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Inequality, Resilience, and Climate Change Adaptation: A Socio-Economic Study of the Coastal Communities in Indramayu, West Java

Fadhli Fauzan Ilahi
UIN Sunan Gunung Djati Bandung
1218030057@student.uinsgd.ac.id

Nina Khoirunnisa
UIN Sunan Gunung Djati Bandung
ninakhoirunnisa09187@gmail.com

Hansa Nabila Rahmat
UIN Sunan Gunung Djati Bandung
hansanrahmat15@gmail.com

Alfath Zaidanaufal Asheva
UIN Sunan Gunung Djati Bandung
zaidanaufalfath@gmail.com

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Abstract:
This study explores the socio-economic impacts of climate change on coastal communities in Indramayu, Indonesia, focusing on livelihood changes, social mobility, and local adaptation processes. Amid growing global concern over climate vulnerabilities, this research underscores the importance of addressing human dimensions in climate responses. Employing a qualitative approach, data were collected through online observations and literature reviews, then analyzed thematically to identify recurring patterns and adaptive behaviors. The findings reveal that climate change has severely affected traditional economic sectors – especially fisheries – triggering income diversification through microenterprises and nature-based tourism. Social solidarity, informal leadership, and collective environmental actions such as mangrove rehabilitation emerged as key components of community resilience. Nonetheless, disparities in access to information, resources, and policy support hinder equitable adaptation, particularly for marginalized groups like small-scale fishers and female-headed households. This research contributes to the literature on climate adaptation by illustrating how socio-economic transformation is both a necessity and consequence of environmental stress. It calls for inclusive, evidence-informed policy interventions that empower communities and reduce adaptation inequality. The originality of this study lies in its emphasis on socio-economic adaptation processes within Indonesian coastal communities – an area underrepresented in existing scholarship.
Keywords**:** *Climate Change Adaptation, Coastal Communities, Socio-Economic Transformation, Community Resilience.*

Abstrak
Penelitian ini mengeksplorasi dampak sosial ekonomi dari perubahan iklim terhadap masyarakat pesisir di Indramayu, Indonesia, dengan fokus pada perubahan mata pencaharian, mobilitas sosial, dan proses adaptasi lokal. Di tengah meningkatnya perhatian global terhadap kerentanan iklim, studi ini menekankan pentingnya dimensi manusia dalam respons terhadap perubahan iklim. Penelitian

menggunakan pendekatan kualitatif, dengan pengumpulan data melalui observasi daring dan studi literatur, yang kemudian dianalisis secara tematik untuk mengidentifikasi pola dan respons adaptif. Hasil penelitian menunjukkan bahwa perubahan iklim telah berdampak besar pada sektor ekonomi tradisional—terutama perikanan—yang mendorong diversifikasi pendapatan melalui usaha mikro dan wisata berbasis alam. Solidaritas sosial, kepemimpinan informal, serta aksi kolektif seperti rehabilitasi mangrove menjadi elemen penting dalam membangun ketangguhan komunitas. Namun, kesenjangan dalam akses informasi, sumber daya, dan dukungan kebijakan menghambat adaptasi yang merata, khususnya bagi kelompok rentan seperti nelayan kecil dan perempuan kepala keluarga. Penelitian ini memberikan kontribusi pada kajian adaptasi iklim dengan menunjukkan bahwa transformasi sosial ekonomi merupakan respons sekaligus konsekuensi dari tekanan lingkungan. Studi ini merekomendasikan kebijakan inklusif berbasis bukti yang memberdayakan komunitas dan mengurangi ketimpangan adaptasi. Keunikan penelitian ini terletak pada penekanan terhadap dinamika adaptasi sosial ekonomi di tingkat komunitas pesisir Indonesia, yang masih jarang dibahas dalam literatur akademik.

Kata Kunci: Adaptasi Perubahan Iklim; Masyarakat Pesisir; Transformasi Sosial Ekonomi; Ketangguhan Komunitas.

