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Original Article

Sustainable Aquaculture in Southeast Maluku: A Strategic Plan for Seaweed Cultivation

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Abstract: The seaweed cultivation management plan in Southeast Maluku is designed to improve community welfare by strengthening the aquaculture sector, which holds significant potential for economic growth in the region. This plan adopts a participatory approach, involving local communities in identifying their needs, aspirations, and the market potential for seaweed-based products. Such an approach ensures that development strategies are aligned with community interests and grounded in local realities. Key components of the plan include the establishment and strengthening of cooperatives, capacity-building initiatives through farmer training programs, and the enhancement of marketing strategies for seaweed products. Cooperatives are expected to play a central role in facilitating collective action, improving access to resources, and increasing bargaining power. Training programs aim to enhance the technical skills of seaweed farmers, ensuring higher productivity and better product quality. Improved marketing is intended to connect producers with wider markets, increase product visibility, and raise the competitiveness of seaweed products both locally and nationally. By focusing on institutional development, human resource empowerment, and market access, the plan is expected to generate higher added value from seaweed production. This, in turn, will contribute to increased household incomes, job creation, and broader regional economic development. Overall, the seaweed cultivation management plan represents a comprehensive, community-driven effort to promote sustainable aquaculture, improve livelihoods, and support long-term economic resilience in Southeast Maluku.

Keywords: Seaweed cultivation; Southeast Maluku; Participatory approach; Cooperative; Market potential.

1. Introduction

The role of local government is crucial in encouraging the success of seaweed cultivation. With the proper support, this sector can be a significant source of income for coastal communities and contribute to regional economic growth. In addition to policy support, adequate infrastructure development is also substantial to support the success of seaweed cultivation (Febrianty, 2021; Frohlich et al., 2023; Gorr-Pozzi, García-Nava, García-Vega, & Zertuche-González, 2023). Construction or repair of docks and ports, repair of access roads, and improvement of post-harvest processing facilities will facilitate transportation and distribution and increase the added value of products. Seaweed cultivation development requires collaboration between supportive policies and adequate infrastructure(Loizia, Voukkali, Chatziparaskeva,

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Navarro-Pedreño, & Zorpas, 2021; Pathak, van Beynen, Akiwumi, & Lindeman, 2021; Rynio & Adamiczka, 2023; Singh & Hari Narayanan, 2023). Formulating clear regional regulations, incentives, and ease of doing business will create a conducive climate. On the other hand, the construction of docks, ports, access roads, and processing facilities will support production and distribution efficiency. Both complement each other and are the key to success in developing the seaweed cultivation sector.

One of the main challenges in developing seaweed cultivation is the lack of adequate infrastructure and policy support. It is necessary to formulate regional regulations that regulate licensing, zoning, and quality standards and provide incentives for farmers. In addition, the construction of docks, ports, access roads, and processing facilities is significant to increase production and distribution efficiency. Seaweed cultivation development requires continuous research and development support(Henríquez-antipa & Cárcamo, 2019) can be done through the provision of research funds for the development of superior varieties, new cultivation technologies, and environmental management. In addition, collaboration with research institutions will produce data-based policy recommendations to strengthen farmer institutions, such as forming farmer groups and cooperatives(Yanfika et al., 2020). Institutional strengthening and research and development support are essential to developing seaweed cultivation. Forming farmer groups and cooperatives will increase farmers' capacity to manage cultivation businesses. Meanwhile, research and development will produce technological innovations that increase productivity and product quality. Both complement each other and will encourage the growth of a sustainable seaweed cultivation sector(Farhaini, Prasetya, & Sungkowo, 2020; Ward, Marfai, Yulianto, Hizbaron, & Aerts, 2011).

One of the challenges in developing seaweed cultivation is the need for farmer institutions. Efforts must be made to strengthen institutions by forming farmer groups and cooperatives. In addition, research and development support is critical to producing technological innovations that can increase the productivity and competitiveness of seaweed products. Continuous monitoring and evaluation are essential to ensure the success of seaweed farming. Developing a monitoring system will allow us to monitor the development of agriculture and its impact on the environment in real time. In addition, periodic program evaluation will help us identify areas for improvement and improve the effectiveness of the programs that have been implemented(Nongna, Junpeng, Hong-Ngam, Podjana, & Tang, 2023; Of & The, 2023; Zhang et al., 2020). Accurate and up-to-date data are essential to support decision-making in developing seaweed farming. Developing a monitoring system will provide the data needed to monitor seaweed growth, water quality, and environmental impacts. This data can then be used to evaluate the programs that have been implemented and make continuous improvements. Monitoring and evaluation are integral parts of the seaweed cultivation development cycle. Through the monitoring system, we can collect relevant data to evaluate the performance of the implemented programs. The results of this evaluation can then be used to improve and refine the program so that it can continuously increase the productivity and sustainability of seaweed cultivation.

