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Learning Model for Developing Eco-Marine-Tourism with Blue Economy-Oriented in Gerokgak District of North Bali-Indonesia

Cening Kardi[1], Nyoman Utari Vipriyanti[2] and Anak Agung Ngurah Amrita [3]

[1] Department of Agribusiness, University of Mahasaraswati Denpasar,
Denpasar 80231, Indonesia

[2] Department of Regional Planning, University of Mahasaraswati Denpasar,
Denpasar 80237, Indonesia

[3] Department of Electrical Engineering, Udayana University,
Bukit Jimbaran 80361, Indonesia

Corresponding author email: lovelycening@unmas.ac.id

Abstract

The coast and sea in Gerokgak District have unique characteristics that are suitable for aquaculture business, but is this marine aquaculture business in line with the blue economy orientation? For developing an Eco-marine-tourism. The research was done in the Gerokgak District. The aim was to build a Learning model for developing Eco-marine-tourism under the ecological, social, and economic determinants of sustainable development. The data were collected through surveys and focus group discussions. The ecological determinant of marine culture was tested by seawater quality. Social-economic determinant was analyzed using a rapid impact assessment matrix. Descriptive statistical analysis was used in generating the finding. The marine aquaculture business in the district of Gerokgak meets the blue economy both from ecological, and socioeconomic determinants. This potential along with the natural, and cultural landscape on the coast is really attractive as an object for Eco-marine-tourism. The learning model is that dealing with and running Eco-marine-tourism should go after the open and instinctive type to build up destinations according to community-based tourism. Future research should examine effective methods and installations for managing aquaculture wastewater to maintain healthy water for sustainable aquaculture.

Keywords*: aquaculture, ecological, business, tourism, sustainable*.

1. Introduction

1.1 Background

As a favorite tourist destination in the world, Bali consistently places the tourism sector as the mainstay sector. The development of the tourism industry in Bali applies the concept of cultural tourism, which implicitly includes the mission of cultivating Balinese culture in every development activity. Tourism has become one of the industries that have a major impact on Bali's economic growth. Bali strongly supports the development of sustainable tourism. On the other hand, the rapid development of tourism in Bali has brought a very powerful impact, causing degradation of the quality of the natural/agricultural/water environment as well as very structural changes to Balinese society and culture (Kardi *et al*., 2019). This is due to too many capital-based tourism developments that lose the agricultural sector in a broad sense, including aquaculture resources that rely on coastal and marine areas. Currently, the development of coastal areas in Bali for tourism that relies on the marine culture business sector is still rarely carried out. Most of the coastal areas have been developed only as recreational tourism spots that focus on natural beauty, are open to the public, and mass tourism with activities of sunbathing on popular beaches (Achjar *et al*., 2018).

The goals and targets of Sustainable Development Goals (SDG) involve diverse themes such as poverty eradication, health, education, water and sanitation, energy, food security and agriculture, sustainable patterns of consumption and production, protection and sustainable use of oceans and terrestrial ecosystems, among others. In this sense, aquaculture activity can

permeate several of these objectives collaborating with sustainable development, particularly with the goal 14 (Life below water), which states that "by 2030 it is necessary to increase the economic benefits for small island developing states and countries of lower relative development from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism" (Cavalli *et al*., 2021).

The increase in aquaculture activity has contributed in recent years to the feeding and supply of quality protein to many people, especially in poor rural areas, where food often lacks essential nutrients. Aquaculture is considered the fastest growing food production sector in the world (Tacon, 2020). However, FAO (2014) warns that to continue to develop sustainably, the aquaculture sector must increase efforts to become less dependent on wild fish for feed and implement greater diversity of species and practices in aquaculture.

Bali has a coastal line of 593 km. The north Bali coastal in Buleleng regency (with 157 km length) has been developed for tourism as well as marine fisheries such as grouper, milkfish, snapper, prawn, pearl oyster, seaweed, coral reef, and various types of mud crab. Sometimes, communities have to face difficult choices, whether to develop tourism or protect the environment. In the efforts to develop coastal and marine areas that are in line with sustainable development goals or SDGs 2030, it is necessary to develop a coastal area development model that can minimize negative impacts of degradation to fishery resource ecosystems, loss of local community wisdom, and environmental damage (Vipriyanti & Kardi, 2014). One alternative that exists in this combination is the development of Eco-marine-tourism with aims to provide added value to marine culture in the broadest sense and environmentally sound, as well as to develop tourism destinations through the adjustment and marketing of tourism packages from activities, products, and landscapes of marine culture (Kardi & Wiasta, 2019).

