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Research Paper

Study of Policy Coherence in Coastal Community Development Based on Local Wisdom in Coastal Urban Area

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Abstract

Policy plays a vital role in addressing the complex economic, social, and environmental challenges faced by coastal communities. This study examines the degree of coherence among coastal community development policies in Surabaya City, focusing on alignment between cross-sectoral policies and local wisdom–based community empowerment programs in the eastern coastal area. Community empowerment is assessed through policy implementation actors, program managerial aspects, and program targets, using parameters such as increased access and market share, expanded access to capital, and improved capacity to manage capital through cooperatives. Methodologically, the study applies MACTOR to analyze actor dynamics and spatial analysis to map the distribution and proximity of empowerment programs. Findings indicate that existing policies show limited coherence, especially in cross-sectoral integration and program synergy. Although community groups serve as key drivers, institutional fragmentation constrains policy effectiveness. Stronger policy alignment and multi-actor coordination are therefore essential to improve coastal community welfare and sustainability.

Keywords: Coastal Communities Empowerment; Matrix of Alliances and Conflicts; Tactics; Objectives and Recommendations; Spatial Analysis; Local Wisdom.

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1. Introduction

Surabaya, a major metropolitan area, possesses significant coastal potential. Geographically, the city is situated between 07°9' and 07°21' S latitude and 112°36' and 112°54' E longitude, positioning it in the downstream region of the Brantas River Basin, which discharges into the Madura Strait. Several primary rivers, including Kali Surabaya, Kali Mas, Kali Jagir, and Kali Lamong, flow through the city from upstream areas. The urban spatial planning is delineated into vertical residential zones, commercial and service areas, industrial estates, and marine and coastal regions. As a coastal territory, Surabaya boasts substantial natural resources, such as mangrove ecosystems, fisheries, and other vital marine resources crucial for the sustenance of its coastal communities and the city's overall ecosystem.

Coastal areas exhibit distinct characteristics, notably mangrove forests, which are unique to these environments and not found inland. These mangrove forests represent a critical ecosystem that consistently provides essential environmental services, including protection against storms and tsunamis (Giesen *et al*., 2007; Fauzi, 2018; Hafiz, 2019). Furthermore, mangroves contribute to enhancing water quality, providing diverse habitats for various species and fisheries, and serving as a source of timber and other forest products. Their biodiversity encompasses rare and endangered species (Duke *et al*., 2007). The presence of healthy mangroves is also intrinsically linked to the sustainable livelihoods of coastal communities that rely on these natural resources through activities such as fishing, aquaculture, and ecotourism. When paraphrasing a source that is not your own, be sure to represent the author's information or opinions accurately and in your own words. Even when paraphrasing an author's work, you still must provide a citation to that work. When directly quoting an author's work, provide citation marks at the beginning till the end of the citation, and the page number must be noted beside the name of the author and the year of publication.

As a coastal region, Surabaya features extensive mangrove forest ecosystems distributed along its eastern coast and the North Surabaya Coast (Panturbaya). This area constitutes one of the largest and most crucial in East Java, serving not only as a habitat for characteristic coastal flora and fauna but also as a vital buffer zone protecting urban areas from the impacts of climate change. The estimated area of the mangrove ecosystem in Pamurbaya is 916.743 hectares, accounting for approximately 82.68% of the total estimated mangrove forest ecosystem in Surabaya, which is 1,108.823 hectares (Surabaya City Government, 2013).

This situation, as reported by the East Java Provincial Environmental Office, underscored the importance of conducting carbon stock calculations in Surabaya's mangrove forests, particularly in Pamurbaya, in 2017 (Rahaju, 2020). This initiative aimed to evaluate the extent to which Surabaya's mangrove forests could mitigate greenhouse gas emissions and the effects of global climate change through atmospheric carbon sequestration. At the municipal level, the Surabaya City Government also incorporates the existing coastal potential into its spatial planning and regional development frameworks (Surabaya City Government, 2007).

Coastal areas within Surabaya are utilized for a variety of purposes, including residential zones for fishermen, salt and fish farming ponds, warehousing, military facilities, shipbuilding industries, and port operations. Additionally, these areas facilitate coastal tourism activities and serve as protected zones along Surabaya's East Coast (Kusnadi, 2009). Access to these coastal regions is supported by various infrastructure, notably the Suramadu Bridge, connecting Surabaya to Madura Island, and the Sukolilo Lor – THP Kenjeran Bridge, which provides access to the northeastern part of Surabaya. The presence of this infrastructure underscores the government's commitment to enhancing accessibility and inter-regional connectivity, aiming to stimulate economic growth while supporting the preservation of coastal ecosystems.

