SYNERGY BETWEEN CLIMATE POLICY AND THE LOCAL ECONOMY: THE ROLE OF RESILIENCE TO HYDROMETEOROLOGICAL DISASTERS IN THE CITY OF SUNGAI PENUH

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ABSTRACT

Climate change has increased the frequency and intensity of hydrometeorological disasters in various regions of Indonesia, including Sungai Penuh City, Jambi Province. This city faces a high risk of flooding, landslides, and changes in rainfall patterns that directly impact the local economy, particularly agriculture and trade. This study aims to analyze the synergy between climate policy and local economic development through strengthening resilience to hydrometeorological disasters. The method used is a qualitative approach with descriptive analysis based on literature studies and secondary data. The results of the study show that the success of climate policy is highly dependent on cross-sector collaboration between local governments, businesses, and communities. Disaster resilience plays an important role as a link between climate adaptation and local economic stability. The main recommendation of this study is the need to integrate climate policy into regional development plans by strengthening early warning systems, adaptive spatial planning, and community-based green economy.
Keywords: Climate Policy; Local Economy; Hydrometeorological Disasters; Resilience; Sungai Penuh City

INTRODUCTION

Global climate change has emerged as a strategic issue in Indonesia's sustainable development due to the country's vulnerability to climate impacts and its significant role in global greenhouse gas emissions. Indonesia's geographical diversity and economic growth ambitions present unique challenges and opportunities in addressing climate change. The country is actively engaged in policy change and strategic planning to integrate climate considerations into its development agenda. This involves a multidisciplinary approach, cross-sectoral coordination, and international collaboration to effectively mitigate and adapt to the impacts of climate change.

Indonesia is highly vulnerable to the impacts of climate change, including sea level rise, increased rainfall, and tropical storms, which threaten its natural resources and economic stability (Legionosuko et al., 2019) . This illustrates the reality that Indonesia is in a highly vulnerable position to the impacts of climate change**.** As an archipelagic country with a long coastline and diverse ecosystems, Indonesia faces serious risks from

sea level rise, increased extreme rainfall, and tropical storms that can trigger hydrometeorological disasters such as floods, landslides, and coastal erosion. This vulnerability not only threatens natural resources such as agriculture, fisheries, and forests, but also national economic stability, especially in sectors that depend on stable environmental conditions. When crop yields decline due to changing weather patterns, or when coastal areas lose land to erosion, the impact is immediately felt on food security, employment, and community welfare**.**

Indonesia's vulnerability to climate change should be a serious call to strengthen adaptation and mitigation policies. The government, the business world, and the community must work together to build an economic system that is more resilient to climate shocks. For example, by promoting a green economy, expanding renewable energy, and strengthening environmental governance at the local level. In addition, environmental education needs to be instilled from an early age so that awareness of the risks of climate change grows into a collective national culture. Indonesia not only needs to survive the impacts of climate change, but also be able to turn this challenge into an opportunity for sustainable development that balances economic, social, and ecological interests.

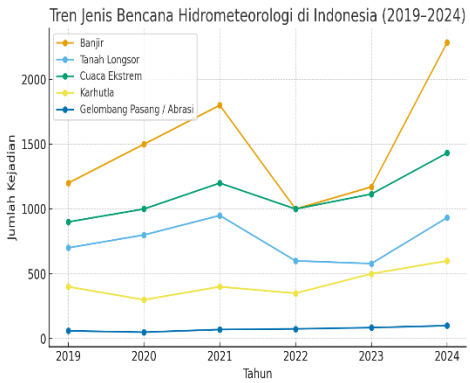

Figure 1. BMKG data on the increase in disasters

Graph data on hydrometeorological disasters in Indonesia over the past five years (2019 2024) shows a significant upward trend in almost all types of disasters, especially floods, landslides, and extreme weather. Floods are the most dominant disaster, with cases rising from around 1,200 to more than 2,200 incidents, followed by landslides and extreme weather, which have also increased due to high rainfall intensity and changes in global weather patterns. Forest and land fires (karhutla) fluctuate, with spikes in dry years due to the El Ni o phenomenon, while tidal waves and abrasion increase in line with rising sea levels and the destruction of coastal ecosystems. Overall, these data reflect Indonesia's high vulnerability to the impacts of climate change and weak environmental management, where anthropogenic factors such as land use change, deforestation, and development without ecological planning have exacerbated the situation.

