

Urgency of Marine Resources Supervision Regulation by North Sulawesi Regional Government to Realize Sustainable and Fair Management

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KEYWORDS	ABSTRACT
First keyword; regulatory supervision, marine resources, North Sulawesi, sustainability, environmental justice, decentralization.	This study examines the urgency and formulation of marine resource supervision regulations by the Regional Government of North Sulawesi Province in realizing sustainable and equitable management. The research method used is normative juridical with an analytical descriptive approach based on the study of laws and regulations, official documents, and related literature. The results of the study emphasize the need for regulations that integrate the principles of environmental sustainability, the principles of distributive and participatory justice, as well as adaptive and technology-based supervisory mechanisms. Ideal regulations must also provide clear and flexible authority to local governments by synchronizing policies with the central government level to avoid overlapping authority. Increasing institutional capacity and the active role of coastal communities are key to effective supervision. This research provides recommendations for regulatory formulation that harmonizes legal, social, and ecological aspects in order to achieve fair and sustainable management of marine resources in North Sulawesi.

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Introduction

Indonesia as an archipelagic state has very large and diverse marine resources, around 70% of the total national area and holds various economic, ecological, and social potentials that can support the welfare of the community (Rochwulaningsih et al., 2019). This potential is vulnerable to overexploitation, destructive fishing practices, and coastal development pressures, requiring effective monitoring mechanisms to ensure sustainability and long-term benefits for local communities (Dao et al., 2024).

Supervision is a vital instrument in ensuring the effectiveness of the implementation of marine and fishery resource management policies, as this function is not only aimed at ensuring compliance with applicable legal norms, but also serves as a corrective mechanism to prevent irregularities, encourage transparent governance, and ensure the sustainability of marine ecosystems that are the main basis of fisheries productivity (Mohammed et al., 2018; Mulianto et al., 2024; Yang et al., 2025).

In public policy theory, supervision is positioned as a strategic function in the policy cycle which includes a series of monitoring, evaluation, and law enforcement activities that are carried out systematically to measure the level of compliance of business actors with regulations and procedures set by the managing authority (Matsiliza, 2019).

Supervision at the regional level is crucial because local governments, especially provinces and districts/cities, have the authority to manage marine resources to a certain extent, this role must be combined with the principle of sustainability so that utilization does not sacrifice ecosystem functions and access for future generations (Schröter et al., 2017).

The authority and responsibility of local governments in the management and supervision of marine resources are regulated by the national legal framework that allocates the authority of marine management to the provinces as stipulated in Chapter V of Provincial Authority in the Sea and Provincial Areas with Archipelago Characteristics, Part One of Provincial Regional Authority in the Sea, article 27 of Law of the Republic of Indonesia Number 9 of 2015 concerning the Second Amendment to Law Number 23 of 2014 concerning Regional Government or abbreviated as the Local Government Law, emphasizes:

- 1) Provincial areas are given the authority to manage natural resources in the sea in their territory.
- 2) The authority of the provincial region to manage natural resources in the sea as intended in paragraph (1) includes:
 - a) exploration, exploitation, conservation, and management of marine resources beyond oil and gas;
 - b) administrative arrangements;
 - c) spatial arrangement;
 - d) take part in maintaining security at sea; and
 - e) participate in defending state sovereignty.
- (1) The authority of the provincial region to manage natural resources in the sea as intended in paragraph (1) is a maximum of 12 (twelve) nautical miles measured from the coastline towards the high seas and/or towards the waters of the archipelago.
- (2) If the sea area between the two provincial regions is less than 24 (twenty-four) miles, the authority to manage natural resources in the sea is divided equally in distance or measured according to the principle of the middle line of the area between the two provincial regions.
- (3) The provisions as intended in paragraph (3) and paragraph (4) do not apply to fishing by small fishermen.

The provisions of Article 27 of Law Number 9 of 2015 reflect the implementation of an asymmetric decentralization policy, where the provincial government is given autonomous authority to manage natural resources in the sea up to 12 nautical miles from the coastline.