A strategically important area for environmental conservation is located on Surabaya's East Coast, encompassing the districts of Gunung Anyar, Rungkut, Sukolilo, and Mulyorejo. This zone falls within Development Unit I Rungkut and Development Unit II Kertajaya, functioning as a natural protection area characterized by mangrove vegetation along Surabaya's eastern coastline (Azhani *et al*., 2019). The establishment of these development units also signifies the government's systematic efforts to integrate environmental preservation into urban development plans. The Pamurbaya Mangrove Area plays a crucial role in maintaining the balance of coastal ecosystems and acts as a natural buffer against abrasion and

saltwater intrusion. The locality development model emphasizes the importance of participatory and consensus-building approaches that enable community members to become actively involved in solving local issues (Wrihatnolo & Dwidjowijoto, 2007; Amri, 2020).

Considering the significant and evolving potential of Surabaya's coastal areas, existing studies remain limited in explaining how local policies are coherently aligned with local wisdom to maximize the benefits derived from this potential. This gap provides a strong scientific rationale for further research aimed at assessing whether current coastal development policies are mutually reinforcing and consistent with locally embedded knowledge and practices. Accordingly, this study examines the degree of policy coherence between Surabaya City's coastal development policies and locally wisdom–based community development initiatives. Policies grounded in local knowledge are generally more adaptive and resilient in addressing the complex environmental and social challenges faced by coastal communities. To support this analytical objective, the study employs the Matrix of Alliances and Conflicts, Tactics, Objectives, and Recommendations (MACTOR) as a methodological tool to systematically assess interactions, influence, and alignment among key policy actors. The use of MACTOR allows for a structured evaluation of actor relationships and policy alignment, thereby providing empirical insights into the strengths and gaps of policy coherence in coastal community development (Saputri, 2020; Wicaksono, 2021). This analysis contributes to the literature by strengthening the understanding of how policy coherence can be enhanced to support more integrated and sustainable coastal development strategies.

2. Methods

The research was conducted in the coastal areas of Surabaya City, focusing on zones relevant to community development initiatives, as shown in Figure 1. The data in this study were collected using a combination of documentation, observation, and interview techniques. Documentation was conducted through a systematic review of official policy documents, coastal development plans, program reports, statistical data, and institutional records related to coastal development and community empowerment in Surabaya's coastal areas. Field observations were carried out through direct visits to coastal areas of Surabaya to examine ongoing community development activities and to capture observable dynamics related to empowerment practices, both directly and indirectly. Semi-structured interviews were also conducted with relevant stakeholders to obtain in-depth information regarding the implementation and outcomes of coastal community development programs that have been carried out. Subsequently, the spatial distribution of this potential was mapped using QGIS software.

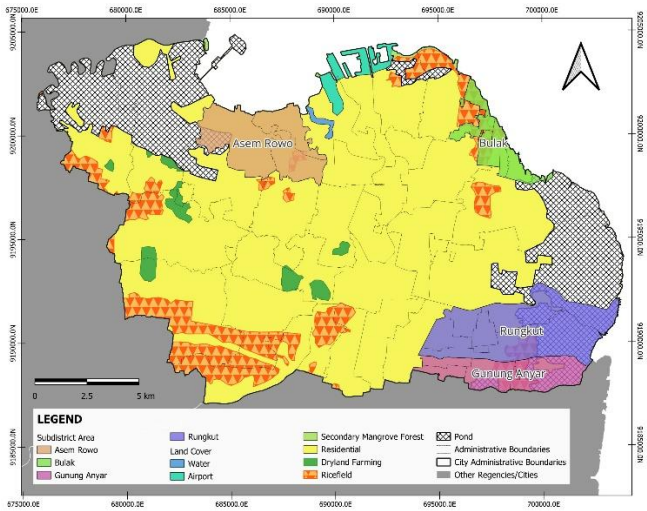

Figure 1. Research Area Map

In this study, an analysis of program-implementing actors who exert significant influence on community development strategies was conducted using the Matrix of Alliances and Conflicts, Tactics, Objectives, and Recommendations (MACTOR) method. The MACTOR method focuses on structured interactions among actors by analyzing their relative power and examining both convergences and divergences in relation to explicitly defined objectives. Within this framework, actors are defined as institutional entities that guide the system and manage resources to influence development outcomes,

either directly or indirectly, through planning authority, regulatory functions, program implementation, or territorial governance.

Based on this definition, nine key actors were identified in the study, consisting of sectoral government agencies and district-level administration. These actors include the Regional Development Planning Agency (RDPA), Environmental Office (EO), Population Control and Family Planning Office (PCFP), Food Security and Fisheries Office (FSFO), Transportation Office (TO), and Tourism Office (TRO), as well as three district-level governments: Asemrowo District, Gunung Anyar District, and Bulak District. These actors were selected due to their formal mandates, functional roles, and involvement across different stages of community-based development programs, particularly those related to marine tourism, mangrove ecosystem management, and waste bank initiatives.