INTRODUCTION

Climate change presents one of the most significant global challenges of the 21st century (Pettorelli et al., 2021), with particularly severe impacts on coastal communities in Indonesia, including the Indramayu region. These communities heavily depend on fisheries, aquaculture, and agriculture, which makes them highly vulnerable to rising temperatures, extreme weather, tidal flooding, seawater intrusion, and coastal erosion (Choirunnisa et al., 2022). According to the Ministry of Marine Affairs and Fisheries (KKP), approximately 75% of Indonesia's population lives in coastal areas, with most relying on marine resources for their livelihoods (KKP, 2023). Reports by the IPCC (2021) and WRI Indonesia (2021) confirm that the northern coast of Java, including Indramayu, has experienced intensified climate-related disasters that damage infrastructure and disrupt traditional means of subsistence.

The impacts of climate change extend beyond ecological degradation and drive deep social and economic transformations (Ismail & Go, 2021; Lynch, 2022). Declining fish stocks, damaged agricultural lands due to seawater intrusion, and increasing frequency of extreme weather events have pushed communities to adapt through various strategies. Previous studies have explored climate change effects on coastal ecosystems (Adger & Campos, 2020) and general adaptation efforts among Indonesian communities, such as livelihood diversification (Rahmawati et al., 2023). However, few have investigated how climate change specifically affects the socio-economic structure of coastal communities in localized and contextual ways, particularly in terms of shifting social status, access to adaptive resources, and the role of community resilience.

This study aims to identify how climate change impacts the economic structure and social status of coastal communities in Indramayu. It focuses on how climate change affects traditional economic sectors such as fisheries and examines how communities respond through small-scale entrepreneurship, community-based tourism, and the strengthening of social networks. It also explores the dynamics of socio-economic status changes, including shifts in social roles and the emergence of new identities within coastal communities. Furthermore, this study investigates how local values, community solidarity, and informal leadership contribute to collective adaptation efforts.

Building on the premise that climate change not only causes physical damage but also reshapes social and economic relations, this study shows that Indramayu's coastal

communities actively adapt using a blend of local knowledge and innovative approaches. However, socio-economic inequality remains a persistent challenge. Vulnerable groups—such as small-scale fishers and female-headed households—often have limited access to adaptive resources. Therefore, this research emphasizes the need for inclusive, evidence-based policies to support just and sustainable adaptation.

METHOD

This study employed a qualitative approach to understand the social changes experienced by coastal communities in Indramayu as a result of climate change (Lune & Berg, 2017; Masrurah et al., 2022). The unit of analysis was the coastal community of Indramayu, with a focus on social dynamics, adaptation strategies, and the impacts of climate change on their daily lives. This approach enabled the researcher to deeply explore the meanings and subjective experiences of the community in responding to environmental changes.

The data sources consisted of secondary data collected from various digital platforms, including social media (Instagram and YouTube), online discussion forums, and local news websites that address climate change issues and the everyday life of coastal residents. In addition, the study utilized reports from government agencies and non-governmental organizations (NGOs) that focus on climate change and its effects on coastal communities.

The researcher used online observation techniques to collect data, which allowed for real-time monitoring and analysis of interactions and discussions among coastal residents on digital platforms (Hine, 2020). The collected data were then categorized thematically to identify the key factors influencing social and economic change in coastal communities as a result of climate change.

Data analysis involved three main stages: data reduction, description, and interpretation (Miles & Huberman, 2013). During the data reduction phase, the researcher selected and concentrated on information relevant to the theme of social change driven by climate change. In the description phase, the researcher organized the data to illustrate the ongoing social transformations in Indramayu's coastal communities. The interpretation phase involved analyzing the broader social, cultural, and economic contexts behind local adaptation responses. The researcher also examined how social stratification and access to resources shaped the community's adaptive capacities.