2. Materials and Methods

Effective seaweed farming management requires a planned, sustainable, and environmentally sustainable approach. Here are some concepts for managing seaweed farming modeling areas correctly and sustainably (Renjaan & Raka Susanty, 2020; Rynio & Adamiczka, 2023; Xu, Xu, Meng, & Zhou, 2023). The methodology for seaweed cultivation in Southeast Maluku begins with the careful selection of an appropriate location, considering environmental factors, water availability, accessibility, and supporting infrastructure. An efficient and environmentally friendly cultivation system design is also a key consideration. The selection of seaweed species is based on the characteristics of the waters, environmental conditions, market demand, and the potential for successful cultivation. Additionally, the chosen species must have high commercial value while being sustainable and not damaging the local ecosystem. Regular monitoring and maintenance of water quality are essential for the health of the cultivated seaweed, ensuring that key water parameters are within optimal ranges. Resource optimization plays a significant role in increasing production efficiency and minimizing the environmental footprint, focusing on land, water, energy, and human resources. The development of an economically sustainable cultivation business requires careful consideration of production costs, selling prices, and financial management. By choosing an appropriate business model and diversifying products, economic resilience can be enhanced. The involvement of local communities in decision-making processes is crucial, as it promotes a sense of ownership and ensures that the practices align with local needs. Providing training and education to improve skills and knowledge in sustainable fisheries cultivation further strengthens this community involvement. Lastly, using environmentally friendly materials in seaweed cultivation is essential to prevent adverse environmental impacts and ensure the sustainability of the cultivation practices in the long term.

3. Results and Discussion

The success of an integrated seaweed cultivation business system based on CBIB depends on several key factors (Elim & Zhai, 2020; Snyder, 2019; Theodora & Spanogianni, 2022). First, ensuring a steady supply of high-quality seeds, sourced from tissue culture, in sufficient quantities through seed gardens is essential. This approach allows

cultivators to focus directly on cultivation and maintenance rather than preparing seeds in advance. The seed preparation period is also crucial, as it affects the readiness of seaweed planting. Cultivators must pay attention to factors such as seed quality, the spacing between ties on the ropes, and the number of seeds per tie or clump to optimize growth. During the maintenance period, which significantly impacts cultivation productivity, it is important to apply appropriate technologies, prepare the land and equipment, and establish a routine maintenance system. Tasks such as regularly removing dirt from the thallus, maintaining the proper positioning of ropes and buoys, and preventing diseases are essential to ensure healthy and disease-free growth. Harvesting must be carefully timed, ideally after 45 days, to preserve the quality of the carrageenan in the seaweed. Proper harvesting techniques and the careful transportation of the seaweed to the drying location are crucial for maintaining its quality. Drying should be done by hanging or using racks, with the seaweed being cleaned of any dirt before the process begins. A transparent plastic cover is recommended over the drying area to protect the seaweed from rain while allowing sunlight to reach it. Finally, once dried, the seaweed should be stored in a warehouse with a 10% yield. Prior to storage, it should be packed in clean materials and pressed to make it more compact, ensuring efficient storage. To effectively implement integrated seaweed cultivation management, both upstream and downstream processes must adhere to these principles of effective and integrated cultivation practices, as presented in the Figure 1:

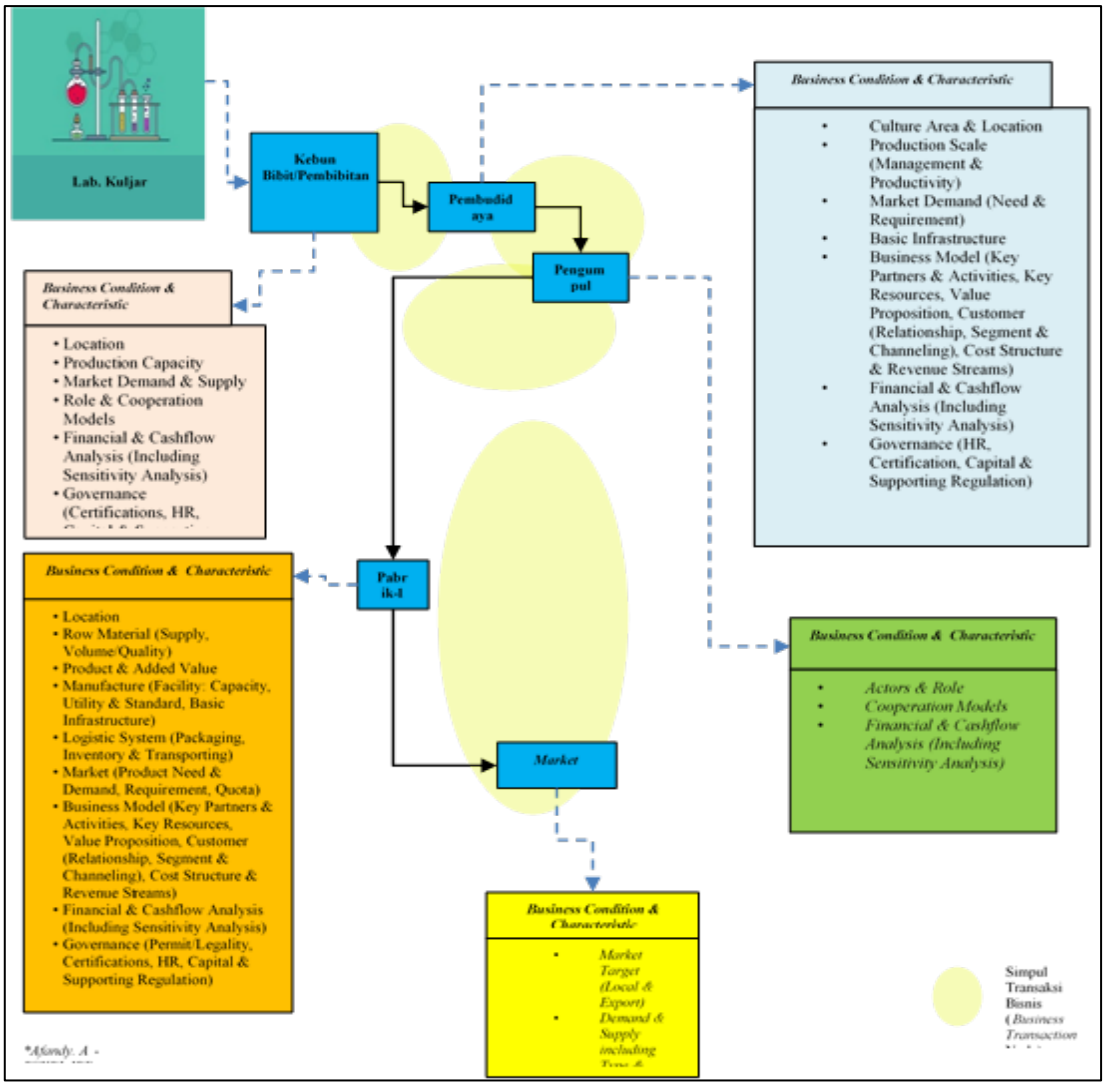

Figure 1. Integrated seaweed cultivation business system based on CBIB

3.1. Integrated Seaweed Business Management (Upstream Downstream)

The business system approach to seaweed cultivation management in Southeast Maluku should develop better, considering the implementation of ministry assistance related to the Seaweed Modeling Area (Adesuji et al., 2020). This area is expected to be used as a reference in managing CBIB-based seaweed cultivation in Southeast Maluku, a center for technology development, and integrated upstream downstream seaweed business development. In an integrated cultivation system, in one seaweed cultivation area, all aspects of development, starting from the existence of a tissue

culture laboratory that functions as a provider of planlets to starter gardens and seed gardens, are the mainstay in providing tissue culture seeds that can be developed into modeling areas and seaweed cultivators throughout Southeast Maluku, as the primary source of seeds (Narwal, Kaur, Yadav, & Bast, 2024). With tissue culture seeds, the production and productivity of seaweed cultivation in Southeast Maluku will increase, which in turn can increase the economic income of the community, especially seaweed cultivators. As a cultivation development system, it is hoped that a business climate can be created that integrates upstream and downstream processes, as shown in Figure 2 below:

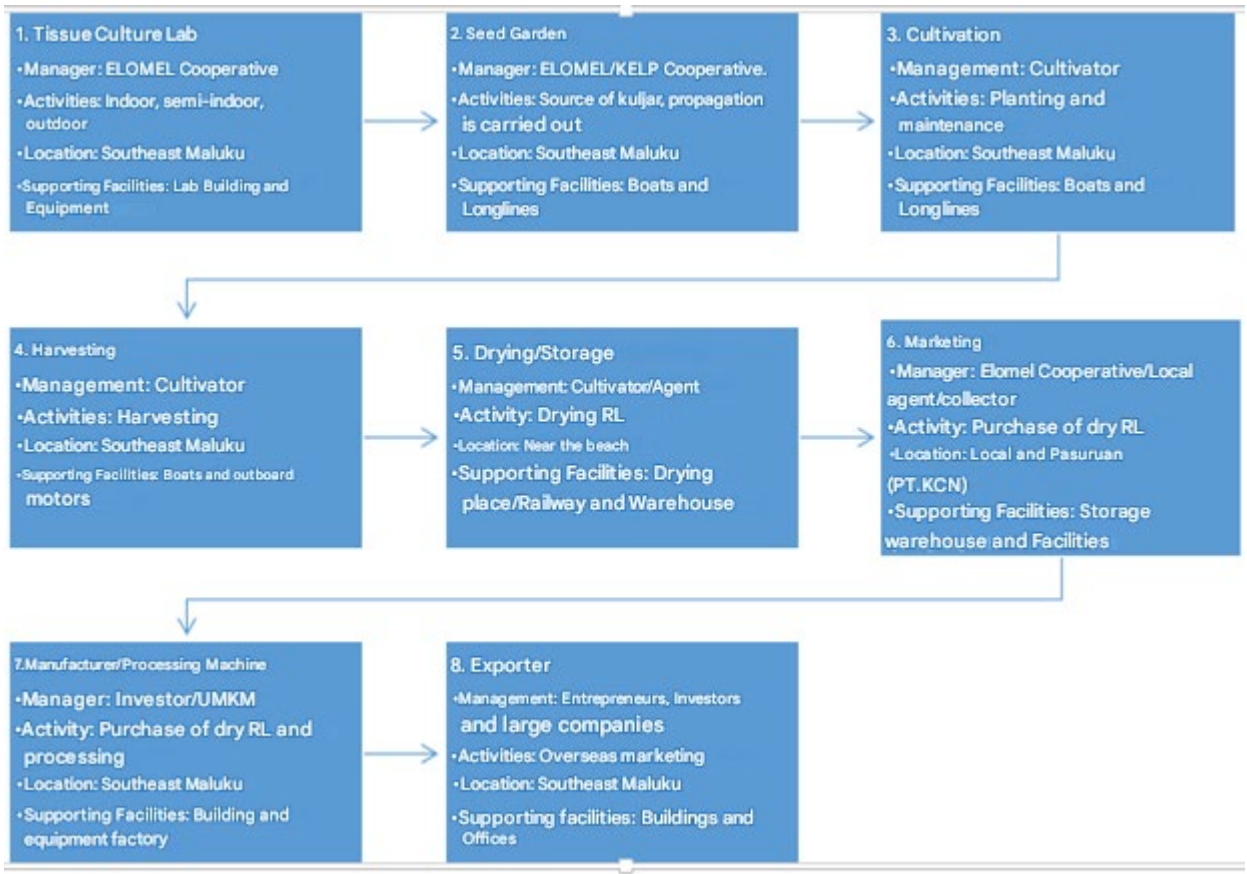

Figure 2. Seaweed Business Approach Based on Upstream-Downstream Business Activities