This delegation of authority is a manifestation of the principle of the division of government affairs between the central government and local governments within the framework of regional autonomy, so that the management of marine potential is carried out more effectively, efficiently, and in accordance with geographical characteristics and regional

interests and has a great responsibility to maintain the sustainability of marine ecosystems while optimizing the potential of the marine economy without neglecting aspects of sovereignty and national security (Christina & Muttaqin, 2020). However, this delegation of authority has major consequences in the form of the responsibility to maintain the sustainability of marine ecosystems, while optimizing the potential of the marine economy without neglecting aspects of sovereignty and national security (Khaskheli et al., 2025; Voyer et al., 2018).

This policy also affirms the importance of regional empowerment in optimizing marine resources for the welfare of local communities as part of the implementation of fiscal decentralization and sectoral authority in modern governance (Christina & Muttaqin, 2020). However, this expansion of authority was not followed by regulatory clarity and institutional readiness in the regions, one of which was in North Sulawesi Province (Razak et al., 2021).

North Sulawesi Province (North Sulawesi) occupies a strategic position in the national marine map, has a long coastline, a cluster of small islands, as well as fishery activities and marine economy that are a source of livelihood for coastal communities (Glaeser et al., 2017). Marine biodiversity including coral reefs, mangroves, and fish stocks is an important asset for food security and local economic development (March & Failler, 2022). However, this capital is also vulnerable to exploitation pressures, conversion of marine space, utilization conflicts, and environmental damage if its management and supervision are inadequate (Budiman, 2018).

Normatively, the authority to supervise marine resources up to 12 nautical miles is mandated in the concurrent government regime, the provincial government has an important role in supervising and coaching the management of SDKP (marine and fishery resources). At the national level, various regulations have been drafted to strengthen the system, including:

- (1) Article 1 number 17 and Article 2 paragraph (2) letter f of Government Regulation Number 28 of 2025 concerning the Implementation of Business Licensing, which is part of the implementation of the Job Creation Law. Article 1 number 17 affirms:

Supervision is an effort to ensure the implementation of business activities in accordance with the standards of the implementation of business activities carried out through a risk-based approach and obligations that must be fulfilled by Business Actors.

Article 2 paragraph (2) letter f

- (2) The scope of the implementation of PBBR as referred to in paragraph (1) includes:f.
This regulation affirms the principle of risk-based licensing in the marine and fisheries sector and strengthens the principle of prudence and sustainability in the use of marine space through the Suitability of Marine Space Utilization Activities (KKPRL) instrument.
- (3) Regulation of the Minister of Maritime Affairs and Fisheries Number. 5 of 2025, concerning Amendments to the Regulation of the Minister of Maritime Affairs and Fisheries Number 30 of 2021 concerning Marine Space Surveillance. This regulation emphasizes the importance of continuous monitoring to protect marine ecosystems from destructive human activities and ecosystem-based supervision, collaboration with local communities, and law enforcement against violations in the marine space such as illegal, unreported, and unregulated fishing (IUU Fishing).

- (4) Regulation of the Minister of Maritime Affairs and Fisheries Number 26 of 2022 concerning Amendments to the Regulation of the Minister of Maritime Affairs and Fisheries Number 31 of 2021 concerning the Imposition of Administrative Sanctions in the Marine and Fisheries Sector.

This regulation places supervision not only as a monitoring function, but as a tool for administrative law enforcement to ensure that the management of marine resources is carried out in an orderly, sustainable manner, and in accordance with licensing provisions and encourages preventive and corrective compliance. The regulation in its implementation is to strengthen participatory supervision and law enforcement mechanisms, encouraging the active role of the fishing community and local organizations as government partners in carrying out supervision (Rohyani et al., 2023). However, at the regional level, especially in North Sulawesi Province, the implementation of supervision has not been fully effective (Rondonuwu et al., 2025; Rumawir et al., 2024).