RESULTS AND DISCUSSION

The Impact of Climate Change on Coastal Communities in Indramayu

This study reveals that climate change has had significant impacts on the lives of coastal communities in Indramayu. Climate change is a long-term process marked by shifting temperature patterns, rainfall irregularities, and extreme weather events, primarily driven by increasing concentrations of greenhouse gases in the atmosphere due to human activities such as fossil fuel combustion, deforestation, and industrialization (Biswas, 2023; Folqué et al., 2021). While this phenomenon affects the environment globally, it also poses serious local consequences, especially for communities that rely heavily on natural conditions, such as coastal populations (Abbass et al., 2022).

In Indramayu's coastal areas, climate change has manifested through rising sea levels, coastal erosion, saltwater intrusion into agricultural lands, and increased frequency of storms and extreme weather events—all of which directly disrupt the livelihoods of fishers and aquaculture farmers. Therefore, climate change is not merely an environmental issue but also a complex and urgent socio-economic threat that demands rapid, precise, and sustainable adaptation by affected communities (Cea & Costabile, 2022; Nguyen et al., 2023).

Through online observation of various media sources, the researcher found tangible evidence of declining fish catches, shifts in fisher occupations, and unequal access to adaptation resources. These data were drawn from media reports such as Kompas TV and Kompas, which depict the real conditions fishers face in the region.

Figure 1. The Impact of Climate Change on Declining Fish Catches

Source: KOMPAS TV, 2019

Figure 1 illustrates the effects of climate change on declining fish catches in Indramayu's coastal areas. In the footage, a Kompas TV reporter explains that high waves forced fishers to repair their boats and nets instead of going to sea. This situation indicates that extreme weather conditions have hindered fishing activities, leading to lower productivity and reduced income for fishers.

Another impact involves occupational shifts. Figure 2 shows a fisher who transitioned to working as a motorcycle pedicab driver. According to a 2023 Kompas report, unstable weather due to climate change has made fishing income unpredictable and seasonal. As a result, many fishers have sought alternative jobs for more stable and secure earnings. Many have turned to work as "cator" drivers, transporting fish from boats to marketplaces. For example, Iwan (53), who has worked as a cator driver for 20 years, stated that fishing income was unstable and high-risk, especially during bad weather. In contrast, he could earn a steady daily income of IDR 75,000–100,000 as a cator. Similarly, Jayana (40) opted to work as a cator because fishing no longer met his family's needs, with a net daily income ranging from IDR 40,000 to 80,000 (Mewangi et al., 2023).

Figure 2. Fisher Transitions to Motorcycle Pedicab Driver

Source: Mewangi et al., 2023

Another consequence of climate change is the inability of fishers to meet daily household needs. Figure 3 shows fishers who chose not to go to sea during bad weather and were forced to borrow money to meet basic needs. This data highlights that extreme weather not only disrupts fishing activities but also drives fishers to seek financial assistance for daily survival.

Figure 3. Fishermen Forced to Borrow Money to Cover Daily Needs

Source: KOMPAS TV, 2023

From the data collected, it is evident that climate change has caused a decrease in fish catch due to high waves, pushed fishers to shift to other economic sectors such as motorcycle pedicab driving, and compelled them to borrow money because of the inability to work during extreme weather (Mewangi et al., 2023). These findings demonstrate that climate change affects not only environmental aspects but also the social and economic dimensions of coastal communities.

The findings also indicate that fishers in Indramayu face significant challenges due to climate change affecting multiple aspects of their lives. Their heavy dependence on favorable weather conditions makes fishing activities particularly vulnerable to extreme weather, such as high waves and storms, which reduce both fish catches and income (KOMPAS TV, 2023). Because of this income instability, many fishers are forced to seek more stable alternatives, such as working as cator drivers or day laborers—revealing job diversification as a key adaptation strategy. However, their inability to fish during bad weather also leads them to borrow money to meet basic needs, underscoring their high economic vulnerability.