Floods are the most common hydrometeorological disaster in Indonesia, especially in areas with high rainfall intensity. Northern Indonesia, including Kalimantan, North Sumatra, parts of Sulawesi, and Papua, is particularly vulnerable to flooding due to extreme rainfall (Satriya et al., 2025) . This phenomenon is not only caused by natural factors such as high rainfall intensity, but is also exacerbated by human activities such as deforestation, land use change, and poor drainage systems in urban areas. These

conditions show that flooding is not only an environmental problem, but also reflects weak spatial planning and disaster risk mitigation at the regional level. The frequent flooding in Indonesia reflects the need for a more integrated policy approach between environmental management, spatial planning, and economic development. Local governments must strengthen early warning systems, improve water control infrastructure such as embankments and canals, and restore the functions of natural ecosystems such as forests and swamps as water catchment areas.

In addition, public awareness needs to be raised through environmental education and active participation in maintaining the balance of local ecosystems. Floods should not only be viewed as routine disasters, but as a warning that development that is not in harmony with the carrying capacity of the environment will always pose a major risk to human sustainability. The following graph shows the increasing trend in economic losses, number of casualties, and infrastructure damage caused by floods in Indonesia over the past five years. This data illustrates that the intensity and impact of floods are increasing, in line with climate change and weak environmental governance in various regions.

Figure 2. Data source: BNPB

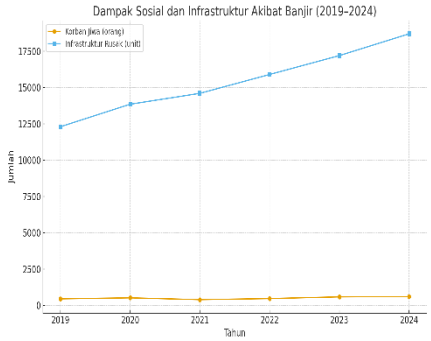

Figure 3. Data source: BNPB

Data on the impact of flood losses in Indonesia during the 2019 2024 period shows a consistent upward trend in both economic and social terms. Economic losses increased significantly from around IDR 6.8 trillion in 2019 to IDR 14.6 trillion in 2024, reflecting the heavy financial burden that the state and society must bear due to damage to land, infrastructure, and disruption to local economic activities. The number of fatalities also fluctuated but tended to increase from 445 people in 2019 to 601 people in 2024, indicating that the risk to human safety remains high when floods occur. In addition, damage to infrastructure such as houses, roads, and bridges continues to increase from around 12,300 units in 2019 to nearly 18,700 units in 2024, indicating the weak physical resilience of the environment to disasters. This increase is closely related to global climate change, which triggers extreme rainfall, as well as anthropogenic factors such as unplanned urbanization, reduced water catchment areas, and environmental degradation.

The economic losses caused by hydrometeorological disasters in Indonesia are significant, and efforts are being made to reduce these impacts through better forecasting models, disaster preparedness, and adaptation strategies. However, challenges remain, including limited resources, low public awareness, and the need for comprehensive public

education and collaboration between government, industry, and academia (Aeni & Khoirul Anwar, 2024) . The economic losses caused by hydrometeorological disasters in Indonesia demonstrate the enormous impact of climate change on national social and economic stability. The government's efforts to improve disaster resilience through the development of forecasting models, early warning systems, and adaptation strategies are important steps that should be appreciated. However, from a public policy perspective, the effectiveness of these efforts still faces fundamental challenges such as limited financial and technical resources, as well as low public awareness of disaster risks and the importance of mitigation.