In the MACTOR framework, objectives are treated as analytical variables that represent strategic program stages and policy priorities toward which actors may express support, neutrality, or opposition. In this study, objectives are operationalized as program phases across three key community development initiatives: Marine Tourism Programs (MTP), Mangrove Programs (MP), and Waste Bank Programs (WBP). Each initiative is divided into three sequential stages—pre-program, during-program, and post-program—resulting in nine distinct objectives: Pre-MTP, D-MTP, Post-MTP; Pre-MP, D-MP, Post-MP; and Pre-WBP, D-WBP, Post-WBP. These objectives serve as proxies to capture actor interests related to planning readiness, implementation intensity, and post-program sustainability.

According to Godet (1991), the MACTOR method begins with the identification of key variables and actor involvement. Godet (2000) further explains that the MACTOR technique involves three main types of matrices, which are based on "influence relationships" among actors. The inputs for MACTOR include position matrices, known as 1MAO (Matrix Actor-Objective) and 2MAO, which measure the level of interest actors have in particular objectives. The 1MAO (Matrix Actor–Objective) is a structured analytical matrix used in the MACTOR method to examine the positions of actors with respect to a predefined set of objectives. In this study, the construction of the 1MAO matrix is preceded by the independent identification of two analytical components: a list of actors and a list of objectives, each established as separate and clearly defined tables. The third matrix, MID (Matrix of Direct Influence), represents variables of direct influence. The final matrix, MIDI (Matrix of Indirect and Direct Influence), is used to calculate both direct and indirect influences among actors.

$$MIDI_{A\to B} = MID_{A\to B}\sum_{C}[min(MID_{A\to C}, MID_{C\to B})]$$

The data obtained from these matrices are subsequently utilized in the next step, which involves determining the "balance of power," a process that is heavily influenced by the position of each actor. Therefore, it is essential to calculate the total influence—both direct and indirect—exerted by each actor. For instance, if we consider the total direct influence of actor A on another actor (e.g., B), then:

$$M_A = \sum_{B}(MIDI_{A,B}) - MIDI_{A,A}$$

IfD_A Refers to the total direct and indirect influence received by actor A from other actors (which essentially indicates A's dependency on those actors), then:

$$D_A = \sum_{B}\left(MIDI_{B,A}\right) - MIDI_{A,A}$$

After determining both components, the next step is to calculate the power balance coefficient using the following formula:

$$r_A = \left[\frac{(M_A - MIDI_{A,A}}{\sum_A(M_A)}\right] \times \left[\frac{M_A}{M_A + D_A}\right]$$

Subsequently, MACTOR proceeds with the computation of the 3MAO matrix, which serves as a fundamental and critical component in the MACTOR analysis. The formula is as follows:

$$3MAO_{A,i} = 2MAO_{A,i} \times r_A$$

By utilizing the 3MAO matrix, various analytical features can be derived, including the mobilization coefficient, which represents each actor's responsiveness in a given situation. This coefficient is calculated using the following formula:

$$Mob_A = \sum |3MAO|$$

The analysis results of the 3MAO matrix subsequently yield a feature related to the level of consensus (agreement), which is calculated using the following formula:

$$Ag_A = \sum_a (3MAO_{A,i}(3MAO > 0))$$

$$3DAA = \frac{1}{2}\sum_i \left(|3MAO_{A,i}| + |3MAO_{B,i}|\right)\left(3MAO_{A,i} \times 3MAO_{B,i} < 0\right)$$

The convergence and divergence among actors ultimately produce a final indicator within the MACTOR framework, namely the ambivalence coefficient for each actor, which is determined using the following formula:

$$3EQ_i = 1 - \left[\frac{\left(\sum_k \left||3CAA_{i,k} - 3DAA_{i,k}|\right|\right)}{\sum_k \left||3CAA_{i,k} + 3DAA_{i,k}|\right|}\right]$$

3. Results and Discussions

3.1. Distribution of Program Potential and Community Income Sources in the Research Area

The program's potential in a given area reflects various opportunities that can be developed to enhance community welfare and environmental sustainability. These programs typically encompass multiple sectors, ranging from economic development and environmental protection to improving the quality of life of the population. By leveraging existing potentials—such as natural resources, cultural wealth, and strategic geographic positioning—these programs can be directed toward achieving inclusive and sustainable growth. The potential of programs within a region not only indicates opportunities for physical and environmental development but is also closely linked to the enhancement of community income sources. Each program must incorporate essential elements such as planning, formulation, goal setting, and performance measurement (Weiss, 1984).

In this study, the characteristics of program potential and community income sources were systematically identified through document analysis of policy documents, regional development plans, and program reports, as well as through stakeholder mapping. These characteristics were subsequently operationalized as analytical inputs in the MACTOR framework, particularly in defining actor objectives and strategic interests related to economic empowerment, environmental sustainability, and livelihood improvement. As such, the identified characteristics serve as substantive dimensions that inform the positioning of actors and their relationships within the MACTOR analysis (Prasetyo, 2019).