However, the results of the facilitation and coordination of strengthening the supervisory function contained in the guidance document of the Directorate of Marine Resources Supervision of the Directorate General of PSDKP of the Ministry of Maritime Affairs and Fisheries, (Directorate of Marine Resources Supervision of the Directorate General of PSDKP of the Ministry of Maritime Affairs and Fisheries, 2024), show that there are still substantive gaps in the supervisory mechanism at the provincial level that have the potential to hinder sustainable and equitable management, such as: the coastal and marine area surveillance system still faces various ecological, socio-economic, and institutional problems that aggravate the damage to marine ecosystems if not addressed immediately, limited supervisory personnel (Polsus PWP3K, Fisheries Supervisor, PPNS), lack of facilities and budget for patrol/supervision, the lack of NSPK/technical supervision techniques in each province, the absence of a coordination mechanism/receipt of systematic violation reports, and the lack of clarity on the regional legal umbrella regarding administrative sanctions for supervision. (Directorate of Marine Resources Supervision of the Directorate General of PSDKP of the Ministry of Maritime Affairs and Fisheries, 2024).

Effective marine surveillance requires specific regulations, which ensure the regulation of marine space, the empowerment of local supervisors, the reporting of violations, and the enforcement of sanctions in a fair and transparent manner. Without adequate local regulations, supervision tends to be reactive, partial, and incapable of ensuring sustainable management and justice for coastal communities (Basri, 2020). Meanwhile, several other provinces have moved further in formulating Regional Regulations/NSPK on the management and/or supervision of SDKP, such as the Central Sulawesi Regional Regulation on the Implementation of Marine Affairs and Fisheries 2023 and the Southeast Sulawesi Regional Regulation on the Supervision of SDKP 2023, which shows a variety of regulatory approaches between provinces and opens up learning spaces (best practices) that can be adapted by North Sulawesi.

These provisions affirm that surveillance is not only an administrative task, but also an integral part of marine spatial planning, conservation, and coastal disaster mitigation. Thus, the purpose of this study is to provide an in-depth analysis of the urgent need for the establishment of marine resource supervision regulations by the Regional Government of North Sulawesi

Province in realizing sustainable and equitable management of marine resources as well as the ideal formulation of marine resource supervision regulations by the local government of North Sulawesi Province as an effort to realize sustainable and equitable management.

This research uses the theory of environmental justice, the theory of Decentralization and Regional Autonomy, it is intended that environmental justice as a principle so that the use of natural resources does not harm current and future generations and ensures the balance of the ecosystem and the welfare of local communities. Meanwhile, decentralization and regional autonomy as a framework for public policy analysis that provides substantial authority for local governments in managing natural resources according to local conditions, with the record that control and coordination functions continue to run effectively to prevent overlap and conflicts of authority. These two theories will be synergistically analyzed to produce recommendations for marine resource supervision regulations that are adaptive and responsive to the challenges of the times.

Research Method

This study used a normative juridical method with an analytical descriptive approach. Secondary data, including laws and regulations, books, journals, and government documents, formed the basis of the analysis (Scott). Conceptual approaches examined legal norms and principles related to environmental justice, decentralization, and regional autonomy. Literature studies involved searching official and academic sources concerning marine supervision and regional regulations. Legal materials, comprising primary, secondary, and tertiary sources, were collected through literature review and qualitatively analyzed using normative and deductive methods to identify regulatory gaps and develop an ideal concept for sustainable and equitable marine resource management.

Results and Discussion

The urgency of establishing marine resource supervision regulations by the Regional Government of North Sulawesi Province in realizing sustainable and equitable management of marine resources

The high level of exploitation of marine resources in North Sulawesi Province is reflected in *overfishing* incidents, destructive fishing practices, conversion of marine space for non-ecological purposes, and declining quality of coral reefs and *mangroves*. (Dahuri R). This condition is exacerbated by weak supervisory capabilities, limited personnel and infrastructure, and the lack of optimal reporting forums and coastal communities in detecting violations. Cases of conflicts over the use of marine space often occur, including competition in the fisheries, tourism, and industrial sectors that are often not in line with the principles of environmental sustainability and social justice.

On the other hand, the local government of North Sulawesi Province has been given significant legal authority through Law Number 9 of 2015 and strengthened by Regional Regulation Number 5 of 2023 to manage and supervise marine resources in the province's marine area up to 12 nautical miles from the coastline. This authority is not only a formal basis for local governments to carry out supervisory functions, but also a form of fiscal and political

decentralization that provides substantial autonomy to adapt marine resource management policies to local conditions and needs (Amiruddin et al., 2022).