The city of Sungai Penuh is one of the areas that is highly vulnerable to hydrometeorological disasters, especially floods and landslides. Due to the city's geographical location in a valley between mountain ranges and surrounded by hilly areas, Sungai Penuh is prone to flooding from the surrounding catchment areas. Rainfall in this region is high throughout the year, especially from October to April, which often causes flooding in residential and agricultural areas. In addition to natural factors, uncontrolled land use changes, such as land clearing for plantations and residential development in vulnerable areas, exacerbate the risk of flooding and landslides.

The impact of hydrometeorological disasters in Sungai Penuh is quite significant. Every rainy season, flooding causes damage to agricultural land, disrupts community economic activities, and damages basic infrastructure such as roads, bridges, and waterways. Landslides in hilly areas also often cut off transportation access between subdistricts. In addition, the social and economic losses incurred are quite large, especially for communities that depend on the agricultural and trade sectors. The local government has made various mitigation efforts, such as building flood barriers, dredging rivers, and disseminating information on disaster preparedness through the Sungai Penuh City Disaster Management Agency (BPBD). However, the effectiveness of these efforts is still limited due to budget constraints and low public awareness of risk mitigation.

The economic impact of hydrometeorological disasters goes beyond direct losses. They affect labor demand, income levels, and overall economic growth, as seen in the 0.16% decline in national GDP following the disaster in Central Sulawesi (Sitepu et al., 2023) . The economic impact of hydrometeorological disasters is not limited to physical damage and direct losses, but also creates a significant ripple effect on the macroeconomy.

The disaster in Central Sulawesi, which caused a 0.16% decline in national GDP, reflects how disruptions to production, distribution, and consumption activities can hamper economic growth. Damage to infrastructure and productive assets reduces production capacity, while loss of livelihoods lowers people's purchasing power and demand for labor. In the long term, these conditions can exacerbate economic inequality and slow down the process of socio-economic recovery. Therefore, hydrometeorological disasters should be viewed not only as an environmental issue, but also as a structural economic challenge that requires integrated mitigation and adaptation strategies in national development policies.

The uncertainty caused by climate change and its impact on weather patterns influences investment decisions, thereby hampering economic growth and stability (Sinaga3 & Dalimunthe6, 2025) . Unpredictable weather patterns make investors more cautious in their decisions due to the increased potential for losses and adaptation costs.

As a result, investment flows may slow down, particularly in areas prone to hydrometeorological disasters, thereby suppressing economic growth and disrupting long-term stability. This uncertainty also impacts fiscal and monetary policies, as governments must allocate more resources to disaster mitigation and recovery than to productive investments. Thus, climate change is not only an environmental issue but also a macroeconomic factor that directly influences market confidence and the direction of national economic development.

Hydro-meteorological disasters occurring in various regions of Indonesia, including Sungai Penuh City, provide a clear picture of how climate change can trigger complex and long-term economic impacts. Not only do these disasters cause physical and social losses, they also affect local economic dynamics through changes in investment patterns, productivity, and community income stability. In this context, the link between direct economic impacts and climate uncertainty is important to analyze, especially in understanding how hydrometeorological disasters slow economic growth and disrupt regional development, as experienced in Sungai Penuh City.

The impact of hydrometeorological disasters in Sungai Penuh City reflects the close relationship between direct economic losses and broader climate uncertainty as described in the two points above. Disasters such as floods and landslides that often hit this region not only cause physical damage to infrastructure, agricultural land, and productive assets, but also suppress labor demand and reduce the income levels of local communities. This phenomenon is in line with the national impact seen in the decline in GDP due to major disasters in other regions, such as in Central Sulawesi. In addition, climate uncertainty, which makes weather patterns increasingly difficult to predict, also affects investment interest in Sungai Penuh. Investors have become more cautious due to the risk of asset damage and high fluctuations in production yields, especially in the agriculture and trade sectors. These conditions hamper regional economic growth, reduce socio-economic stability, and slow down the post-disaster recovery process. Thus, hydrometeorological disasters in Sungai Penuh City not only cause material losses but also reinforce the cycle of economic uncertainty that can hinder sustainable development.