The marine aquaculture business sector in northern Bali, especially in the Gerokgak District, has great potential, supported by the development of superior commodities: hatchery products of milkfish, grouper, snapper, and pearl oysters; and fish products of grouper, snapper, and shrimp. This marine cultivation has been carried out en masse for hatchery and nursery activities using seawater circulation tanks on the coast, as well as marine waters for fish farming activities in floating net cages.

Blue Economy generally refers to the sustainable ocean-based economic model where coastal and marine ecosystem resources are explored for use in increasing food security, alleviating poverty, creating jobs, lifting trade and industrial profiles whilst at the same time conserving biodiversity, protecting the coasts and oceans as well as the health, livelihoods, and welfare of the people in coastal areas (General Economics Division, Bangladesh Planning Commission, 2021). While the Blue economy-oriented in this study is that the marine culture business directs to zero waste, social inclusiveness, product increasing of added value and employment, multi-products that produce several types of products and create innovation and can adapt in all circumstances.

Ecological and social-economic determinations have an important role in sustainable coastal development areas. The coastal areas in Gerokgak District have been stated as a center of marine culture business by the local government, therefore an appropriate strategy needs to be formulated. Even though there is potential but the ecological, social, and economic determinant has not been formulated properly. Especially in developing marine culture business, to minimize environmental damage that can degrade resources for marine aquaculture. The Eco-marine-tourism model (learning to develop coastal areas based on marine culture-tourism and blue economy-oriented) that is integrated on involving academicians, bureaucracy, companies, and community or ABCC as stakeholders haven't been built yet. This learning model for development has an important role in maintaining the sustainability of development programs and the welfare of coastal communities in Bali (Vipriyanti & Kardi, 2014).

1.2 Problem Statement

- Does the marine aquaculture business in the district of Gerokgak meet the principles of the blue economy?, those are: (a) what is the ecological determinant for coastal area sustainable development of the marine aquaculture business in Gerokgak district?; and (b) what is the social-economic determinant for a marine culture that supports blue economy for developing Eco-marine-tourism (some like the production technology, multispecies products, the outcome, the level of

risk, the absorption of labor, and the social institution of aquaculture business)?

- What is the strategical role of academicians, bureaucracy, companies, and community (ABCC) stake holders in developing Eco-marine-tourism?
- What is the formulation of the learning model for developing Eco-marine-tourism in the Gerokgak District under the ecological, social, and economic determinants of sustainable development?

2. Research Objective

2.1 Objective

- To analyze whether the marine aquaculture business in the district of Gerokgak meet the principles of the blue economy.
- To find out the strategical role of academicians, bureaucracy, companies, and community (ABCC) stake holders in developing Eco-marine-tourism.
- To formulate the learning model for developing Eco-marine-tourism in the Gerokgak District under the ecological, social, and economic determinants of sustainable development.

2.2 Research Framework

Marine cultivation that is practiced in an environmentally friendly manner is the best alternative to developing food products derived from marine flora and fauna. The Sustainable Development Goals (SDG) of the United Nations (UN) particularly goal 14 (Life below water) reinforce and direct this new form of farming toward the protection and sustainable use of oceans and terrestrial ecosystems. In Balinese local wisdom, this concept is expressed as the *Nyegara-Gunung* culture (integrated cultivation of oceans and terrestrial ecosystems which prioritizes harmony).

Singh *et al*., (2021) explained that governance and decision-making to promote sustainable development for the land-sea interface must therefore be integrative across diverse dimensions of social-ecological systems. Because coastal systems are so important to people and are so social-ecologically complex, sustainable coastal development is essential for achieving the SDGs. Here, the definition coastal sustainable development is as human activities and planning processes that contribute across the SDGs and minimized trade-offs between SDG objectives. In some cases, making progress on coastal sustainability can directly contribute to SDG areas such as food security (SDG 2), longer term economic and employment opportunities (SDG 8), and improved ecosystem states (SDGs 14 and 15).

SDG 14 directs blue economy synergy in the management of aquaculture resources in the coastal and marine waters of the Gerokgak District. Meanwhile, the study for the development of Eco-marine-tourism in Gerokgak District is based on scientific efforts to identify ecological determinants and socioeconomic determinants of the blue economy. This engineering Eco-marine-tourism development can be initiated through a matching fund program among academicians, bureaucracy, companies, and community (ABCC) stakeholders which can be conducted by academicians from universities.

The result of the Eco-marine-tourism village in the Gerokgak District is expected to provide incentives that encourage the realization of blue economy marine cultivation, income-generating for coastal communities, and maintained environmental health for marine aquaculture, as well as a research innovation camp to build a learning ecosystem for "Freedom to Learn-Independent Campus" The chart of the conceptual framework for Learning model to develop Eco-marine-tourism with blue economy-oriented in Gerokgak District, and its interrelation with SDGs 2030 is presented in Figure 1. The scope of this research is an environment-based marine aquaculture business that is integrated with the development of marine aquaculture tourism in the coastal and marine waters areas of the Gerokgak District.