However, the magnitude of this authority has not been offset by adequate institutional readiness for supervision, including the availability of clear and operational Norms, Standards, Procedures, and Criteria (NSPK), as well as an integrated and responsive reporting system. These weaknesses contribute to the formation of oversight gaps that can hinder efforts to achieve the goals of ecosystem sustainability and equitable distribution of benefits to coastal communities who are direct users of these resources (Amiruddin et al., 2022).

This problem is very critical considering the complexity of marine space management that requires cross-sectoral work, ranging from marine zoning regulation, habitat protection, to law enforcement for violations and empowerment of local communities as part of participatory monitoring mechanisms. (Ministry of Maritime Affairs and Fisheries, 2022). Incomplete regulations and unintegrated reporting systems lead to a lack of monitoring effectiveness, as well as increase the risk of illegal fishing practices, habitat destruction, and social conflicts that can exacerbate the vulnerability of marine ecosystems and socio-economic communities (Syahrin, H). As shown in table 1 as follows:

Table 1. Authority, Institutional Resiliency, and Its Impact on Marine Resources Supervision in North Sulawesi Province

Aspects	Conditions in North Sulawesi	Impact on Management and Supervision	Policy recommendations
Management Authority	The authority to manage the sea up to 12 nautical miles as regulated in Regional Regulation 5/2023	Granting substantial autonomy to local governments	Need to strengthen the framework and harmonization of NSPK
Institutional Readiness	Limited supervision institutions, lack of personnel and infrastructure	Gaps in supervision and reporting, low data integration	Institutional capacity building, digital reporting technology
Breach Reporting System	The reporting system is still manual and partial, public participation is limited	Slow detection and handling of violations	Implementation of a community-based unified reporting system
Regulatory Implementation	Regulations already exist but have not been fully implemented optimally ⁴	Potential damage to ecosystems continues	Strict supervision and periodic evaluation with community involvement

Source: Analysis results based on North Sulawesi Provincial Regulation No. 5/2023 and North Sulawesi BPSDL data (2024)

Table 1 shows that the amount of authority of local governments in marine management needs to be aligned with the strengthening of supporting regulations, the development of

supervisory institutional capacity, and innovation in the reporting system that actively involves the community.

Based on this description, in the perspective of environmental justice theory from Schlosberg and Kuehn, it is proven that regional regulations must be able to guarantee distributive justice (proportional distribution of environmental benefits), corrective justice (penalties and compensation for environmental losses), procedural justice (community participation rights), and social justice (fulfillment of coastal communities' rights to marine resources). Meanwhile, from the perspective of the theory of decentralization and regional autonomy, Huda and Rondinelli emphasized the urgency of delegating authority to the regions and the active participation of the community for the sake of effective management of marine resources with local characteristics.

The results of the study show that marine surveillance regulations in North Sulawesi normatively contain the principles of sustainability and participation, but supervision institutions, reporting systems, and infrastructure still need to be improved. Coastal communities that have been the main subjects of policies are often not substantively involved in the formulation of surveillance policies and have not been fully protected from the impact of marine ecosystem damage. (SISWASMAS, 2022). As shown in table 2 as follows:

Table 2. Research Findings

Phenomenon	Regulatory and Theoretical Aspects	Research Findings	Policy Recommendations
Overfishing and ecosystem degradation	North Sulawesi Regional Regulation No. 5/2023, Distributive justice	Conservation zones are not optimal, benefits are not evenly distributed ⁷	Quota enforcement, distribution of benefits for small fishers
Economic sector conflicts	Decentralization theory, Regional autonomy	Cross-sectoral policies are not yet harmonious	Harmonization of NSPK and cross-sector forums
Minimal community participation	Procedural fairness	Participatory supervision is less active	Strengthening education, participation of coastal communities
Institutional limitations	Administration and HR supervisors	Non-integrated supervision	Institutional improvements, surveillance technology

Source: Processed from the results of field research and document analysis of North Sulawesi Regional Regulation No. 5/2023

Table 2 shows that although North Sulawesi Regional Regulation No. 5/2023 has normatively accommodated the principles of environmental justice and the principle of decentralization, the implementation of supervision still faces challenges in the form of weak institutional capacity, lack of participation of coastal communities, and suboptimal cross-sector synergy across government sectors. Improving regulations and strengthening collaboration

between parties is the key to the success of sustainable and equitable marine governance in North Sulawesi Province.