Sungai Penuh City, as one of the areas prone to hydrometeorological disasters, faces serious challenges in maintaining economic stability and sustainable regional development. Changes in rainfall patterns, floods, and landslides that occur more frequently require adaptive and integrated policies between the environmental and economic sectors. Therefore, it is important to assess the extent to which climate policies and local economic policies have been implemented and how they can work together to strengthen regional resilience to disasters. In this context, this study is designed to answer various fundamental questions, ranging from the conditions of existing policies, the level of resilience of the community and local government, to the factors that influence the effectiveness of the integration of climate and local economic policies.

In line with these issues, this study aims to analyze the implementation of climate policies and local economic policies in facing the risk of hydrometeorological disasters, identify the level of resilience of the community and local government, and explain the form of synergy between the two policies in strengthening local economic resilience. In addition, this study also aims to formulate policy recommendations that can support sustainable economic development based on resilience to climate change and hydrometeorological disasters in Sungai Penuh City.

RESEARCH METHOD

This study uses a qualitative approach with a descriptive design to analyze the synergy between climate policy and local economic policy in addressing the risk of hydrometeorological disasters in Sungai Penuh City. This approach was chosen because it provides an in-depth understanding of the policy context, socio-economic conditions, and the level of resilience of communities in disaster-prone areas. The research design was carried out through literature study and document analysis, examining various secondary data sources in the form of local government reports, rainfall data and disaster statistics from BMKG and BNPB, BPBD documents of Sungai Penuh City, economic development data from BPS, as well as journal articles relevant to climate change, disaster resilience, and local economic development. The scope of the research includes an analysis of climate change adaptation policies, local economic development policies, and the social, economic, physical, and institutional resilience of the community in Sungai Penuh City. The main research materials consist of policy documents such as the RPJMD (Regional Medium-Term Development Plan), RTRW (Spatial Plan), regional performance reports, disaster trend data, and related scientific publications. Meanwhile, the research tools used include computers, document processing devices, and digital literature search tools to trace scientific sources.

Data collection was carried out through literature studies and documentation studies with a process of selection, categorization, and validation of data sources. The collected data was sorted based on the main themes, climate policy, local economic policy, disaster resilience , and policy synergy to facilitate the analysis process. The operational definitions of the variables in this study include: climate policy as all local government adaptation and mitigation efforts in response to climate change; local economic policy as government policies focused on increasing productivity and sustainable economic development; hydrometeorological disaster resilience as the ability of communities and governments to respond to, survive, and recover from floods and landslides; and climate policy synergyand local economic policy as the level of integration between environmental and economic policies to support resilient and sustainable regional development. Data analysis techniques use qualitative descriptive analysis, which includes data reduction, data presentation, interpretation of findings, and drawing conclusions based on the theoretical framework of public policy, climate change, Local Economic Development (LED), and resilience theory. The validity of the findings is strengthened through triangulation of sources by comparing data from BMKG, BNPB, BPBD, BPS, and scientific literature, so that the analysis results are able to comprehensively describe the policy conditions and the degree of regional resilience in facing hydrometeorological disasters.

RESULTS AND DISCUSSION

1. Climate and Local Economic Policy Conditions in Sungai Penuh City

Sungai Penuh City is an area with a high level of vulnerability to hydrometeorological disasters such as floods and landslides. Based on data from the Regional Disaster Management Agency (BPBD) and BMKG, high rainfall intensity throughout the year, especially from October to April, causes flooding in residential areas, agricultural areas, and public facilities. The local government has issued a number of adaptation policies, such as the construction of flood barriers, river dredging, and river

basin management. However, these policies are still sectoral in nature and have not been fully integrated into local economic development plans.

