollutants from industry and steam power plants have changed the primary productivity of the oceans there [22], even the growth of various fishery species is disrupted.

4 Conclusion

Despite changes in mindset, attitude, and behavior, these adaptations have the potential to threaten a regional and national economy because the fisheries sector is the main contributor of gross domestic product (GDP). Declining yield catches and the desire to obtain high economic benefits quickly without paying attention to sustainability, are also the main driving factors for the emergence of maladaptive behavior in coastal communities. Without serious attention, climate change and environmental pollution will trigger socio-economic impacts that are worse than COVID-19 pandemic.

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