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Legal Strategy for Sustainable Sargassum Management to Improve the Maritime Economic of Bima

Didik Irawansah^{1*}, Kasmar Kasmar², Muhamad Amin³, Absori Absori⁴

^{1,2,3}, Faculty of Law and Economy, Universitas Muhammadiyah Bima, Indonesia

⁴, Faculty of Law and Politic, Universitas Muhammadiyah Surakarta, Indonesia

*correspondence email : didikirawansah25@gmail.com

Abstract

The aim of this study is to describe the economic potential of Sargassum in supporting the maritime economy of coastal communities in Bima Regency and to conceptualize strategic legal policies for the sustainable management of Sargassum to enhance the economic competitiveness of coastal villages in Bima.

The method used is an empirical legal study employing a mixed-methods approach, combining qualitative and quantitative methods. The study was conducted in the coastal village of Teluk Waworada, Bima Regency, using purposive sampling of relevant stakeholders. Data were collected through observation, interviews, questionnaires, and documentation. Analysis was conducted qualitatively through data reduction, presentation, and drawing of conclusions.

The novelty of this study lies in the formulation of a legal governance policy model for Sargassum that has not been previously researched, integrating environmental protection, the empowerment of coastal communities, and the enhancement of maritime economic competitiveness in Bima Regency.

The results of the study indicate that Sargassum makes a tangible contribution to the income and economic resilience of coastal households; however, its utilization remains traditional, lacking downstream processing and legal certainty.

The conclusion is that comprehensive local regulations are needed to ensure sustainability, added value, and the competitiveness of the Sargassum-based maritime economy.

Keywords: Governance; Sargassum; Maritime Economy; Coastal; Bima

Abstrak

Tujuan Penelitian ini untuk mendeskripsikan potensi ekonomi Sargassum dalam mendukung ekonomi maritim masyarakat pesisir di Kabupaten Bima dan untuk mengkonseptualisasikan Kebijakan Hukum Strategis dalam Tata Kelola Sargassum Berkelanjutan untuk Meningkatkan Daya Saing Ekonomi Maritim Desa Pesisir di Bima.

Metode Penelitian yang digunakan merupakan penelitian yuridis empiris dengan pendekatan mixed methods, yaitu kualitatif dan kuantitatif. Penelitian dilakukan di desa pesisir Teluk Waworada Kabupaten Bima, dengan teknik purposive sampling terhadap pemangku kepentingan terkait. Data dikumpulkan melalui observasi, wawancara, kuesioner, dan dokumentasi. Analisis dilakukan secara kualitatif melalui reduksi, penyajian, dan penarikan kesimpulan.

Kebaruan Penelitian ini menawarkan kebaruan yang perumusan Konsep model kebijakan hukum tata kelola Sargassum yang belum diteliti oleh peneliti sebelumnya dengan mengintegrasikan perlindungan lingkungan, pemberdayaan masyarakat pesisir, dan peningkatan daya saing ekonomi maritim di Kabupaten Bima.

Hasil penelitian menunjukkan Sargassum berkontribusi nyata terhadap pendapatan dan ketahanan ekonomi rumah tangga pesisir, namun pemanfaatannya masih tradisional, tanpa hilirisasi dan kepastian hukum.

Kesimpulan Diperlukan regulasi daerah komprehensif untuk menjamin keberlanjutan, nilai tambah, dan daya saing ekonomi maritim berbasis Sargassum.

Kata Kunci: Tata kelola; Sargassum; Ekonomi Maritim; Pesisir; Bima

1. INTRODUCTION

Sargassum seaweed is a potential marine biological resource with high economic value,¹ particularly in the cosmetics, food, and pharmaceutical industries.² In the coastal area of Bima Regency, there are three villages: Laju, Wilamaci, and Tangga Baru, which primarily contribute to the supply of raw materials for cosmetics, food, and pharmaceuticals from sargassum seaweed, making sargassum a primary commodity driving the maritime economy of these coastal village communities.³ However, to date, there is no comprehensive policy or regulation regarding the governance of sargassum utilization and conservation.⁴ This absence of a policy has triggered various multidimensional problems that hinder the development of the maritime economy of the coastal village communities of Bima Regency.