In the context of development, which constitutes a collaborative effort among the community, government, and private sector, these programs play a crucial role. This is because the development process involves continuous orientation and activities aimed at achieving significant social change (Surjono et al., 2008). By identifying and fostering key sectors such as agriculture, fisheries, tourism, and creative industries, these programs contribute not only to the creation of new employment opportunities but also to strengthening the overall local economy. This approach ensures that each program is well integrated into broader development efforts and yields sustainable positive impacts.

Community income sources refer to various forms of activities or efforts undertaken by individuals or groups within a community to obtain economic earnings or benefits (Suminartini & Susilawati, 2020). These income sources can originate from the formal sector, such as employment in companies, industries, and public services, as well as from the informal sector, including small and medium enterprises, trade, and freelance work. In an economic context, community income sources are diverse and reflect the level

of economic development and social structure in a region (Todaro, 2012). Furthermore, income sources may be influenced by factors such as education, skills, access to resources, and government policies.

Various types of income sources play a vital role in improving community welfare and quality of life. For instance, in rural areas, many people rely primarily on agriculture, livestock, and fisheries as their main sources of income. Meanwhile, in urban areas, the service sector, manufacturing, and information technology often serve as primary economic pillars. Diversification of income sources is also important to mitigate economic risks; when one sector experiences a downturn, communities still have alternative income sources to rely upon. Therefore, understanding community income sources assists in formulating more inclusive and sustainable economic policies (Mardikanto et al., 2015).

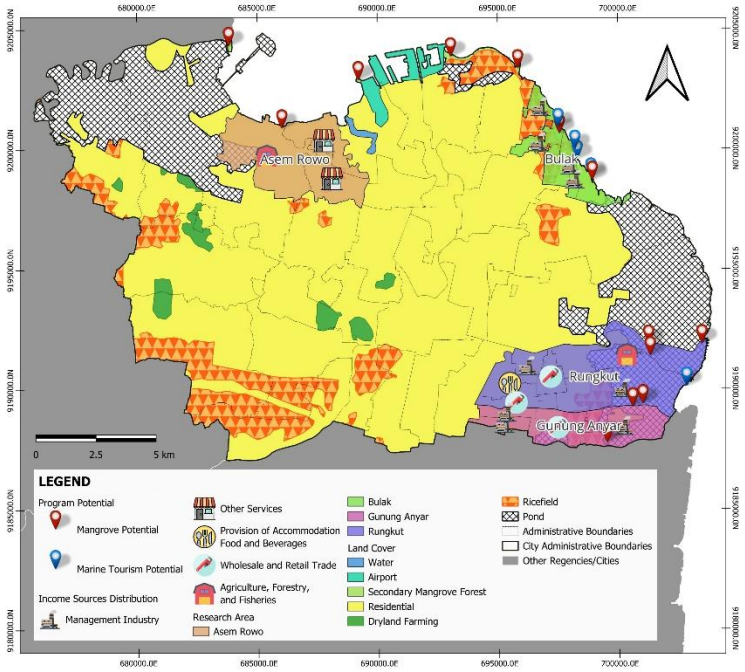

Figure 2. Map of Program Potential and Income Source Distribution in the Research Area

As illustrated in Figure 2, the distribution of program potential can be identified, with the largest mangrove potential located in the Bulak and Rungkut areas. This potential can be maximized through strategically designed programs, such as involving the replanting of mangroves in degraded areas and protecting intact mangrove zones from destructive activities like illegal logging and land conversion. Land restoration in degraded areas can also be undertaken by rehabilitating critical land conditions using environmentally friendly bioengineering techniques. In addition to conservation efforts, mangrove-based ecotourism development offers significant opportunities to enhance the welfare of local communities. Ecotourism can be designed to educate visitors about the importance of mangroves for the ecosystem while providing direct nature interaction experiences. Activities such as boat tours through mangrove forests, trekking along mangrove trails, and bird watching can serve as unique tourism attractions. Through ecotourism, local communities can benefit economically from services such as tour guiding, souvenir sales, and environmentally integrated accommodation. These programs focus not only on environmental protection but also on improving the community's quality of life. By integrating conservation with economic empowerment, the mangrove areas in Bulak and Rungkut can become models of sustainable natural resource management. The long-term benefits will be experienced not only by the environment and local ecosystems but also by future generations who will enjoy the preserved ecological functions and beauty of mangroves.

Bulak District not only possesses significant mangrove potential but also demonstrates great potential to be developed as a premier marine tourism destination. The development of marine tourism potential in Bulak can begin by improving and expanding supporting tourism facilities, such as providing clean and well-maintained beaches, safe and attractive snorkeling areas, and professional boat tour

services. Besides infrastructure development, incorporating educational components into marine tourism programs is also crucial (East Java Provincial Office of Marine Affairs and Fisheries, 2019). Both local communities and tourists can be involved in marine conservation activities, such as coral reef adoption programs, beach clean-up campaigns, or training on environmentally friendly fishing practices. The success of marine tourism development in Bulak largely depends on sustainable approaches, including the use of renewable energy, effective waste management, and strict regulation of tourism activities that have the potential to damage the environment. These measures are essential to maintain a balance between tourism exploitation and environmental preservation. With the right development strategy, Bulak District has the potential to become a leading marine tourism destination that not only offers exceptional visitor experiences but also serves as a model for sustainable tourism development that positively contributes to community welfare and environmental sustainability.