The essence of strengthening regional regulations as an essential legal foundation in the management of marine resources. The strengthening of this regulation is not only related to the normative aspect, but also to the implementation aspect, namely how the regulation is carried out consistently and inclusively through the participatory involvement of coastal communities in the supervision and management process. This is especially important in North Sulawesi, which has unique socio-economic and ecological characteristics, as well as the complexity of multi-stakeholder marine governance. (North Sulawesi Regional Regulation, Number 5 of 2023)

Consistent implementation of regulations ensures legal certainty and sustainability of marine ecosystem management, so that there are no inconsistencies in the enforcement of rules that can cause conflicts of interest and damage the sustainability of ecosystem functions. Meanwhile, the involvement of coastal communities as part of participatory monitoring strengthens aspects of social justice and the recognition of the rights of indigenous peoples and fishers in accessing and managing marine resources in a sustainable manner.

This participatory approach is also in line with environmental justice theory that prioritizes equitable distribution of benefits and the equitable fulfillment of ecological rights, as well as supporting more effective oversight functions through the involvement of local actors. Thus, the vision of sustainable and equitable management can only be achieved if harmony between strong regulations and the implementation of participatory supervision can be realized in real terms on the ground. (KKP, 2022). This is as outlined in table 3 as follows:

Table 3. The main aspects of strengthening regulations and participatory implementation in marine resource management in North Sulawesi

Reinforcement Aspects	Key Focus	Positive Impact	Challenges in Implementation
Strengthening Regional Regulations	Legal certainty and policy framework	Creating management certainty	Limited cross-sector coordination
Consistency of Implementation	Ongoing oversight and legality	Reduce conflict and violations	Variations in the understanding and application of rules
Community Participation	Coastal community involvement	Increased monitoring effectiveness	Low awareness and capacity of the community
Social and Ecological Justice	Fulfillment of fishermen's rights and habitat protection	Fair and sustainable management	Local socio-economic and cultural barriers

Source: Results of field data synthesis and literature studies

Table 3 shows that strengthening regional regulations accompanied by consistent implementation and participatory supervision is the main foundation for achieving sustainable and equitable management of North Sulawesi's marine resources. Synergy between legal, administrative, and social aspects is the key to the success of the policy.

The ideal formulation of marine resource supervision regulations by the local government of North Sulawesi Province as an effort to realize sustainable and equitable management.

The ideal formulation of marine resource supervision regulations in North Sulawesi Province must meet several main principles rooted in the specific needs of the region, the socio-ecological characteristics of coastal communities, as well as the requirements of national laws governing marine governance. These regulations should bring together substantial legal aspects and clear, measurable, and participatory administrative processes to ensure oversight is not only formal, but also has a tangible impact on the sustainability and fairness of marine resource management, as follows:

- a) Ideal regulations need to accommodate the principles of environmental sustainability that focus on the holistic management of marine resources by prioritizing the conservation of critical habitats such as coral reefs and mangrove forests, as well as maintaining the capacity of marine biodiversity productivity so that it can be used sustainably. (Dahuri, R,)

This holistic approach requires regulations to not focus on just one aspect, such as exploitation or utilization, but to ensure that all ecosystem elements interact with each other in a balanced manner to maintain the ecosystem's ability to produce sustainable marine resources in the long term. Regulations that prioritize the conservation of critical habitats seek to address the negative impacts of human activities, such as overfishing, sand or coral mining, and habitat destruction due to uncontrolled coastal development. In addition, the ideal regulation should establish a framework to maintain the capacity of marine biological productivity, namely the ability of marine biotic components to reproduce and recover so that fish stocks and other marine resources remain available cumulatively for future generations. This requires science-based arrangements of catch quotas, no-catch zones, and strict monitoring mechanisms so that utilization rates do not exceed the limits of the ecosystem's natural regeneration. (FAO, 2020) The implementation of sustainability principles in regulations must also be coordinated with the preparation of a clear Coastal and Marine Area Zoning Plan (RZWP3K), so that marine spatial planning can be utilized optimally and systematically. This approach also ensures the protection and utilization of marine resources that is balanced between conservation and economic development, and empowers local communities to play an active role in the management of the resources on which they live. (Ministerial Regulation No. 18 of 2022) Therefore, the formulation of the ideal regulation requires multidisciplinary integration that combines legal, ecological, social, and economic aspects as well as strengthening supervision mechanisms based on community participation and information technology. This is the key to realizing sustainable and

equitable management of marine resources, as aspired in the vision of the development of the North Sulawesi region.