Problems arising from the lack of a sargassum management policy include: 1) because of its rich benefits as a raw material for cosmetics and food, leading to uncontrolled overexploitation of sargassum, which has had a negative impact on marine ecosystem damage due to environmentally unfriendly extraction, such as uprooting coral reefs;⁵ 2) The economic value of sargassum is largely enjoyed by middlemen or outsiders, while the coastal communities of Bima are merely collectors with very little profit due to the lack of protective policies regarding standard prices.⁶ 3) Without government policies and intervention,

¹ Muh Nasir, "Ekstraksi Senyawa Bioaktif Dari Rumpun Laut Sargassum Sp. Sebagai" 13, no. 2 (2024).

² Chalvyn S Pakidi and Hidayat Suryanto Suwoyo, "Potensi Dan Pemanfaatan Bahan Aktif Alga Cokelat Sargassum Sp. Octopus Journal," *Jurnal Octopus* 6, no. 1 (2017): 551–62; Rini Febriyanta Br Ginting and Amir Husni, "Karakteristik Flakes Dengan Fortifikasi Tepung Sargassum Hystrix Sebagai Pangan Fungsional," *Industria: Jurnal Teknologi Dan Manajemen Agroindustri* 9, no. 3 (2020): 241–61, <https://doi.org/10.21776/ub.industria.2020.009.03.8>.

³ Syahbuddin Syahbuddin and Habibah Habibah, "Budidaya Rumpun Laut Dalam Meningkatkan Pendapatan Ekonomi Masyarakat (Studi Kasus Di Desa Laju Kecamatan Langgudu Kabupaten Bima)," *Jurnal Pendidikan Ips* 11, no. 2 (2021): 101–6, <https://doi.org/10.37630/jpi.v11i2.513>.

⁴ Cicilia S.B. Kambey et al., "An Analysis of the Current Status and Future of Biosecurity Frameworks for the Indonesian Seaweed Industry," *Journal of Applied Phycology* 32, no. 4 (2020): 2147–60, <https://doi.org/10.1007/s10811-019-02020-3>; Risti Permani, Yanti N. Muflikh, and Fikri Sjahrudin, "Mapping the Complex Web of Policies for Seaweed Industry Development in Indonesia: What Is the Role of a National Roadmap?," *Ocean and Coastal Management* 259, no. August (2024): 107464, <https://doi.org/10.1016/j.ocecoaman.2024.107464>.

⁵ Michéal Mac Monagail et al., "Sustainable Harvesting of Wild Seaweed Resources," *European Journal of Phycology* 52, no. 4 (2017): 371–90, <https://doi.org/10.1080/09670262.2017.1365273>.

⁶ Rizal Karlina, Taena La, "Jurnal Online Program Studi Pendidikan Ekonomi" 8, no. 1 (2023): 181–89.

communities tend to sell raw sargassum at low prices to middlemen.⁷ The lack of downstream processing also hinders increasing added value to the community's economy. 4) Without a legal umbrella, coastal village businesses lack protection or business certainty, whether in terms of legality, investment, or business protection.⁸ These issues have significantly impacted coastal communities in Laju, Tanga Baru, and Wilamaci villages in Bima, resulting in a decline in income, which is the primary source of local livelihood.⁹

Appropriate policies will ensure optimal utilization of sargassum through cultivation, industrial processing, and marketing involving coastal village communities, thereby improving their well-being.¹⁰ With clear policies and regulations, sargassum utilization can encourage maritime economic growth, create new jobs,¹¹ and preserve the marine environment of Bima Regency.

Therefore, the solution to this problem requires a sustainable sargassum management policy without damaging the environment. This policy aims to encourage maritime economic development, coastal resource management, and strengthen marine-based food and energy security. This also serves as a strategic mission in responding to the Asta Cita National Program, namely "Accelerating sustainable maritime and natural resource-based economic development."