The business system approach to seaweed cultivation management in Southeast Maluku should be able to develop better, considering the implementation of ministry assistance related to the Seaweed Modeling Area (Azlina Musa, Elia Syarafina Abdul Shakur, Rabiu Muazu Musa, 2023; Forradellas, Alonso, Vázquez, Fernández, & Miró, 2021; Priatmoko, 2018). This area is expected to be used as a reference in managing CBIB-based seaweed cultivation in Southeast Maluku, a center for technology development, and integrated upstream downstream seaweed business development. In an integrated cultivation system, in one seaweed cultivation area, all aspects of development, starting from the existence of a tissue culture laboratory that functions as a provider of planlets to starter gardens and seed gardens, are the mainstay in providing tissue culture seeds that can be developed into modeling areas and seaweed cultivators throughout Southeast Maluku, as the primary source of seeds. With tissue culture seeds, the production and productivity of seaweed cultivation in Southeast Maluku will increase, which in turn can increase the economic income of the community, especially seaweed cultivators (James, Blythe, Sandrine, & Campero, 2021; Luo, Wan, Wang, & Zhang, 2022).

The area-based business system will continue to develop if, in the implementation of cultivation in the farming community, CBIB-based technology can be applied so that it can reduce the risk of failure due to non-standard cultivation management (use of non-modification seeds, inappropriate cultivation care, harvests that do not meet the standard age/45 days, and harvesting and drying systems do not reflect sound processing (Lee & Lee, 2020). Likewise, in the marketing chain, a marketing structure should have been arranged that is able to increase the selling price of seaweed from farmers, for example, with the availability of semi-finished seaweed processing machines (carrageenan) managed by groups or cooperatives around the area, then the selling value of carrageenan will be higher than just selling directly in the form of dried seaweed. Seaweed processing cooperatives/groups can sell directly to exporters or pharmaceutical and cosmetic factories that use a lot of carrageenan flour as a gelling agent, thickener, or stabilizer.

3.2. Development of Seaweed Cultivation Modeling Area

Generally, seaweed cultivation areas in Southeast Maluku cannot run continuously throughout the year. Several factors, especially oceanographic factors, namely waves and currents, influence the Banda Sea during the western season. This condition causes seaweed productivity in Southeast Maluku to fluctuate over one year(Wuwung et al., 2022; Xu et al., 2023). Southeast Maluku Regency contributes around 14% of the total seaweed production in Maluku Province. However, Southeast Maluku is an island regency with high seaweed cultivation potential. The seaweed species commonly cultivated by the people of Southeast Maluku is Eucheuma *cotton*, which is called an agar-agar plant. Cultivation activities last about 6-8 months. Based on production and production value, the Hoat Sorbay Bay area (543 ha) has the highest production compared to other places. In 2023, Hoat Sorbay contributed up to around 40% of the total seaweed production in Southeast Maluku Regency. The high seaweed production in this area is due to its characteristics, which differ from those of other regions. Seaweed cultivation activities can run yearly (Claisse et al., 2014; Patel, 2024).

The development of seaweed cultivation through modeling areas in Southeast Maluku Regency is carried out by implementing good aquaculture practices (GAP/CBIB) from upstream to downstream. It is intended so that the management of seaweed cultivation is carried out in an integrated manner, from the provision of seeds from tissue culture and seed gardens to planting seaweed that implements a good and correct cultivation system by considering weather factors and planting seasons. With such a planting pattern, the cultivation productivity per unit area is hoped to increase. In line with the increase in production, the seaweed marketing system also needs to be appropriately arranged so that the selling price of the RLK is more stable. (Mutia, 2020) The development of integrated seaweed cultivation is known as area-based seaweed cultivation modeling. This activity includes (1) the Provision of Tissue Culture laboratories, (2) the Provision of Seaweed Seed Gardens, and (3) Sea Rumout Cultivation. The following is the location of the development of seaweed seed gardens and the development of seaweed cultivation modeling areas.