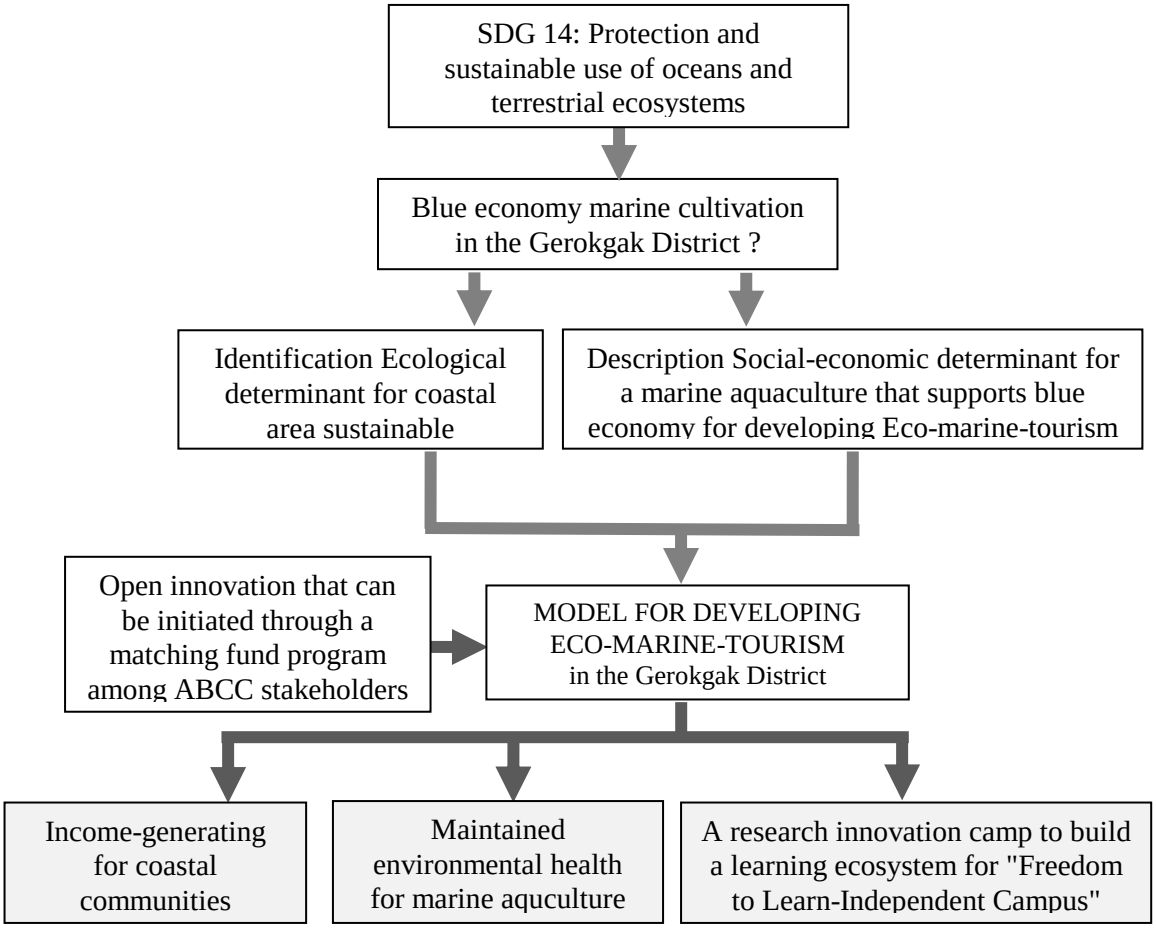

Figure. 1. The Chart of the conceptual framework for Learning model to develop Eco-marine-tourism with blue economy-oriented in Gerokgak District