Previous studies on Sargassum still show fragmented and partial characteristics. Most studies focus on the bioactive aspects, industrial potential, and ecological characteristics of Sargassum,¹² and emphasize the downstreaming of Sargassum as an antibacterial material,¹³ for example in the development of woven fabric products, thus contributing strongly to the innovation of value-added products. However, these studies have not touched on the aspect

⁷ Alfian Hidayat and Purnami Safitri, "Pengembangan Komoditas Rumput Laut Nusa Tenggara Barat Dengan Model Hexagon Untuk Pembangunan Ekonomi Lokal," *Jurnal Kebijakan Sosial Ekonomi Kelautan Dan Perikanan* 9, no. 1 (2019): 45, <https://doi.org/10.15578/jksekp.v9i1.7359>.

⁸ Mohammad Mahrus Ali, Zaka Firma Aditya, and Abdul Basid Fuadi, "Coastal Communities Protection of Constitutional Rights: The Urgency of Harmonization of Integrated Coastal Management Regulations," *Jurnal Konstitusi* 17, no. 4 (2020): 799–827, <https://doi.org/10.31078/jk1745>.

⁹ Syahbuddin and Habibah, "Budidaya Rumput Laut Dalam Meningkatkan Pendapatan Ekonomi Masyarakat (Studi Kasus Di Desa Laju Kecamatan Langgudu Kabupaten Bima)."

¹⁰ Scott Waldron, "Lanskap Kebijakan Dan Tata Kelola Rantai Pasok Industri Rumput Laut Indonesia : Sebuah Fokus Pada Sulawesi Selatan," no. June (2024), <https://doi.org/10.13140/RG.2.2.20228.95369>.

¹¹ Nunik Cokrowati et al., "Introduksi Teknologi Budidaya Rumput Laut Sargassum Sp. Untuk Produksi Bioethanol," *Jurnal Pengabdian Magister Pendidikan IPA* 7, no. 2 (2024): 663–67; Hidayat and Safitri, "Pengembangan Komoditas Rumput Laut Nusa Tenggara Barat Dengan Model Hexagon Untuk Pembangunan Ekonomi Lokal."

¹² Elena Martínez-Martínez et al., "Beyond the Bloom: Invasive Seaweed Sargassum Spp. as a Catalyst for Sustainable Agriculture and Blue Economy—A Multifaceted Approach to Biodegradable Films, Biostimulants, and Carbon Mitigation," *Sustainability (Switzerland)* 17, no. 8 (2025): 1–29, <https://doi.org/10.3390/su17083498>; Maya Puspita et al., "Species Are One of the Marine Species of Brown Algae with Substantial Values. Their Wide Range of Potentiality, Especially Their Bioactive Compounds, Make Them a Natural Resource for Various Applications in Food, Cosmetic and Pharmacological Sectors. Thus," n.d.; Kartika Virgi Forestin, Eko Nurcahya Dewi, and Ita Widowati, "Analysis of Sustainability Status and Management of Brown Seaweed Sargassum Sp. in the Waters of Ujung Kulon Conservation Area," *Asian Journal of Current Research* 9, no. 2 (2024): 25–38, <https://doi.org/10.56557/ajocr/2024/v9i28561>.

¹³ Muh Nasir, "Ekstraksi Senyawa Bioaktif Dari Rumput Laut Sargassum Sebagai Material Antibakteri Pada Kain Tenun Tembe Nggoli" 13, no. 2 (2024).

of Sargassum resource governance comprehensively. Several studies have indeed examined the distribution, habitat characteristics, and bioenergy potential of Sargassum on a national scale as a bio-ecological basis,¹⁴ but have not linked it to management at the regional level or the socio-economic impacts on coastal communities. On the other hand, there are also studies that analyze the governance and supply chain of the seaweed industry at a macro level, but these studies do not specifically highlight Sargassum in coastal areas and small islands as the main suppliers of Sargassum.¹⁵ Departing from this gap, this study explicitly positions Sargassum as the main object of resource governance that has not received serious attention in local government policies, a gap that this study aims to fill. Thus, the novelty of this research lies in the formulation of the concept of Strategic Sargassum governance policy based on the integration of law, ecology, and maritime economy which is specifically designed according to the characteristics of coastal communities in Bima Regency, which until now has not been studied comprehensively in previous research.