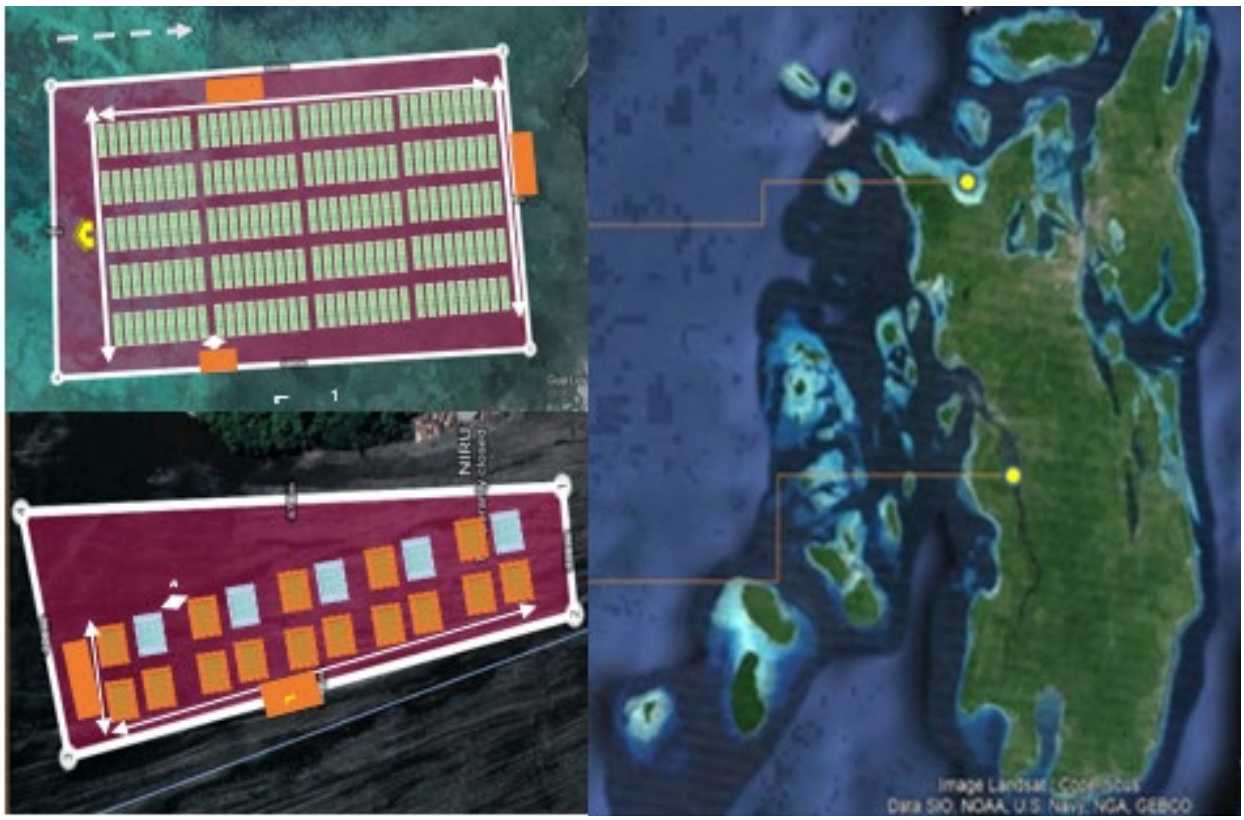

Figure 3. Location of Seedling and Starter Garden Development and Location of Seaweed Cultivation Modeling Area

4. Conclusions

The participatory approach integrated into this plan plays a crucial role in more precisely identifying the needs and aspirations of the community. By focusing on the development of cooperatives, targeted training, and enhanced marketing efforts, the plan aims to boost the added value of seaweed products, making a significant contribution to the regional economic development of Southeast Maluku. Through this approach, which emphasizes both institutional strengthening and active community involvement, the management plan for seaweed cultivation is expected to foster improved community welfare. It will achieve this by increasing the market value of seaweed products, directly stimulating

economic growth within the region. Furthermore, this plan not only prioritizes increasing production but also emphasizes the sustainability of seaweed farming. The combination of a participatory methodology and institutional development is designed to establish a resilient, sustainable cultivation system that ensures long-term economic benefits for local communities, while also safeguarding environmental sustainability. The overall objective is to create a balanced approach that supports economic progress, strengthens social structures, and preserves natural resources for future generations.

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References

Adesuji, A., Idowu, K., Olorunfemi, E., Omowonuola, F., Adetunji, M., Jesutofunmi, A., & Ajayi, A. (2020). Enhanced flood hazard modelling using hydraulic, analytical hierarchical process and height above nearest drainage models in Ogunpa river basin, Ibadan, Southwestern Nigeria. *Modeling Earth Systems and Environment*, *2030*(0123456789). https://doi.org/10.1007/s40808-020-01037-9

Azlina Musa, Elia Syarafina Abdul Shakur, Rabiu Muazu Musa, N. A. C. A. (2023). Health Management Culture In Food Health Handling Compliance In Terengganu Business Night Market. *Journal of Southwest Jiaotong University*, *58*(1), 427–466.