Furthermore, it is evident that the community in Asemrowo District derives income primarily from agriculture, forestry, fisheries, and service sectors. Meanwhile, the community in Bulak District generates income mainly from the processing industry (factories, handicrafts, etc.), whereas the community in Gunung Anyar District sources income from both the processing industry and large-scale and retail trade, including automobile and motorcycle repair services.

The majority of coastal residents in Surabaya City within the observed research area earn their income from fisheries, including both capture fisheries and aquaculture. In addition, economic activities such as seafood trading, handicrafts, and tourism also support the coastal economy. The Surabaya City government has implemented various policies grounded in local wisdom to support and develop these sectors. These policies reflect strong synergy with the development of coastal communities. The local government actively involves the community in the planning and implementation of programs, fostering a sense of ownership and responsibility towards environmental sustainability and natural resource management (Nugroho & Dahuri, 2004; Basuki, 2019; Ng & Tan, 2021).

The vulnerability of coastal areas such as those in Asemrowo, Bulak, and Gunung Anyar can disrupt community income sources. According to Dahuri (2011), environmental degradation in coastal regions may lead to issues including pollution resulting from urban activities, physical damage to habitats such as mangrove forests, estuaries, seagrass beds, and overall ecosystem networks. Additionally, problems related to excessive use of coastal space include conversion of protected areas to development zones, overexploitation of coastal and marine resources, and coastal abrasion caused by both natural factors and human activities. These vulnerabilities directly impact the livelihoods of coastal communities that often depend on fisheries and tourism sectors (Pongthanapanich, T., 2010). Environmental changes can reduce fish catches and damage marine habitats, while natural disasters may damage tourism infrastructure and economic assets (Andersen, 2019; Permana, 2020). Therefore, it is crucial for the government and relevant institutions to pay close attention to these conditions and design effective mitigation strategies to minimize negative impacts on coastal livelihoods.

Empowerment and community development programs become critically important in this context (Setyawan, 2020; Supriatna, 2021). Empowerment is defined as a process that provides individuals or groups with opportunities to take action and create value. This involves providing access and support that enable them to initiate and actively contribute (Suharto, 2009). Through programs such as marine tourism, mangrove management, and mangrove-based waste banks, coastal communities can be empowered with new knowledge and skills to enhance their economic resilience (Hikmat, 2010; Soetomo, 2011).

3.2. Actors Analysis

MACTOR analysis results presented in Figure 3 illustrate the map of influences and dependences among actors derived from the Matrix of Direct and Indirect Influences (MDII) generated through the MACTOR analysis. The results shown in Figure 3 indicate that eight key actors are concentrated in Quadrant II, namely Bappeda Surabaya City, the Environmental Office of Surabaya City, Asemrowo District, Gunung Anyar District, Bulak District, the Food Security and Fisheries Office of Surabaya City, the Transportation Office of Surabaya City, and the Tourism Office of Surabaya City, all exhibiting high influence and high dependence. This suggests that cooperation and interaction among these actors significantly impact the strategy and community development, both before, during, and after program implementation. Bappeda Surabaya City collaborates with the Environmental Office, Asemrowo, Gunung

Anyar, and Bulak Districts in developing marine tourism programs, mangrove conservation initiatives, and mangrove waste bank programs aimed at empowering coastal communities based on local wisdom. These efforts are supported by the Food Security and Fisheries Office, the Transportation Office, and the Tourism Office of Surabaya City. Through institutional synergy, these programs not only enhance environmental awareness and coastal ecosystem sustainability but also encourage active community participation in marine tourism development, mangrove forest management, and the operation of the mangrove waste bank, ultimately improving the economic and social welfare of Surabaya's coastal communities.

In Quadrant IV, the Population Control and Family Planning Office are identified as an actor with low influence and low dependence. Despite its limited influence and dependence, this agency plays a facilitative role in supporting coastal community development with a local wisdom-based approach through programs such as marine tourism, mangrove management, and mangrove waste banks. Although possessing limited direct influence, the agency empowers coastal communities through sustainable programs focusing on marine tourism, mangrove development, and the establishment of mangrove waste banks. By emphasizing local self-reliance, the agency gradually enhances the capacity of coastal communities to manage natural resources through these predefined programs.