From the various previous studies above, First, the study by Kartika Virgin Forestin, Dewi, and Widowati (2024) which examines the sustainability status and management of brown seaweed Sargassum in the Ujung Kulon conservation area. This study focuses on bio-ecological aspects, particularly habitat conditions, sustainability levels, and conservation-based management approaches.¹⁶ Although it makes an important contribution to understanding the ecological characteristics of Sargassum, this study has not linked the management of these resources to regional policies or socio-economic impacts on coastal communities. Second, Waldron's (2024) study analyzes the policy landscape and governance of the seaweed industry supply chain in Indonesia with a focus on South Sulawesi. This study highlights the industry structure, actors in the supply chain, and policy dynamics at the macro level.¹⁷ However, this study does not specifically place Sargassum as the main object of study and has not highlighted the role of coastal areas and small islands as the basis for providing these resources. Therefore, the novelty of this research proposed by the author lies in the formulation of a strategic legal concept in integrative Sargassum governance by combining legal, ecological, and maritime economic perspectives, and specifically placing coastal communities in Bima Regency as the study context. This approach offers a model for Sargassum management based on regional policies and economic empowerment of coastal communities that has not been comprehensively studied in previous research.

The urgency of this research is crucial: 1) to identify the economic potential of sargassum and formulate sustainable governance policies to improve the welfare of coastal communities

¹⁴ Nunik Cokrowati, Dewi Nur, and Salnida Yuniarti Lumbessy, "Jurnal Biologi Tropis Growth Performance Sargassum Sp . Cultivated in Labuan Ijuk , Moyo Hilir Sumbawa Besar Regency , Nusa Tenggara Barat" 21 (2021): 783–91.

¹⁵ Waldron, "Lanskap Kebijakan Dan Tata Kelola Rantai Pasok Industri Rumput Laut Indonesia : Sebuah Fokus Pada Sulawesi Selatan."

¹⁶ Kartika Virgi and Eko Nurcahya, "Analysis of Sustainability Status and Management of Brown Seaweed Sargassum Sp . in the Waters of Ujung Kulon Conservation Area" 9, no. 2 (2024): 25–38, <https://doi.org/10.56557/AJOOCR/2024/v9i28561>.

¹⁷ Waldron, "Lanskap Kebijakan Dan Tata Kelola Rantai Pasok Industri Rumput Laut Indonesia : Sebuah Fokus Pada Sulawesi Selatan."

in Bima Regency within a blue economy framework. 2) Policies are needed to maintain a balance between sargassum utilization and conservation;¹⁸ 3) Without clear regulations, sargassum utilization risks suboptimal economic and ecological outcomes. 4) to encourage economic growth in coastal communities; 5) to provide a legal basis for investment and government support; 6) through this research, it is hoped that strategic solutions for sargassum management can be found that not only increase community income but also maintain the balance of the coastal ecosystem in a sustainable manner.¹⁹

The research questions are as follows: 1). What is the economic potential of sargassum in supporting the maritime economy of coastal communities in Bima Regency? 2) What are the strategic legal policies for sustainable sargassum governance to improve the maritime economic competitiveness of coastal villages in Bima?

2. METHOD

This study employs an empirical juridical research design using a mixed-methods approach, integrating both qualitative and quantitative methods). The qualitative approach is applied to examine the legal framework, public policies, and the perceptions of coastal communities regarding Sargassum governance. Meanwhile, the quantitative approach is used to assess the economic potential, productivity, and the impacts of Sargassum utilization on community welfare and environmental sustainability.

The research is conducted through four sequential stages: (1) a comprehensive literature review and policy analysis concerning Sargassum governance; (2) the collection of primary data through surveys and in-depth interviews with key stakeholders; (3) data analysis and the formulation of a sustainable governance policy model; and (4) validation of the proposed governance model through a limited Focus Group Discussion (FGD) involving academics, local government representatives, and coastal community members.