On the economic side, regional policies still focus on increasing the productivity of the agricultural and trade sectors as the main sources of community income. However, there are not many policies that consider the risks of climate change to the sustainability of these two sectors. For example, programs to increase agricultural yields have not been accompanied by land conservation and adaptive water management efforts in response to climate change. This situation shows a gap between economic and climate policies, so that the synergy between the two is still limited to rhetoric and has not been operationalized in regional development planning.

2. Level of Regional Resilience to Hydrometeorological Disasters

Disaster resilience in Sungai Penuh City covers physical, social, economic, and institutional aspects. Physically, much of the public infrastructure and community settlements are still not resistant to flooding and landslides. Socially, the community shows a fairly good level of adaptation through mutual assistance and local knowledge of disaster signs, but limited economic resources mean that mitigation efforts are reactive rather than preventive.

Local institutions, through the Regional Disaster Management Agency (BPBD) and the Environment Agency, have conducted disaster preparedness socialization and simulations, but there is no systematic policy evaluation and learning mechanism ( ). The economic resilience of the community is also still low due to high dependence on the agricultural sector, which is vulnerable to extreme weather. These results show that regional resilience still relies on local initiatives rather than a structured and sustainable policy system.

3. Synergy between Climate and Local Economic Policies

The analysis shows that the synergy between climate and local economic policies in Sungai Penuh City is still in its early stages. There is no formal policy framework linking regional economic development plans (RPJMD) with climate change adaptation strategies. However, there is great potential to build this synergy through strategic sectors, particularly: Climate-adaptive agriculture, for example through the implementation of water-efficient irrigation systems, diversification of flood-resistant crops, and training farmers in environmentally friendly agricultural technologies. In addition, community-based green economy, such as the development of organic agricultural products, eco-tourism, and community-based integrated waste management. Finally, climate-resilient infrastructure, which integrates adaptation principles into road planning, drainage, and urban spatial planning.

This integration is in line with the theory of Local Economic Development (LED) and the concept of green economy, which emphasizes the importance of balance between economic growth and environmental sustainability. Thus, climate policy not only serves as a mitigation instrument, but also as a catalyst for local economic innovation.

4. The Role of Resilience as a Link between Climate Adaptation and Economic Stability

Disaster resilience plays an important role in maintaining regional economic stability. Field findings show that every time a major flood occurs, trade and transportation activities in Sungai Penuh City are disrupted for 3 5 days, causing a 40% decline in daily income for the community. In the long term, these repeated disruptions reduce agricultural productivity and slow down local economic recovery.

Strengthening resilience can serve as a bridge between climate policy and economic policy, as both require a socio-economic system that is resilient to climate shocks. For example, policies that strengthen infrastructure resilience, diversify income sources, and encourage community participation in environmental management can reduce economic losses while accelerating post-disaster recovery.

CONCLUSION AND RECOMMENDATIONS

This study concludes that the synergy between climate policy and local economic policy in Sungai Penuh City is still in its early stages, with implementation that is not yet optimally integrated. Regional climate policy tends to focus on disaster impact mitigation, while economic policy focuses more on increasing the productivity of the agricultural and trade sectors without considering the risks of climate change.

This condition results in low socio-economic resilience of the community to hydrometeorological disasters such as floods and landslides. Disaster resilience plays an important role as a link between climate adaptation and regional economic stability , where strengthening community capacity, developing climate-resilient infrastructure, and integrating risk-based spatial planning are strategic steps in promoting sustainable development.

As a suggestion, local governments need to strengthen cross-sectoral coordination by integrating climate policies into regional economic development planning, expanding community-based green economy programs, and improving early warning systems and public education on climate risks. Collaboration between the government, the private sector, and the community is essential to create an adaptive, resilient, and sustainable regional development model. Thus, Sungai Penuh City can turn the challenges of climate change into opportunities to strengthen the local economy while protecting the environment and community welfare.

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