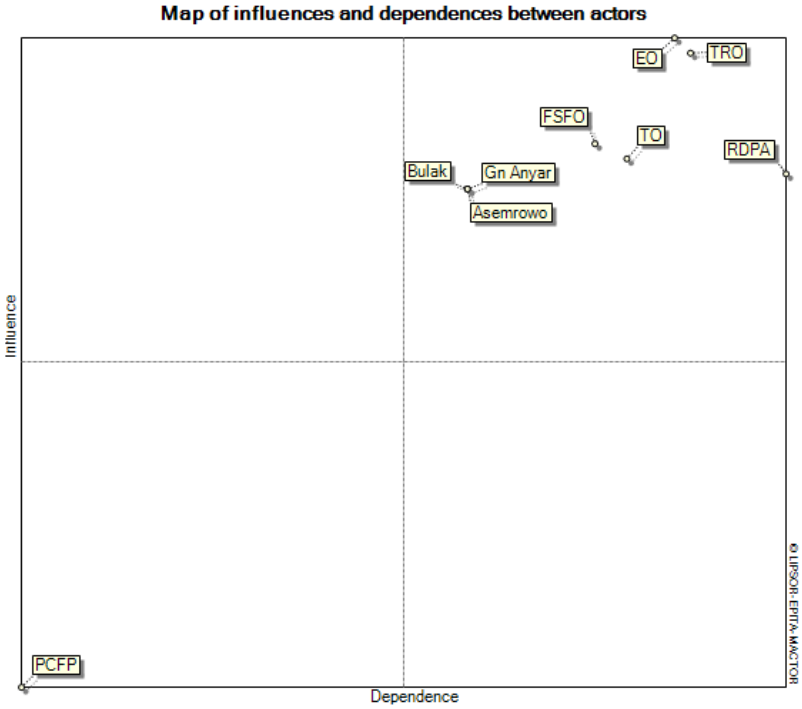

Figure 3. Inter-Institutional (Actor) Map Involved in Community Development Policy

Based on the Matrix of Direct and Indirect Influences (MDII) results (Figure 4), the values presented in the column Ii (the last column on the right) represent the net direct and indirect influence. In contrast, the indicator Di (the last row) reflects the net direct and indirect dependence. From these results, it is evident that the Environmental Office of Surabaya City is a highly influential actor, with an Ii value of 141 and a Di value of 139. This finding corresponds to the role and active participation of the Environmental Office of Surabaya City in community development initiatives for coastal areas based on local wisdom through marine tourism programs, which have increased awareness of the importance of marine conservation among the local population. Furthermore, the mangrove program initiated by the Environmental Office has contributed to the development of a healthier and more resilient coastal ecosystem, providing protection against the impacts of natural disasters. The mangrove waste bank program encourages the community to engage proactively in maintaining environmental cleanliness while simultaneously enhancing economic value through sustainable recycling practices.

MDII	RDPA	EO	PCFP	Asemrowo	Gn Anyar	Bulak	FSFO	TO	TRO	ii
RDPA	19	17	13	17	17	17	17	17	17	132
EO	20	20	13	16	16	16	19	20	21	141
PCFP	13	13	13	11	11	11	13	13	13	98
Asemrowo	18	17	11	18	18	18	16	16	17	131
Gn Anyar	18	17	11	18	18	18	16	16	17	131
Bulak	18	17	11	18	18	18	16	16	17	131
FSFO	20	19	13	15	15	15	20	18	19	134
TO	19	19	13	15	15	15	18	19	19	133
TRO	20	20	13	16	16	16	19	20	21	140
Di	146	139	98	126	126	126	134	136	140	1171

Figure 4. Results of the Matrix of Direct and Indirect Influences (MDII)

The convergence results among actors from the MACTOR analysis depicted in Figure 5, which illustrate collaboration in implementing community empowerment programs, show that nearly all actors exhibit strong convergence. Notably, there is a very strong convergence between the Environmental Office of Surabaya City and the Gunung Anyar, Asemrowo, and Bulak Districts, each with a convergence value of 38.2. This indicates a highly solid collaboration among these four actors in community development efforts aimed at empowering coastal communities based on local wisdom through marine tourism programs, mangrove conservation initiatives, and mangrove waste bank programs. The Environmental Office of Surabaya City has established close cooperation with Gunung Anyar, Asemrowo, and Bulak Districts to develop coastal communities grounded in local wisdom. These programs not only aim to preserve the environment but also to empower local communities through various sustainable initiatives (Alfitri, 2011). One flagship initiative is the marine tourism program, which promotes Surabaya's marine natural beauty to tourists while involving the community in managing and preserving the marine ecosystem's sustainability.

Additionally, the mangrove program is a central focus of this collaboration. By planting and maintaining mangrove forests along the coastline, the Environmental Office, together with the related districts, seeks to build ecological resilience in coastal areas (Kustanti, 2011; Gupta, 2020). Mangroves serve not only as vital buffers for marine ecosystems but also as educational platforms for local communities regarding the importance of environmental conservation (Siburian & Haba, 2016; Wijaya, 2021). Equally important is the mangrove waste bank program, implemented to address plastic waste issues in coastal regions. Through this program, communities are encouraged to collect, recycle, and creatively repurpose plastic waste to boost the local economy while mitigating negative impacts on the marine environment. With strong collaboration between the Environmental Office and nearby districts, a clean and sustainable environment is expected to be achieved for all stakeholders involved.