The study is carried out in Bima Regency, West Nusa Tenggara, Indonesia, with a primary focus on the coastal villages surrounding Waworada Bay, where Sargassum resources are abundant, namely Laju Village, Wilamaci Village, and Tangga Baru Village. The study population comprises all stakeholders directly involved in the utilization and management of Sargassum, including 55 fishers, 155 seaweed farmers, 5 local entrepreneurs, 2 officials from the Department of Marine Affairs and Fisheries, 2 academics, 2 members of the Regional House of Representatives (DPRD), and 1 industrial representative engaged in processing Sargassum into high-value products. Research participants are selected using purposive sampling, ensuring that all informants have direct knowledge and practical experience in Sargassum utilization and governance.

¹⁸ Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional, *MENUJU INDONESIA EMAS REFLEKSI DAN VISI PEMBANGUNAN 2005-2045*, 2023; Supattra Maneein et al., "Methane Production from Sargassum Muticum: Effects of Seasonality and of Freshwater Washes," *Energy and Built Environment* 2, no. 3 (2021): 235–42, <https://doi.org/10.1016/j.enbenv.2020.06.011>.

¹⁹ Clifford Louime et al., "Sargassum Invasion of Coastal Environments: A Growing Concern," 2017, 2011–17, <https://doi.org/10.3844/ajessp.2017.58.64>; Sien van der Plank et al., "Polycentric Governance, Coordination and Capacity: The Case of Sargassum Influxes in the Caribbean," *Coastal Management* 50, no. 4 (2022): 285–305, <https://doi.org/10.1080/08920753.2022.2078172>.

Data are collected using four complementary techniques. First, field observations are conducted to directly examine Sargassum harvesting and utilization activities in the coastal villages of Bima Regency. Second, in-depth interviews are undertaken with coastal community members, village officials, and local government representatives to explore their perspectives on Sargassum governance. Third, structured questionnaires are distributed to coastal communities to obtain quantitative data on the economic impacts of Sargassum utilization. Finally, document analysis is conducted by reviewing relevant policy documents, regional regulations, official reports, and previous studies related to Sargassum governance.

The collected data are analyzed using qualitative data analysis techniques involving data reduction, data display, and conclusion drawing and verification. The findings are subsequently integrated with the quantitative results to develop a sustainable, regulation-based governance model for Sargassum utilization that supports the development of the maritime economy and improves the welfare of coastal communities in Bima Regency.

3. DISCUSSION

3.1. The Economic Potential of Sargassum in Supporting the Maritime Economy of Coastal Communities in Bima Regency.

The economic potential of sargassum in supporting the maritime economy of coastal communities in Bima Regency demonstrates its strong characteristics as a locally based marine bioresource that is natural, sustainable, and inclusive. Field observations in the coastal area of Waworada Bay indicate that sargassum is naturally available, grows abundantly, and is renewable, following tidal patterns and seasonal cycles that have been recognized for generations by coastal communities. In Laju Village, Wilamaci Village, and Tangga Baru Village, sargassum does not require special cultivation technology like *Eucheuma* or *Gracilaria* seaweed, and production costs are low. Communities rely solely on family labor and simple tools. Therefore, from a resource economic perspective, sargassum has a relatively high cost-benefit ratio and has significant potential to be developed as a pillar of a community-based maritime economy.

Evidence obtained from questionnaires and in-depth interviews indicates that *Sargassum* plays an increasingly important role in strengthening the economic resilience of coastal households. Rather than functioning merely as a supplementary marine resource, *Sargassum* has evolved into a strategic livelihood asset that helps communities cope with fluctuations in fisheries production caused by seasonal variability and adverse weather conditions. Participants consistently emphasized that income derived from *Sargassum* harvesting provides an accessible economic buffer during periods of reduced fishing activity and, in some cases, becomes the principal source of household earnings during peak harvesting seasons. Although the market value of dried *Sargassum* at the local level remains relatively modest, its economic contribution lies in the continuity of harvesting opportunities and its capacity to diversify household income sources. These findings underscore that the socioeconomic importance of *Sargassum* extends beyond its immediate commercial value, contributing to livelihood diversification, income stability, and the adaptive capacity of coastal

communities in responding to environmental and economic uncertainties.²⁰ The selling price of dried sargassum at the community level ranges from IDR 2,000 to IDR 2,500 per kilogram. Although nominally low, it can generate significant income. Research indicates that in a single harvest season, a family can collect approximately 300–500 kilograms of dried sargassum, equivalent to a gross income of IDR 600,000 to IDR 1,250,000 per season.²¹

In the context of the local maritime economy, this contribution is strategic because it reduces community dependence on a single livelihood, particularly capture fisheries, serves as an economic buffer during fish shortages or extreme weather, and strengthens the economic resilience of coastal households. Thus, empirically, sargassum has served as a stabilizing instrument for the maritime economy of coastal communities, although its management remains traditional and suboptimal.