Additionally, occupational shifts and economic instability are beginning to reshape the social structure and dynamics within fishing communities. Many young people have chosen to leave the fishing profession and migrate to urban areas in search of more stable livelihoods (Mewangi et al., 2023). This trend shows that climate change influences not only environmental factors but also broader social and economic systems in coastal areas.

In conclusion, climate change has brought wide-ranging and complex consequences to coastal communities. It impacts not only the environment but also triggers significant social and economic transformations. Declining fish catches and income instability have forced fishers to adapt by seeking alternative employment, which is gradually altering the community's social structure. Their dependence on weather conditions and economic vulnerability highlights the urgent need for policy interventions to help coastal communities adapt. Such interventions may include economic diversification programs, skills training, and access to financial assistance. This study contributes to a better understanding of how climate change influences social mobility and economic resilience in coastal communities, while also emphasizing the importance of a holistic approach to address these challenges.

Economic Adaptation Strategies of Coastal Communities in Indramayu

Online observations of coastal communities in Indramayu, West Java, reveal that local residents have implemented various economic adaptation strategies to address the impacts of climate change. These strategies include livelihood diversification, coastal tourism development, reinforcement of communal values and local traditions, utilization of social networks, and the influential role of informal leaders in promoting economic resilience (Nugroho, 2017; Rachmawati, 2021).

One informant stated during an online interview:

"Nowadays, fishermen don't just rely on fish. Some of them run food stalls, produce salt, or work at small seaside lodgings" (Rachmawati, 2021).

Table 1. Visualization of Coastal Residents' Adaptation Strategies

Adaptation Strategy	Implementation Examples
Livelihood Diversification	Salt production, food stalls, livestock, handicrafts
Coastal Tourism Development	Losarang Beach and Pinggir Papas tourism activities
Communal Values and Local Traditions	Community meetings, preservation of traditional fishing
Social Networks and Income Support	Family-run businesses, community leader-led initiatives
Role of Informal Leaders	Religious leaders promoting collective adaptation efforts

Source: Research Findings, 2023

By no longer relying solely on fishing, the coastal communities of Indramayu have begun to innovate in finding new sources of income. Weather uncertainties, declining marine yields, and the degradation of coastal ecosystems due to abrasion and seawater intrusion have forced communities to adjust their economic strategies. One prominent innovation includes utilizing coastal lands for salt production, capitalizing on local geographical and climatic conditions (Diskanla Indramayu, 2022; Diskominfo Indramayu, 2022). Residents have also developed microenterprises such as food stalls, repair shops, small lodgings, and home-based industries using local materials like shells, bamboo, or coconut shells. This diversification represents not only an economic solution but also a form of social resilience against ecological pressures (Adger et al., 2011).

Figure 4. Coastal Salt Production in Indramayu

Source: Diskanla Indramayu, 2022.

Coastal tourism development has emerged as a promising strategic step. Areas such as Losarang Beach and Pinggir Papas have been developed as community-based local destinations, with residents directly involved in providing services such as boat rentals, local tour guiding, homestays, and coastal cuisine. This type of community-based tourism adds economic value while also strengthening local ecological and cultural identity (Komunitas Blogger Indramayu, 2019). Women and youth have begun to play an active role in tourism activities, thus expanding the scope of beneficiaries within the community.

Figure 5. Losarang Beach Tourism in Indramayu

Source: Komunitas Blogger Indramayu, 2019

Community support and social networks have become critical foundations for sustaining these adaptation strategies. Communal cooperation, village deliberations, and informal solidarity systems have played vital roles in times of crisis. In many instances, residents help each other build tourism infrastructure or repair agricultural fields and fish ponds. Social ties also serve as channels for information, assistance, and access to new resources, including

government or NGO programs that support climate adaptation. As Putnam (2000) notes, the presence of social capital significantly enhances community resilience, especially amid social and ecological changes.