3. Materials and Methods

This research was conducted from February to December 2022. The ecological determinants of sustainable development were described by climate, quality of coastal plains, seabed, and seawaters. The estimation of seawater health parameters for marine culture (physical, chemical, and biological) and used measurement tools refers to the APHA, 1992. Seawater samples were taken from fifteen surveillance positions along the coastal areas in the Gerokgak district. At each station, three samples of seawater were taken (located near, medium, and far from the shoreline). The health parameters of marine culture products (chemical, and biological characteristics of grouper) were examined through laboratory tests on each of eight juvenile samples of hatchery and eight fish samples of sea cage cultivation. A survey of primary data on the characteristics of the production process, productivity, production costs, and revenues of grouper hatcheries and ranching fishes in sea cages, was conducted to assess the economic determinants of the marine aquaculture business. In this manner, the survey was conducted on 20 samples of hatchery firms and 10 samples ranching firms. The determinant of social was carried out by measuring the perception and valuation of coastal community development in welfare and local institution. The social-economic determinant was analyzed using a rapid impact assessment matrix. The formulation of the Eco-marine-tourism development learning model with blue economy-oriented was carried out by involving ABCC stakeholders in a focus group discussion in the Gerokgak village and Sumberkima village of the Gerokgak District. Tabulation of data and descriptive statistical analysis were used in generating the finding (Kardi & Wiasta, 2019).

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4. Results and Discussion

4.1 The blue economy of the marine aquaculture business in the Gerokgak District

The ecological determinant for coastal area sustainable development of the marine aquaculture business in Gerokgak district can be described as follows. The physical quality of the seawaters along the Gerokgak district can be described as follows (see Table 1). The temperature level in the waters along the Gerokgak district has a range of 28.60-30.12 ^{o}C which is ideal for marine culture activities. The brightness level of seawater, total suspended solids (TSS), and seabed substrate are also in a range that strongly supports the marine culture business. Especially for the cultivation of fishes in sea cages, the dynamic quality of the seawater must be ideal. Sumberkima bay which is a center for ranching fishes in sea cages has mixed type tides and tends to be single daily, with a maximum tidal range of 2 meters. The depth range of the waters in this bay is 5-30 m. The quality of marine waters for aquaculture activities is strongly influenced by the tides because a very large mass of seawater will enter (at high tide) or leave (at low tide) into the waters. Tidal fluctuations of seawater in Sumberkima bay are considered quite good for marine culture activities, both for fish cultivation in sea cages, and brackish water cultivation or ponds.

Table 1. Parameters of sea water health for marine aquaculture in Gerokgak District

No	Parameter	Test result (Range)	Quality standard (Range)
	Physical		
1	Temperature	28.60-30.12 ^{o}C	28.0-32.0 ^{o}C
2	Brightness	5.6-9.8 m	> 3 m
3	Total suspended solids (TSS)	0.008-0.018 ppm	<80.00 ppm
4	Seabed substrate texture	86.4-92.8 %	-
	Chemical		
1	pH	8.10-8.34	7.00-8.50
2	Salinity	33.3-34.5 ppt	33-35 ppt
3	DO	7.40-8.00 ppm	> 5 ppm
5	NO_3	0.0275-0.0624 ppm	< 0.008 ppm
6	NO_2	0.038-0.062 ppm	-
7	NH_3	0.010-0.1196 ppm	< 0.300 ppm
8	PO_4	0.002-0.1139 ppm	< 0.015 ppm
9	BOD	2.15-8.68 ppm	< 20 ppm
10	Heavy metals	Cd 0.80-4.25 ppm; Cu 2.36-40.52 ppm; Pb 1.38-21.22 ppm; Mn 10.08-68.88 ppm; Zn 3.20-42.24 ppm; Ni 2.05-30.10 ppm; Hg 0.00	
	Biological	Index of diversity	Index uniformity	Domination index
1	Macrozoobenthos	2.28	0.66	0.18
2	Plankton	2.40	0.74	0.12

Source: primary data analysis, 2022

The chemical quality parameters of seawater along the waters of the Gerokgak district, namely nitrate (NO3) and phosphate (PO4) have a range of 0.0275-0.0624 ppm and 0.002-0.1139 ppm. Although they have not caused problems in marine culture activities, they are in the category of more than quality standards seawater for marine survival (< 0.008 ppm and < 0.015 ppm) according to the Decree of the Minister of the Environment No. 51 of 2004. This is due to too much waste from marine aquaculture there. In the meantime, other chemical parameters: pH, DO, BOD, nitrite (NO_2), ammonia (NH_3), and salinity are at rest in the safe and healthy category for marine survival. The biological quality parameters of seawater along

the Gerokgak district are as follows. The average diversity index of macrozoobenthos of 2.28 and plankton of 2.40 (both higher than 2.00) indicates that the marine waters are not polluted so that they are healthy for marine cultural activities. The average Macrozoobenthos dominance index of 0.18 and plankton of 0.12 (both lower than 0.40) indicate a low partial dominance of macrozoobenthos and plankton so that marine waters are healthy for marine cultural activities.