Furthermore, research findings indicate that the economic value of sargassum extends beyond meeting short-term financial needs, but also contributes significantly to social and human development. Interviews with community leaders, village heads, and fishermen indicate that income from sargassum is used to meet daily food needs, repair uninhabitable homes, and finance children's education up to university level.²² Some informants even stated that proceeds from sargassum sales enable families to send their children to postgraduate level education. These findings confirm that sargassum serves as a strategic commodity for social development, encouraging social mobility, improving the quality of human resources, and strengthening the basis for inclusive economic development in coastal areas.

However, the research also reveals significant gaps in the sargassum utilization value chain. The majority of sargassum produced by the community is still marketed as raw material without further processing. However, sargassum has high economic value industrially as a raw material for alginate in the food and pharmaceutical industries, as an active ingredient in cosmetics, as an organic fertilizer and animal feed, as well as as a bioenergy and environmentally friendly material. The absence of processing units at the village level causes all added value to shift outside the region, while coastal communities only serve as suppliers of cheap raw materials. This situation weakens the community's bargaining position and prolongs dependence on middlemen.

At the local level, *Sargassum* is generally marketed as raw biomass or subjected only to simple drying processes, resulting in relatively limited economic returns for coastal communities. In contrast, at the industrial level, *Sargassum* represents a strategic raw material that can be transformed into a wide range of high-value products, including alginate for the food and pharmaceutical industries, organic fertilizers and agricultural biostimulants, natural

²⁰ Hasil Wawancara dengan Masyarakat atau Pengepul Rumput Laut Sargassum di Desa Tangga Baru Kecamatan Monta Kabupaten Bima, Tertanggal 10 Januari 2026

²¹ Didik Irawansah dan Ridwan, "Penguatan Kesadaran Hukum Masyarakat Pesisir Terhadap Pengelolaan Sargassum Berkelanjutan Berbasis Partisipatif Di Teluk Waworada Kabupaten Bima Strengthening the Legal Awareness of Coastal Communities towards Participatory-Based Sustainable Sargassum Man" 2, no. December (2025): 91–101.

²² Kasmar DDidik Irawansah, "Model Kebijakan Tata Kelola Sargassum Yang Berkelanjutan Dalam Penguatan Ekonomi Maritim Masyarakat Desa Pesisir Kabupaten Bima," *Jurnal Tana Mana* 2, no. 1 (2025): 297–305.

cosmetic ingredients, aquaculture feed, as well as biomaterials and bioplastics. Countries such as China, Japan, South Korea, and India have successfully developed integrated *Sargassum* value chains through advances in processing technologies, supportive policy frameworks, and strong industrial participation, enabling them to generate substantially higher value-added products than those obtained from exporting raw materials. This situation contrasts with that of Bima Regency, where *Sargassum* commercialization remains largely confined to the trade of primary raw materials. Consequently, a significant proportion of the economic value added is captured by regions or countries possessing more advanced processing capacities. These findings indicate that the development of a *Sargassum*-based downstream industry is a strategic priority for enhancing coastal household incomes, strengthening the regional maritime economy, and promoting a more sustainable, competitive, and value-added utilization of marine resources.

Empirically, research has found that there are no local price standards, no village economic institutions specifically for *Sargassum*, and no guarantees of a sustainable market. This fact indicates that *Sargassum*'s economic potential has not been integrated into the regional maritime economic system and remains in an extractive phase, rather than a productive, value-added phase.²³

From a sustainable maritime economic perspective, *Sargassum* has three main advantages: it is based on local resources without dependence on imports or high technology,²⁴ it is environmentally friendly with rapid natural recovery, and it is inclusive because it is accessible to coastal communities with limited capital. However, this potential will not be fully developed without the intervention of governance policies.²⁵

3.2. Strategic Legal Policy for Sustainable *Sargassum* Governance to Improve the Maritime Economic Competitiveness of Coastal Villages in Bima.