The role of informal leaders, such as traditional elders and local influencers, is equally crucial. These figures not only guide community decision-making but also serve as bridges between the government, NGOs, and the community. Leadership grounded in local values has proven effective in building trust and promoting collective participation. In the context of Indramayu's coastal communities, the synergy between traditional values and modern adaptation strategies is key to successfully responding to the challenges of climate change. Economic adaptation strategies, therefore, are not only about material survival but also about preserving social, cultural, and environmental sustainability together (Diskanla Indramayu, 2022; Diskominfo Indramayu, 2022; Komunitas Blogger Indramayu, 2019).

These findings reinforce the understanding that economic adaptation among coastal communities is not merely technical—it is deeply influenced by socio-cultural factors embedded in daily life. Strategies such as income diversification do not stand alone; they evolve alongside local values like mutual cooperation, community solidarity, and the role of traditional leaders in mediating adaptation processes. In this context, adaptation is not just about changing income sources, but about how communities collectively interpret, respond to, and reshape their socio-economic structures to become more resilient to climate pressures. This highlights the higher effectiveness of community-based approaches in building long-term resilience because they are rooted in local knowledge and social capital (Berkes & Ross, 2013).

The income diversification practices adopted by Indramayu's coastal communities—ranging from small businesses and salt production to tourism development—represent concrete expressions of livelihood resilience, defined as the capacity of individuals and communities to maintain and modify their livelihoods in the face of environmental stress (Ellis, 2000). This approach positions the community as active agents who creatively leverage local potential rather than passive recipients of externally imposed adaptation policies. For instance, community-managed coastal tourism not only boosts income but also strengthens environmental stewardship, thereby encouraging ecosystem preservation. Therefore, adaptation policies should not only focus on providing infrastructure or technology but also on strengthening local capacities, preserving traditional knowledge, and empowering communities to design solutions tailored to their specific socio-geographical contexts (Adger et al., 2011).

The involvement of community leaders and the application of local values such as mutual aid demonstrate the importance of cultural embeddedness in adaptation strategies. These values not only facilitate decision-making at the local level but also promote sustained collective participation. In many cases, community leaders hold strong legitimacy and can bridge government policy with the daily realities of citizens. When adaptation efforts are guided by trusted local actors, the resulting strategies are more likely to be embraced and carried out collectively. Hence, community-based adaptation strategies that strengthen social networks, traditional values, and local capacities are not only short-term solutions but also foundational pillars for achieving inclusive and sustainable climate resilience (Ensor & Berger, 2009).

Discussion

The findings of this study indicate that the coastal communities in Indramayu have experienced the tangible impacts of climate change, particularly in the fisheries sector.

Declining fish catches, increased extreme weather events, and seawater intrusion into productive land have forced residents to seek alternative sources of income. These findings also reveal that the adaptation strategies employed by the communities are not only individual but also collective and community-based. Economic diversification, the utilization of local tourism potential, the reinforcement of communal values such as mutual cooperation, and the role of informal leaders have proven to be foundational in building community resilience to climate change.

This phenomenon aligns with previous studies that demonstrate how climate change exacerbates extreme weather risks and accelerates coastal ecosystem degradation (Laino & Iglesias, 2023). Rising sea levels cause beach erosion and seawater intrusion into farmland, which threaten the livelihoods of coastal populations (Bulathsinhalage et al., 2018; Nissanka et al., 2023). Furthermore, increasing sea temperatures affect marine habitats such as coral reefs and mangrove forests, which serve as key ecosystems for fisheries resources (Bell et al., 2022).

These adaptation strategies reflect a relationship between mounting environmental pressures and the communities' social capacity to respond. As fishers face declining catches due to worsening weather and marine ecosystem damage, they have turned to more stable income sources such as salt production, running small food stalls, or working in the local tourism sector. Social factors—particularly community networks and mutual cooperation—play a vital role in strengthening this adaptive capacity. The decision to switch professions or start new businesses is not merely an economic response; it is also part of the community's socio-cultural dynamics, historically shaped by solidarity and collectivism.