The analysis of ecological determinants that influence the sustainability of coastal development programs for the quality of juveniles, and fishes of grouper is shown in Tables 2 to 3. The average biological and chemical contaminants in the grouper juveniles and fishes which is lower than the standard quantity indicate that the quality and health of the fish are very good, and do not contain harmful pollutants. These indicators can be a driving factor for submitting a certificate to the Aquaculture Stewardship Council. So that they will be able to mainstay commodities for export as well as supporting the sustainable Eco-marine-tourism village.

Table 2. The laboratory test results on the health of 8 grouper fishes

Parameter	Test result (average)	Coefficient of Variance (%)	Health Standard
Microbiology test			
- Escherichia colli (APM/g)	<3	0	<3
- Salmonella (per 25g)	Negative	0	Negative
- Parasite (piece)	0	0	0
- Coliform (APM/g)	<3	0	<3
Chemical test			
- Histamine (µg/g)	30.20	22.55	Max 100
- TVB (mg N %)	8.28	11.35	Max 25
- TMA (mg N %)	3.40	32.16	-
- Formaldehyde	Negative	0	Negative
- Plumbum	Negative	0	Negative
- Mercury	Negative	0	Negative
- Cadmium	Negative	0	Negative

Source: primary data analysis, 2022

Table 3. The laboratory test results on the health of 8 grouper juveniles

Parameter	Test result (average)	Coefficient of Variance (%)	Health Standard
Microbiology test			
- Escherichia colli (APM/g)	<3	0	<3
- Salmonella (per 25g)	Negative	0	Negative
- Parasite (piece)	0	0	0
- Coliform (APM/g)	<3	0	<3
Chemical test			
- Histamine (µg/g)	5.75	13.16	Max 100
- TVB (mg N %)	4.24	18.68	Max 25
- TMA (mg N %)	0.00	0.00	-
- Formaldehyde	Negative	0	Negative
- Plumbum	Negative	0	Negative
- Mercury	Negative	0	Negative
- Cadmium	Negative	0	Negative

Source: primary data analysis, 2022

Mass cultivation in hatcheries, ponds, and fish rearing in sea cages can give a negative impact on the marine environment, caused by leftover feed; excessive chemicals and drugs; genetic pollution, and fish disease & parasite transfer. Therefore, the capacity of aquaculture, the multispecies of fish farmed, the density of fish stocking, the type of artificial feed used, and the cultivation method must be properly controlled to achieve an integrated marine culture that supports the development of Eco-marine-tourism. As was explained by (Soto, 2009) that the idea of integrated aquaculture has been often considered a

mitigation approach against the excess nutrients/organic matter generated by intensive aquaculture activities particularly in marine waters. Several control measures can be carried out through: (1) rotation of fish cage placement; (2) digitalization of electric cables, cameras, control of the physical condition of sea water in sea cages and application of stationary autofeeder (e-fishsery) machines to increase productivity and efficiency of fish management in sea cages; (3) conduct quality control/screening (pathogens in fish and fish physical normality) selectively before stocking fish seeds; (4) improve the sanitation of the sea cage environment and prevent pests and diseases of fish using hydrogen peroxide, (5) make fish breeding at various stages of ideal age (multi stage seeds sowing) to meet the continuity of demand; (6) improve the ecological function of sea cage sediment health through the cultivation of sea cucumbers at the bottom of the sea cage; (7) procurement of cage net washing installations on land to prevent washing waste to contaminate marine waters; 8) improving the conservation/rehabilitation of coral reefs in an effort to increase the buffer for the life of coastal and marine biota, biodiversity and protection of cages from currents, winds and waves; (9) improving conservation/rehabilitation of mangrove forests and aquasilviculture; and (10) services and assistance to coastal communities to create a clean, healthy and beautiful culture to beaches and the sea there.

The Social-economic determinant for coastal area sustainable development in Gerokgak district can be described as follows. The social-economic determinant for a marine culture that supports Eco-marine-tourism development consists of strategic location for production, and corporation; joint marketing of marine culture products for export, and domestic sales; cooperation among business actors in providing inputs for production; availability of en mass production technology; the number of production costs and revenues that have implications for corporation profits; local wisdom as well as a local institution, and community hospitality in the plural. Marine culture in the Gerokgak district (especially grouper and snapper) consists of three levels of production, namely: hatchery, nursery, and ranching fish in sea cages. In the large quantity of these marine culture products, both seeds and fishes for export, and the rest for domestic trade. Each stage of this production activity can be managed as an independent business. However, the hatchery business with a backyard scale is the most widely engaged in by coastal communities, with products in the form of juveniles of milkfish, grouper, and snapper.