Claisse, J. T., Pondella, D. J., Love, M., Zahn, L. A., Williams, C. M., Williams, J. P., & Bull, A. S. (2014). Oil platforms off California are among the most productive marine fish habitats globally. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(43), 15462–15467. https://doi.org/10.1073/pnas.1411477111

Elim, H. I., & Zhai, G. (2020). Control system of multitasking interactions between society 5.0 and industry 5.0: A conceptual introduction & its applications. *Journal of Physics: Conference Series*, *1463*, 0–8. https://doi.org/10.1088/1742-6596/1463/1/012035

Farhaini, N., Prasetya, J. D., & Sungkowo, A. (2020). Evaluation of land carrying capacity of Sundak Beach, special region of Yogyakarta, as a coastal recreational site. *AIP Conference Proceedings*, *2245*(July). https://doi.org/10.1063/5.0006898

Febrianty, I. (2021). Public perception of catfish aquaculture ponds in Banjar District , South Kalimantan , Indonesia. *AACL Bioflux*, *14*(1), 227–232.

Forradellas, R. R., Alonso, S. N., Vázquez, J. J., Fernández, M. Á. E., & Miró, N. V. (2021). Entrepreneurship, sport, sustainability and integration: A business model in the low-season tourism sector. *Social Sciences*, *10*(4), 10040117. https://doi.org/10.3390/socsci10040117

Frohlich, M., Fidelman, P., Dutton, I., Haward, M., Head, B. W., Maynard, D., … Vince, J. (2023). A network approach to analyse Australia's blue economy policy and legislative arrangements. *Marine Policy*, *151*(March), 105588. https://doi.org/10.1016/j.marpol.2023.105588

Gorr-Pozzi, E., García-Nava, H., García-Vega, F., & Zertuche-González, J. A. (2023). Techno-economic feasibility of marine eco-parks driven by wave energy: A case study at the coastal arid region of Mexico. *Energy for Sustainable Development*, *76*(August). https://doi.org/10.1016/j.esd.2023.101299

Henríquez-antipa, L. A., & Cárcamo, F. (2019). Stakeholder ' s multidimensional perceptions on policy implementation gaps regarding the current status of Chilean small-scale seaweed aquaculture. *Marine Policy*, *103*(96), 138–147. https://doi.org/10.1016/j.marpol.2019.02.042

James, N., Blythe, J., Sandrine, C., & Campero, C. (2021). Blue growth and blue justice : Ten risks and solutions for the ocean economy. *Marine Policy*, *125*(January), 104387. https://doi.org/10.1016/j.marpol.2020.104387

Lee, C., & Lee, C. (2020). Understanding the Factors Determining the Attractiveness of Camping Tourism: A Hierarchical Approach Understanding the Factors Determining the Attractiveness of Camping Tourism : A Hierarchical Approach. *Tourism Planning & Development*, *0*(0), 1–17. https://doi.org/10.1080/21568316.2020.1758761

Loizia, P., Voukkali, I., Chatziparaskeva, G., Navarro-Pedreño, J., & Zorpas, A. A. (2021). Measuring the level of environmental performance on coastal environment before and during the covid-19 pandemic: A case study from Cyprus. *Sustainability (Switzerland)*, *13*(5), 1–25. https://doi.org/10.3390/su13052485

Luo, Z., Wan, G., Wang, C., & Zhang, X. (2022). The distributive impacts of the Belt and Road Initiative. *Journal of Economic Surveys*, *36*(3), 586–604. https://doi.org/10.1111/joes.12436

Mutia, F. (2020). Kalanganyar River , Sidoarjo Regency , Indonesia as a natural urban catalyst , living place or society pest Kalanganyar River , Sidoarjo Regency , Indonesia as a natural urban catalyst , living place or society pest. *IOP Conference Series: Earth and Environmental Science*, *490*. https://doi.org/10.1088/1755-1315/490/1/012007

Narwal, S., Kaur, M., Yadav, D. S., & Bast, F. (2024). Sustainable blue economy: Opportunities and challenges. *Journal of Biosciences*, *49*(1). https://doi.org/10.1007/s12038-023-00375-x