- b) The principles of environmental justice must be used as a guideline to ensure the distribution of benefits and the recognition of the rights of coastal communities and small-scale fishers as an integral part of the monitoring and management system. The principle of environmental justice is a fundamental foundation in the sustainable management of marine resources. This principle demands that the distribution of benefits from marine resources be carried out fairly and equitably among all communities, including coastal communities and small-scale fishers, who have often experienced inequality in access and benefits.

Recognition of the rights of coastal communities and small-scale fishers as an integral part of the monitoring and management system means that policies and regulations not only focus on normative aspects, but also ensure the active participation and protection of their rights in the process of managing marine resources. (Christian, E) The implementation of the principles of environmental justice in the monitoring policy includes aspects of balanced distribution of economic and social benefits, equal treatment in the decision-making process, and protection of the ecological and social rights of coastal communities. The sustainability of marine ecosystems can be achieved through fair, non-discriminatory, and empowerment-oriented management of local communities, especially small-scale fishers who are the most vulnerable and often marginalized (Sulaiman, M)

The following is an illustration of the role of the principle of environmental justice in the marine resource monitoring system as shown in table 4 as follows:

Table 4. The role of the principle of environmental justice in the marine resource monitoring system

Key Aspects of Environmental Justice Principles	Implementation and Implications	Purpose and Benefits
Benefit Distribution	Equitable access for small-scale fishers and coastal communities to marine products	Improve social justice, reduce inequality, and increase community income
Protection of Ecological Rights	Respect for ecological rights through the conservation of important habitats	Ensure the sustainability of natural resources and marine ecosystems at all times
Participation in Management	Involve the community in policy formulation, implementation, and supervision	Strengthen democratic processes, increase accountability, and reduce conflict
Procedural Justice	The right of the community to equal and participatory treatment	Ensure a fair and transparent decision-making process

Source: Extracted from Schlosberg's environmental justice theory and field research findings

Table 4 shows that the principle of environmental justice is a crucial foundation in the management of marine resources by ensuring equitable distribution of benefits and protection of the rights of coastal communities and small-scale fishers. The implementation of this principle not only increases the sustainability of the ecosystem, but also strengthens the involvement of local communities so that management is more inclusive and equitable. In this way, supervision regulations can run effectively and adaptively according to socio-ecological needs in North Sulawesi.

- c) The formulation of regulations must give clear and flexible authority to local governments while ensuring policy integration with the central government level. This is to avoid overlapping authorities and ensure synchronization of supervision programs on a national and local scale. (Nimatul Huda, 2020) The formulation of marine resources supervision regulations by the local government of North Sulawesi Province must be based on the principle of providing clear and flexible authority to local governments, as well as ensuring the integration and synchronization of policies with the central government level. This concept is important to avoid the classic problem of overlapping authority that can lead to duplication of tasks, coordination confusion, and even inter-agency conflicts, ultimately weakening the effectiveness of marine resource oversight at the local and national levels.

Clear authority means that regulations must expressly regulate the boundaries of authority owned by the provincial government, including the marine area for which it is responsible up to 12 nautical miles from the coastline, as well as a mechanism for transfer of authority if necessary. The flexibility of authority provides room for local governments to make technical and tactical adjustments according to the social, economic, and ecological characteristics of their regions, which are dynamic and differ between regions.

The integration of policies with the central government level is an absolute requirement so that all policies made both at the central and regional levels run harmoniously in an integrated management system. This requires a strong coordination and communication mechanism so that surveillance programs in the regions do not contradict or are isolated from national strategic objectives. Program synchronization also includes the exchange of complementary data and information between the central and regional governments as well as continuous technical support from the central government to local governments.