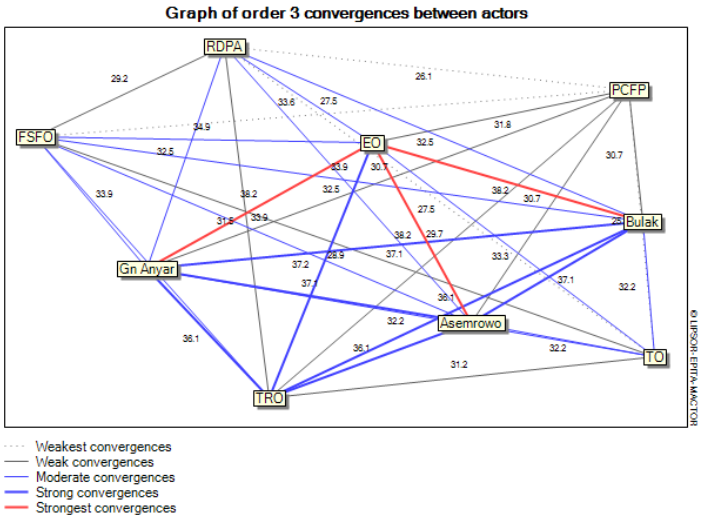

Figure 5. Convergence Map of Actors Involved in Community Development Policy

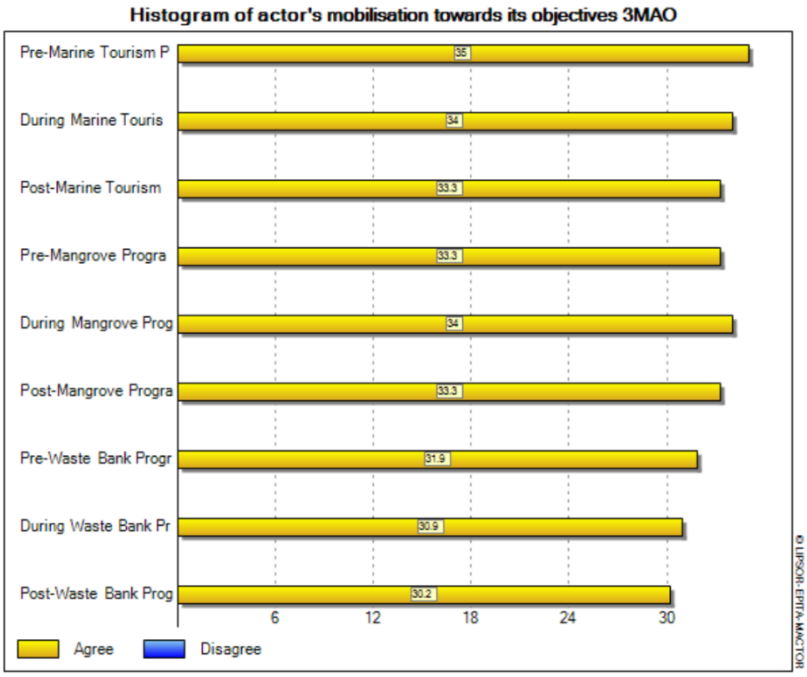

Figure 6. Histogram of Goal Achievement in Surabaya City Community Development Programs

The histogram derived from the 3MAO matrix using MACTOR, as illustrated in Figure 6, depicts the levels of mobility and support (pro) from all evaluated regional institutions in the implementation of each community development program aimed at empowering coastal communities. Empowerment efforts across the pre-, during-, and post-phases of the marine tourism program, mangrove program, and mangrove waste bank program indicate the presence of regional institutions in Surabaya City that endorse and approve the implementation of these empowerment initiatives. Programs such as marine tourism, mangrove conservation, and mangrove waste bank provide clear evidence of their benefits in the development of coastal communities based on local wisdom in Surabaya. Prior to implementation, these activities rely on in-depth assessments of marine ecosystem potentials, including biodiversity, tourism potential, and the needs of the local community. The pre-marine tourism program phase involves identifying potential marine tourism destinations capable of attracting visitors, alongside planning infrastructure with environmental sustainability considerations. During the marine tourism program, coastal communities directly benefit through increased income generated from tourism services such as homestays, local culinary businesses, and handicrafts. Additionally, awareness of the importance of maintaining coastal and marine cleanliness is reinforced, thereby reducing the risk of environmental pollution detrimental to marine life and surrounding communities. In the post-marine tourism program phase, positive impacts are observed in local economic growth and environmental conservation (Supriharyono, 2009; Purnomo, 2020; Rachman, 2021). Coastal communities actively participate in managing marine natural resources, ensuring that ecosystems are well preserved and provide long-term benefits for future generations (Hartono, 2019).