Nongna, C., Junpeng, P., Hong-Ngam, J., Podjana, C., & Tang, K. N. (2023). Rasch Analysis for Standards-Setting Appraisal of Competency Level-Based Performance on the Part of Instructors in Higher Education. *Pertanika Journal of Social Sciences and Humanities*, *31*(1), 319–338. https://doi.org/10.47836/PJSSH.31.1.17

Of, S., & The, A. A. T. (2023). Visual Assessment of Landscapes At the South Kuta Coast, Bali. *Journal of Southwest Jiaotong University*, *58*(3). https://doi.org/10.35741/issn.0258-2724.58.3.55

Patel, R. (2024). Securing development: Uneven geographies of coastal tourism development in El Salvador. *World Development*, *174*(October 2023), 106450. https://doi.org/10.1016/j.worlddev.2023.106450

Pathak, A., van Beynen, P. E., Akiwumi, F. A., & Lindeman, K. C. (2021). Impacts of climate change on the tourism sector of a Small Island Developing State: A case study for the Bahamas. *Environmental Development*, *37*(August), 100556. https://doi.org/10.1016/j.envdev.2020.100556

Priatmoko, S. (2018). Analysis of Marketability, Sustainability, Participatory and Disaster Mitigation (MSP+DM) for the development of rural Community-Based Tourism (CBT) destinations Case study: Depok beach, Bantul, Yogyakarta. *IOP Conference Series: Earth and Environmental Science*, *202*(1). https://doi.org/10.1088/1755-1315/202/1/012032

Renjaan, M. J., & Raka Susanty, I. I. D. A. (2020). Carrying capacity and tourism suitability of Ngurbloat Beach, Southeast Maluku Regency. *IOP Conference Series: Earth and Environmental Science*, *517*(1). https://doi.org/10.1088/1755-1315/517/1/012011

Rynio, D., & Adamiczka, H. (2023). The role of rivers in creating a blue-green city economy on the example of Wroclaw and Gdansk. *Economics and Environment*, *85*(2), 140–153. https://doi.org/10.34659/eis.2023.85.2.557

Singh, A. K., & Hari Narayanan, V. (2023). Can There be a Paradigm Shift in the Indian Education System? An Analysis of Socio-Economic Challenges in Implementing National Education Policy 2020. *Pertanika Journal of Social Sciences and Humanities*, *31*(2), 747–763. https://doi.org/10.47836/pjssh.31.2.14

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*(March), 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Theodora, Y., & Spanogianni, E. (2022). Assessing coastal urban sprawl in the Athens ' southern waterfront for reaching sustainability and resilience objectives. *Ocean and Coastal Management*, *222*(February), 106090. https://doi.org/10.1016/j.ocecoaman.2022.106090

Ward, P. J., Marfai, M. A., Yulianto, F., Hizbaron, D. R., & Aerts, J. C. J. H. (2011). Coastal inundation and damage exposure estimation: A case study for Jakarta. *Natural Hazards*, *56*(3), 899–916. https://doi.org/10.1007/s11069-010-9599-1

Wuwung, L., Croft, F., Benzaken, D., Azmi, K., Goodman, C., Rambourg, C., & Voyer, M. (2022). Global blue economy governance – A methodological approach to investigating blue economy implementation. *Frontiers in Marine Science*, *9*(November), 1–17. https://doi.org/10.3389/fmars.2022.1043881

Xu, Z., Xu, J., Meng, W., & Zhou, G. (2023). Understanding residents' policy preferences to construct effective marine debris governance policies. *Marine Policy*, *158*(September), 105872. https://doi.org/10.1016/j.marpol.2023.105872

Yanfika, H., Rangga, K. K., Viantimala, B., Listiana, I., Mutolib, A., & Rahmat, A. (2020). Evaluation of the Success of Programs and Strategy for Sustainable Coastal Community Development in Tanggamus Regency. *Journal of Physics: Conference Series*, *1467*(1). https://doi.org/10.1088/1742-6596/1467/1/012026

Zhang, Z., Plathong, S., Sun, Y., Guo, Z., Munnoy, T., Ma, L., … Tanboot, L. (2020). Analysis of the island tourism environment based on tourists' perception—A case study of Koh Lan, Thailand. *Ocean and Coastal Management*, *197*(August). https://doi.org/10.1016/j.ocecoaman.2020.105326