There are 74 hatchery firms with a total area of 1240 larvae ponds (with a size of 4x3 m). Besides larvae ponds, hatchery cultivation also needs plankton ponds and rotifer ponds to produce live feed for the growth of fish larvae. All hatchery firms are located on the coast, making it easier for seawater to be taken through the inlet pipe set-up. All locations are also affordable by car transportation and have complied with spatial and regional regulations. Cooperation (in providing production inputs, technology adoption, and production export) both among backyard hatcheries and between backyard hatcheries with complete hatcheries and the Gondol Marine Cultivation Research Center in the Gerokgak district strongly supports the sustainability of the marine fish hatchery business. The population of hatchery and nursery firms in Gerokgak district is very potential as the future of fish fingerling on the global scene. The data of production in the year 2017 (domestic sales and export) were: 65.6 million seeds of grouper, 782.4 million juveniles of milkfish, 47 tons of grouper of ranching fish, and 652.5 tons of snapper on consumption size. The total trade value of these productions was USD 25.65 million.

The types of marine fish that were initially cultivated were Tiger Grouper (*Epinephelus fuscoguttatus*), Rat Grouper (*Cromileptes altivelis*), Sunuk Grouper (*Plectropomus leopardus*), and White Snapper. Recently, with the development of spawning and hatching technology, farming communities are now more engrossed in cultivating Cantang hybrid grouper that is a cross product between Tiger Grouper (*E. fuscoguttatus*, Forsskal 1775) and Naga Grouper (*E. lanceolatus*, Bloch, 1790). This is because hybrid grouper has a faster growth rate than natural grouper. Within 8 months of cultivation from larvae, the hybrid grouper has reached the size of consumption (approximately 0.5 kg), while the cultivation of the natural grouper takes 16 months to reach the size of 0.5 kg.

The results of the analysis of production costs and revenues of the Cantang hybrid grouper hatchery from a sample of 20 firms can be seen in Table 4. The average production cost of the Cantang grouper hatchery was USD 3,321.2 per production cycle at a production capacity of 600 thousand pieces of grouper eggs stocked. The average juvenile production of the Cantang grouper was 85200 heads per production cycle, so the average survival rate was 14.2% of the number of grouper eggs that were stocked. The juvenile price of the Cantang grouper (on the size 3 cm) at the farmer level was USD 0.1/head, so the revenue was USD 8,520.0 and the average profit per production cycle was USD 5,198.8 with variance coefficient was 28%. The effective period for one production cycle was 2 months, so the average profit of Cantang hybrid grouper hatchery firm was USD 2,599.4 per month. The variance coefficient of profits of 28% indicated that the Cantang hybrid

grouper hatchery firm had variance and the level of business risk was quite low due to the coefficient of variance being less than 40%. The high profitability of the hatchery business can certainly support the development of Eco-marine-tourism. In addition, the grouper hatchery production cycle activity is a food chain management, which has the attraction to become an object of Edu-tourism.

Table 4. Average production cost, revenue, and profit of the Cantang hybrid grouper hatchery per production cycle

Input/Outcome	Quantity	Price (USD)	Value (USD)
1) Grouper eggs	600 thousand pieces	0.2/ thousand pieces	120.0
2) Pellet feed:			
▪ Sanofax 2	1 kg	36.6/kg	36.6
▪ Otohime A1	2 kg	33.3/kg	66.6
▪ Otohime B1	4 kg	20.0/kg	80.0
▪ Otohime B2	6 kg	18.0/kg	108.0
▪ Otohime S1	6 kg	11.6/kg	69.6
3) Artemia feed	30 cans	33.0/can	990.0
4) Rebon Shrimp	400 sachet	0.5/sachet	200.0
5) Rotifera	150 sachet	0.8/sachet	120.0
6) Monthly labor	4 months	233.0/month	932.0
7) Daily labor	25 days	5.3/day	132.5
8) Medicine	3 sachet	11.3/sachet	33.9
9) Electricity			120.0
10) Tool reduction			192.0
11) Land contract			120.0
Total cost			3,321.2
Return (juveniles)	85200 heads	0.1/head	8,520.0
Profit			5,198.8

Source: primary data analysis, 2022.

Most of the hatchery firms in Gerokgak District have not been equipped with wastewater treatment plants (only 3 complete hatchery firms do wastewater treatment). They think that the volume of wastewater from aquaculture ponds produced is very low, and the pollutant materials contained in it are very insignificant so the wastewater that enters marine waters can be purified by the relatively high kinetic motion of waves and sea currents. Therefore they believe that hatchery wastewater will not have an impact on the health of sea waters for aquaculture. Besides, there is no strict regulation from the government that requires every aquaculture firm to purify wastewater before it is discharged into sea waters.