Legal policy strategies for sustainable *sargassum* governance to improve the maritime economic competitiveness of coastal villages in Bima Regency must be embedded within a legal framework that is not solely administrative in nature, but oriented toward resource protection, community empowerment, and the creation of added economic value. Research findings indicate that the primary problem in *sargassum* utilization lies not in the availability of natural resources, but rather in the lack of comprehensive and integrated legal policies. *Sargassum* utilization has been sporadic, unstandardized, and exploitative, thus failing to foster sustainable maritime economic competitiveness in coastal villages.

Normatively, the legal policy strategy must begin with the establishment of regional regulations specifically governing *sargassum* governance, either in the form of Regional Regulations or Regional Head Regulations. These regulations serve as a legal umbrella that

²³ Kasmar, "Model Kebijakan Tata Kelola *Sargassum* Yang Berkelanjutan Dalam Penguatan Ekonomi Maritim Masyarakat Desa Pesisir Kabupaten Bima Kasmar," *Jurnal Tana Mana* 6, no. 2 (2025).

²⁴ Hazel A Oxenford, Shelly-ann Cox, and Brigitta I Van Tussenbroek, "Challenges of Turning the *Sargassum* Crisis into Gold: Current Constraints and Implications for the Caribbean," 2021, 27–48.

²⁵ Luke A Gray et al., "Caribbean-Wide, Negative Emissions Solution to *Sargassum* Spp. Low-Cost Collection Device and Sustainable Disposal Method," 2021, 49–75.

provides business certainty for coastal communities and also serves as a control instrument to ensure that sargassum utilization does not damage the marine ecosystem. Based on field findings, the lack of regulations regarding harvest zoning, harvest quotas, and environmentally friendly harvesting techniques has resulted in the continued practice of removing sargassum, including the roots and coral reefs. Therefore, legal policies must include technical standards for utilization based on the principles of prudence and sustainability as part of coastal environmental protection.

Furthermore, legal policy strategies need to be directed at strengthening the economic position of communities through regulating the sargassum value chain. This research found that coastal communities are in the weakest position in the value chain, acting solely as raw material suppliers without price protection and market certainty. Therefore, legal policies must regulate a mechanism for setting a floor price for sargassum at the local level to prevent monopsony practices by middlemen. This regulation also provides legal protection for sargassum fishermen and farmers, ensuring they obtain a fair economic value from the resources they manage.

To increase maritime economic competitiveness, legal policies must also encourage village-based sargassum downstreaming. Empirical findings indicate that the absence of processing units at the village level causes all added value to shift outside the region. Therefore, legal policy strategies need to include obligations and incentives for local governments to facilitate the establishment of sargassum processing units through Village-Owned Enterprises (BUMDes) or village cooperatives. Strengthening these economic institutions not only increases product added value but also creates new jobs and strengthens the local maritime economic structure.

Furthermore, sustainable legal policies must be collaborative and cross-sectoral. Research shows that coastal communities are ready and willing to develop sargassum as a primary business, but are limited by a lack of technical knowledge and access to technology. Therefore, legal policy strategies must integrate the roles of local governments, universities, the private sector, and communities within a collaborative governance framework. Regulations need to establish a fair partnership model, with the private sector acting as a downstream and marketing partner, while communities remain the primary stakeholders in resource management.

From an environmental law and blue economy perspective, sargassum governance must be directed at balancing economic interests and ecosystem sustainability. This research confirms that sargassum has a rapid natural recovery, but remains vulnerable to overexploitation if left unregulated. Therefore, legal policy strategies must integrate sustainable development principles through regulating harvest cycles, ecosystem rehabilitation, and community-based monitoring. This approach aligns with the concept of community-based management, which positions communities as the primary actors and guardians of resource sustainability.