The pre-mangrove program phase begins with mapping and identifying areas suitable for mangrove rehabilitation. During the implementation phase, the planted mangroves serve not only as coastal buffers and habitats for wildlife but also contribute to improving water quality and reducing coastal erosion. Local communities are actively involved in the planting and maintenance of mangroves, fostering a stronger sense of ownership and responsibility toward their environment. Following the completion of the mangrove program, a significant improvement in coastal environmental sustainability has been observed. Thriving mangrove growth has created a balanced ecosystem, enhanced fisheries productivity, and reduced the risks of natural disasters such as tidal flooding and storms. Moreover, this program has increased public awareness of the importance of mangrove conservation as a vital component in global climate change mitigation efforts (Cormier-Salem, 2006).

The pre-mangrove waste bank program phase begins with education on the importance of sustainable waste management. During its implementation, the waste bank is well-organized and integrates environmentally friendly practices in waste processing. Local communities are empowered to manage the mangrove waste bank, transforming waste into resources with both economic and environmental value. As the mangrove waste bank program progresses, a cleaner and healthier environment emerges. Increased income from the sale of recycled materials provides positive economic impacts for coastal communities. Additionally, the reduction of plastic waste in mangrove areas supports ecosystem sustainability and improves overall public health. In the post-program phase, improvements in quality of life and environmental awareness among coastal communities become evident. People show greater concern for environmental cleanliness and adopt more responsible waste management practices. This fosters a greener and more sustainable environment, reinforcing ecological and economic resilience in Surabaya City.

Conclusion

The livelihood structures of coastal communities in Surabaya vary significantly across districts. Asemrowo District relies predominantly on agriculture, forestry, fisheries, and service-related activities, while Bulak District is mainly supported by processing industries such as small-scale manufacturing and handicrafts. In contrast, Gunung Anyar District exhibits a more diversified economic base, combining processing industries with wholesale and retail trade, including vehicle repair services. Despite these differences, all three districts share a common vulnerability to environmental degradation and climate-related hazards. Coastal ecosystem degradation, declining fish stocks, and natural disasters pose direct threats to income stability, particularly in communities that depend heavily on fisheries and coastal tourism. These findings indicate that uniform policy interventions are insufficient to address the heterogeneous livelihood conditions of coastal districts. Instead, differentiated and context-sensitive policy responses are required. Districts with strong dependence on fisheries, agriculture, and tourism demand policies that prioritize environmental protection, ecosystem restoration, and disaster risk reduction, while areas with more diversified economies require support for sustainable industrial development and market resilience. Accordingly, this study highlights the need for integrated coastal development policies that coherently align sectoral policies in fisheries, tourism, spatial planning, and environmental management. Such policy coherence is essential to reduce livelihood vulnerability, enhance economic resilience, and safeguard long-term community welfare in coastal areas.

Community empowerment programs constitute a critical policy instrument within this integrated framework. Initiatives such as marine tourism development, mangrove rehabilitation, and mangrove waste bank programs not only strengthen local economic capacity but also promote environmental stewardship and social participation. The MACTOR analysis further demonstrates that the effectiveness of these programs is highly dependent on institutional coordination and actor alignment. Among the identified stakeholders, the Environmental Office of Surabaya emerges as the most influential actor, playing a central role in coordinating policy implementation and fostering collaboration among district governments and community organizations. The prominence of the Environmental Office implies that governance policies should formally reinforce cross-sectoral collaboration and clarify institutional roles in coastal community development. Policies supporting marine tourism, mangrove conservation, and waste bank initiatives should be institutionalized within an integrated, multi-actor policy framework that embeds local wisdom as a guiding principle. By strengthening inter-agency coordination and aligning development objectives across sectors, such policies can enhance program effectiveness, contribute to disaster mitigation, and ensure sustainable livelihood security for coastal communities in Surabaya.

Limitations

The research is limited to three coastal districts in Surabaya (Asemrowo, Bulak, and Gunung Anyar). While these areas are representative, the findings may not fully generalize to other coastal regions in Indonesia with differing socio-ecological or economic conditions. Although the paper discusses environmental outcomes (e.g., improved water quality, reduced erosion), it lacks empirical environmental data (e.g., biodiversity indices, pollution levels, fish stock assessments) to validate ecological claims.

Future studies should compare multiple coastal cities in Indonesia or Southeast Asia to examine how regional differences affect actor collaboration, community empowerment, and environmental outcomes. Utilize spatial and climate risk modeling to simulate future coastal vulnerability scenarios and test the robustness of current community development strategies under various stressors (e.g., sea-level rise, storm surges). Also need to explore how different groups (women, elderly, disabled, youth) are included or excluded from these programs and assess the distributional equity of benefits.

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