Policy insynchronization and unclear authority have been the main obstacles in the implementation of marine resource supervision, resulting in low coordination between institutions, and weak supervision in the field. Therefore, the ideal regulation must formulate a supervisory system that not only contains legal norms, but also regulates institutional governance and coordination between levels of government and ensures the active participation of the community and stakeholders in supervision (Amiruddin et al., 2022).

This is relevant to the theory of decentralization and regional autonomy which provides a strong foundation for building marine resource supervision regulations that not only recognize local authority proportionately, but also realize the principles of integrated and sustainable governance on a national and local scale.

- d) The integration of information technology based on an integrated reporting system involving the public and official supervisory institutions is a vital element in regulations designed to be effective and responsive to management dynamics in the field (KKP, 2022) The integration of information technology based on an integrated reporting system is a strategic component in the formulation and implementation of marine resource supervision regulations that are effective and responsive to changes in the situation in the field. This system allows the synchronization of surveillance data between official institutions and coastal communities as actors and direct observers of the use of marine resources. (GB, 2023) Through the use of technologies such as digital reporting applications, geographic information systems (GIS), and sensor monitoring, regulations can provide real-time access to data on ocean use and rule violations that occur. (BPSDL North Sulawesi, 2024) An integrated reporting system involving coastal communities aims to initiate participatory monitoring so that it does not rely only on limited formal supervisory capacity. The community plays an active role in detecting, reporting, and supervising activities that have the potential to damage marine resources, while official supervisory agencies act as processors, verifiers, and enforcers of violations (Wahyuni, D. & Sari, Y., 2024). This approach improves transparency, accountability, and overall supervisory effectiveness.

The availability of adequate information technology infrastructure and training for the community and supervisors are the determining factors for the success of this system. In addition, regulations must regulate inter-agency coordination mechanisms and responsive protocols for handling information on violations and protecting whistleblowers to provide security and trust guarantees for all stakeholders (Wahyuni, D. & Sari, Y., 2024). The integration of information technology is not only an administrative tool, but also a driver of sustainable and equitable marine governance transformation. Some of the ideal formulations offered by the author are formulations of effective regulations in the supervision of marine resources in North Sulawesi Province that must integrate various basic elements that can overcome existing institutional, social, and ecological challenges. This regulation must build a strong foundation not only legally formal, but also be able to adapt to real conditions and needs in the field. Strong legal elements include clear authority deposition, strict operational standards and procedures, and protection of the rights of coastal communities and small-scale fishers in a system of equitable supervision and management of resources.

The successful implementation of regulations is highly dependent on the balance between a solid legal governance structure and the active involvement of the community as a supervisory partner. Coastal communities, who are usually the most affected parties and those who know local conditions firsthand, will spearhead effective participatory surveillance when supported by inclusive regulations and adequate empowerment

mechanisms. In addition, regulatory formulation must pay attention to synergy and synchronization between levels of government to avoid overlapping authorities and improve the efficiency of marine resource supervision.

This coordination should include central and regional policy alignment, real-time exchange of data and information, and adequate technical and financial resource support to support surveillance activities (Amiruddin et al., 2022). Ecologically, regulations must accommodate the principle of sustainable management, namely maintaining a balance between exploitation and conservation so that the productivity of marine resources does not decline over time. Socio-economic must also be the main focus so that the results of management can be enjoyed fairly by all levels of society, including the most vulnerable. The ideal formulation of marine resource supervision regulations in North Sulawesi Province must combine legal firmness, flexibility of local adaptation, synergy between governments, institutional strengthening, and community empowerment to ensure sustainable and equitable management.

Conclusion

The management of marine resources requires strengthened regulations through a holistic, integrative approach that includes institutional capacity, active community participation, and the application of information technology in supervisory systems. Sustainable and equitable management depends on effective synergy between central and local governments, alongside local communities acting as strategic partners in surveillance. Future regulations should grant clear yet flexible authority to local governments, supported by technology-based reporting systems and community involvement. Strengthening institutions, harmonizing policies, and building capacity are essential to achieve sustainability and fairness in marine resource management. Future research could focus on evaluating the effectiveness of technology-based supervision systems and community participation models in enhancing marine resource governance at local levels, particularly in regions like North Sulawesi where regulatory and institutional gaps currently exist.

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