The downstream sector of the hatchery is the business of ranching fish in floating net cages, utilizing the marine waters of Sumberkima bay in the Gerookgak District. There are 27 sea cage firms with a total of 3860 fish ponds (size 3x3 m). For grouper ranching, the average investment capital (for sea cage infrastructure) per pond is USD 833.0 and working capital per pond is USD 1,867.0 so the average capital needed to run a fishpond of grouper ranching is USD 2,700.0. On the price of grouper fish USD 7/kg, the average profit for a fishpond is USD 827.0 per production cycle (7 months). On average operating 100 ponds requires 8 workers, so the entire population of ranching fishes in sea cages absorbs about 300 workers.

The integration of all marine aquaculture business activities (management of fish brooders, hatcheries, nursery and ranching fish in sea cages) that are blue-economy oriented, along with the natural and cultural landscape in the coastal and marine areas of the Gerokgak District is really beautiful and attractive as an object or village for Eco-marine-tourism. A tourism destination area with specific attractions, namely: Edu-tourism, recreational tourism, direct catch-sea food culinary tourism, and coastal diversity tourism (shown in Figure 2 to 3). Some traditional heritage temples there, namely: Menjangan Island Temple, Banyu Wedang Hot Spring, Pulaki, Melanting, Segare Rupek, and Gili Putih for religious tourism can be connected to enrich the Eco-marine-tourism object.

Figure 2. The map of Eco-marine-tourism in the Gerokgak District, Bali island.

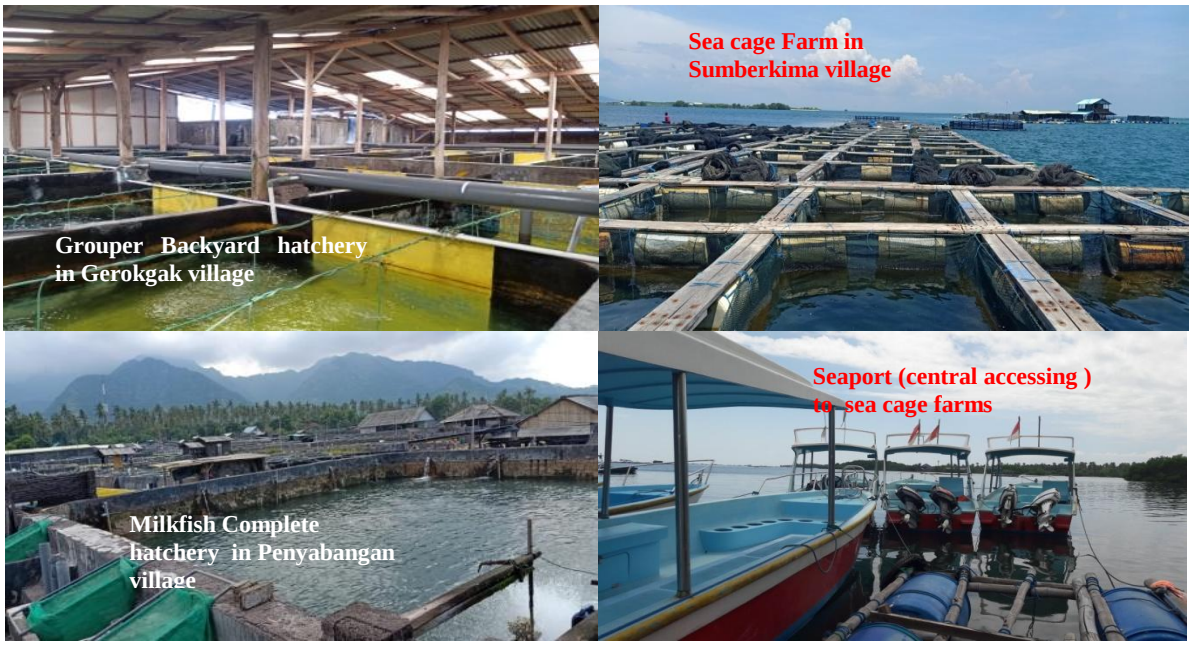

Figure 3. The landscape examples of Eco-marine-tourism in the Gerokgak District

4.2 The strategical role of ABCC stake holders in developing Eco-marine-tourism

Several stakeholders involved in coastal sustainable development in north Bali are academicians, bureaucracy, local companies, and the community (ABCC). The strategic role of each ABCC stakeholder for the development of Eco-marine-tourism with blue economy-oriented can be described as follows.