Some residents have actively responded to environmental crises through coastal rehabilitation efforts, such as planting mangroves to prevent erosion and strengthen ecosystem resilience (Sultana et al., 2022). These efforts not only produce ecological benefits but also create new economic opportunities through conservation-based ecotourism. At the same time, social networks and mutual support continue to serve as primary pillars for sustaining households, especially during times of economic crisis.

Compared to previous research, such as that by Berkes and Ross (2013) and Ensor and Berger (2009), this study similarly highlights the crucial role of social capital and community-based approaches in building resilience to climate change. However, this study contributes additional local context by emphasizing how the coastal communities of Indramayu actively integrate traditional values with modern strategies to form economic adaptation systems. This insight enriches the literature on community-based adaptation by offering empirical evidence from coastal Indonesia—a region that remains underrepresented in academic studies.

This research also addresses a gap in climate change studies by stressing the socio-economic dimension, which is often overlooked in predominantly ecological approaches. The study underscores that climate change creates acute social challenges: income loss, increased debt, occupational shifts, and forced migration. As such, inclusive, evidence-based policies are urgently needed—not only to address environmental impacts but also to respond comprehensively to the local communities' social and economic needs (Lane et al., 2015; Supekar, 2019).

The significance of this study goes beyond the discovery that people manage to survive difficult situations. It reveals a deeper social transformation that occurs alongside adaptation. Economic adaptation here is not merely a form of resistance to change but represents an active process of identity formation—toward becoming more flexible and resilient in the face of climate uncertainty. When fishers shift to becoming small business owners or engage in tourism, they are not just trying to survive; they are redefining their social roles within the community.

However, reflecting on these findings also highlights that adaptation success is not evenly distributed. Vulnerable groups—such as small-scale fishers without additional assets or female-headed households—continue to face significant challenges in accessing adaptive resources. This disparity shows that although community-based adaptation can be a strength, it still requires external interventions, such as public policy support and institutional assistance, to ensure that adaptation processes are inclusive and equitable. Other obstacles include limited access to information, a lack of resources, and weak policy support, as noted by Nurhidayah and McIlgorm (2019).

Based on these findings, this study recommends that policies should aim to strengthen local capacity through entrepreneurship training, financial support for small businesses, and the development of community-based tourism infrastructure. The government also needs to provide social protection for vulnerable groups and ensure the active involvement of communities in climate adaptation planning. In addition, policymakers must enhance the synergy between local values and institutional support to ensure that adaptation strategies are not only responsive to current conditions but also sustainable in the long term.

CONCLUSION

This study demonstrates that the coastal communities of Indramayu have developed complex economic adaptation strategies deeply rooted in local values in response to climate change pressures. The main findings reveal that livelihood diversification, the development of community-based tourism, and the strengthening of social networks and the role of informal leaders serve as key strategies in building the socio-economic resilience of coastal populations. These adaptations go beyond mere responses to environmental crises; they also reflect a broader social transformation toward more resilient and sustainable ways of life.

The primary contribution of this research lies in its emphasis on the socio-economic dimensions of climate change adaptation, which are often overlooked in purely ecological approaches. By presenting empirical data from local communities in Indramayu, this study enriches the discourse on community-based adaptation and offers a fresh perspective on the integration of modern strategies with local practices in addressing climate challenges. This approach highlights the importance of considering cultural aspects, solidarity, and local capacities when formulating effective adaptation policies.

However, this study has certain limitations in terms of geographic scope and the depth of analysis regarding vulnerable groups, such as women and small-scale fishers. In addition, limited access to primary field data has constrained the exploration of more complex social dynamics. Therefore, future research should expand the study area, explore gender roles more deeply in adaptation strategies, and investigate the relationship between government policies and the effectiveness of adaptation at the local level. By doing so, researchers and policymakers can develop a more comprehensive and inclusive approach to supporting the long-term resilience of coastal communities.

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