Furthermore, legal policies need to function as instruments to increase the

competitiveness of the maritime economy in coastal villages. Competitiveness is determined not only by resource availability but also by legal certainty, institutional quality, and innovation capacity. With clear regulations, local businesses will have business certainty, access to financing, and more open investment opportunities. This will encourage the transformation of the coastal economy from an extractive economy to a productive economy based on added value.

Based on the overall research findings, the legal policy strategy for sustainable sargassum governance in Bima Regency must be built around three main pillars: resource and environmental protection, coastal community economic empowerment, and institutional and value chain strengthening. Without structured legal policies, sargassum utilization will continue to follow traditional patterns with low economic value and the risk of environmental damage. Conversely, with progressive and community-oriented legal policies, sargassum can develop into a superior commodity that enhances the competitiveness of the maritime economy in coastal villages in a sustainable and inclusive manner.

From the perspective of legal substance, these findings reveal a regulatory gap in the legal framework specifically governing the management of *Sargassum*. Existing regulations remain general in nature, addressing only the management of coastal areas and marine resources without providing legal certainty regarding sustainable utilization mechanisms, licensing procedures, sustainable harvesting standards, habitat protection, investment incentives for downstream processing industries, or price protection for coastal communities. Consequently, there is an urgent need for the establishment of regional legal instruments, either in the form of a Regional Regulation (Peraturan Daerah) or a Regent Regulation (Peraturan Bupati), specifically designed to govern the management of *Sargassum* across the entire value chain, from conservation and sustainable harvesting to downstream industrial development.

From the perspective of legal structure, this study also found that coordination among key stakeholders—including the Marine and Fisheries Agency, village governments, fishermen's groups, business actors, and higher education institutions—has not yet been integrated into a collaborative governance system. As a result, community capacity building, resource-use monitoring, technology transfer, access to financing, and downstream industrial development have not been implemented effectively. These findings are consistent with the concept of collaborative governance proposed by Ansell and Gash (2008), who argue that natural resource management becomes more effective when it is based on collaboration among stakeholders with clearly defined roles, responsibilities, and coordination mechanisms.

These findings can also be interpreted through Lawrence M. Friedman's Legal System Theory, which posits that the effectiveness of legal policy depends on the integration of three interrelated elements: legal substance, legal structure, and legal culture. In the context of Bima Regency, weaknesses in the regulatory framework (legal substance) are accompanied by the limited effectiveness of implementing institutions (legal structure), while the prevailing legal culture remains oriented toward the sale of *Sargassum* as a raw commodity due to limited

access to technology, capital, and markets (legal culture). Therefore, the legal policy strategy developed should not be confined to the enactment of new regulations alone. It must also strengthen institutional capacity, enhance community participation, promote the downstream industrialization of *Sargassum*-based products, and foster strategic partnerships among government agencies, academic institutions, business actors, and coastal communities. Through such an integrated approach, *Sargassum* governance can not only ensure the sustainable management of marine resources but also generate greater economic value, improve the livelihoods of coastal communities, and enhance the competitiveness of Bima Regency's maritime economy.

4. CONCLUSION

Sargassum has real and strategic economic potential to support the maritime economy of coastal communities in Bima Regency. Sargassum is naturally abundant and sustainable, with low production costs, making it easily accessible to coastal communities. Empirically, the use of sargassum has contributed directly to household incomes, both as a supplementary and primary source of income, and served as an economic buffer during times of declining capture fisheries yields. In addition to its economic impact, sargassum also contributes to social development by improving the quality of life and access to education in coastal communities. However, sargassum's economic potential has not been optimally utilized due to its continued traditional and extractive utilization patterns. The absence of comprehensive legal policies has resulted in weak environmental protection, low community bargaining power, minimal added value, and dependence on middlemen. Therefore, legal policy strategies in sargassum governance must be directed at establishing regional regulations that guarantee business certainty, resource protection, strengthening the value chain, and developing village-based downstream processing. With structured, collaborative, and blue economy-oriented legal policies, Sargassum has the potential to develop into a superior commodity that increases the competitiveness of the maritime economy of coastal villages in a sustainable and inclusive manner.

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