- Academics (from research centers and universities) as agents of change must present appropriate technology based on community needs. The scope of collaborations that can be initiated by universities (Kementerian Pendidikan Kebudayaan Riset dan Teknologi, 2022) include:
  - ✓ Adoption or diffusion, downstream, commercialization of products, prototypes, technology, and policies (including mini-plants, teaching factories, and teaching industries) to meet the needs of the global business and the aquaculture agribusiness industry. Product Downstreaming to standardize superior products of aquaculture agribusiness through tests so that the products/outputs produced are by statutory provisions/standards and can increase domestic and international market demand.
  - ✓ Adoption of science and technology and expertise by universities for business and industry (including forms of training, coaching, and other forms of services/products) for the development of coastal aquaculture agribusiness communities.
  - ✓ Application of business plans and business model canvas (BMC) for startups (including MSMEs) built by universities in collaboration with the business firms and industries from aquaculture agribusiness. This scope is

intended for research collaborations to solve problems faced by the business firms and industries, as well as the success of government policies/programs, helping to solve problems faced by the business firms and industries as well as coastal communities.

- The Bureaucracy must facilitate the community to establish cooperation with the company. Companies can channel their social cooperation responsibility funds to the community. This linkage is expected to be able to accelerate the impact of development and be sustainable. The bureaucracy builds facilitation for production, post-harvest and market channels by making agreements between communities and companies. The government also facilitates the community to improve the ability of aquaculture fishermen in production activities as well as to manage input and production which is quite well established. The delivery of the fish is accompanied by a complete inspection of the bureaucracy of Ngurah Rai Fisheries Quarantine Center in Denpasar.
- The Community has the main function to implement new technology or development model prototypes produced by the academic community to control and always improve the quality of their products. As producers of coastal products, they must keep complete records of investment, production facilities, labor, production, product delivery, and planning for subsequent production activities. They also anticipate the dynamics of information by holding regular meetings at least once every three months to discuss updating production techniques, controlling fish pests and diseases, procuring joint production facilities, and joint marketing.
- Companies as private companies need to channel funding properly to encourage people who have prospective businesses, through corporate social responsibility funding. Companies can collaborate with universities/research centers for the development of the latest technology to increase production, add value, or market products in a wider area.

This ABCC role can help the community to realize their vision and mission of Eco-marine-tourism as they asserted in the focus group discussion: “We desire to build a brilliant future for the lives and livelihoods of coastal communities through strengthening sustainable marine culture entrepreneurship, as well as encouraging its downstream sector towards a peaceful and prosperous Eco-marine-tourism village. By revitalizing the dignified values of our ancestral traditions, beliefs, aspirations, and cultures in every marine culture business activity (to implicate both Eco-etno-technology and Eco-Edu-entrepreneurship), we will return the earth to a point before damage and disharmony threatened our coastal existence”.

Sharing funds through the matching fund program among ABCC stakeholders is certainly needed in increasing production and marine aquaculture business for both the hatchery, nursery, and ranching fish in sea cage industries, as well as processed fishery product, especially for commodities of grouper and snapper. This ABCC matching fund program further will also encourage capacity building of the Eco-marine-tourism village with blue economy-oriented, as well as to build a learning ecosystem for "Merdeka Belajar-Kampus Merdeka or Freedom to Learn-Independent Campus" which is managed by universities. The learning ecosystem for " Freedom to Learn-Independent Campus" as an innovation is expected to produce graduates who have high competence in marine aquaculture entrepreneurship.

4.3 Formulation of learning model for developing Eco-marine-tourism

The high and low transactions of tourist visits to Eco-marine-tourism destinations are very dependent on the supply and demand of the Eco-marine-tourism destination. Adapted from (Gunn & Var, 2002), the supply component can be either man-made, or natural (which does exist without human intervention for its procurement) and will consist of: tourist attractions, facilities, accessibility, information, and promotions. The determinant factors of a tourist attraction that can be managed, namely: security, cleanliness/neatness, and hospitality. Coastal areas which are open access to property resources usually have the impression of being slums, less safe, and have low hospitality due to coastal communities who come from various ethnicities. Therefore, it is necessary to carry out imaging of Eco-marine-tourism. The results of the training and assistance to coastal communities during this research in Gerokgak district, in building the image of the Eco-marine-tourism destination have been determined to be adhered to, namely: The model for securing Eco-marine-tourism destinations; Design model for the formation of a clean and healthy culture; and Model for improving hospitality among Eco-marine-tourism actors. These three models should be actualized in a customary regulation or *awig-awig* for a coastal village.

The deal and running of Eco-marine-tourism should go after the open and instinctive type to build destinations that are incorporated with the configuration of life, both space, and model according to the home community (community-based tourism). As was explained by (Hamzah & Khalifah, 2009) that community-based tourism is a community development tool that strengthens the ability of rural communities to manage tourism resources while ensuring the local community’s

participation. Community based tourism can help the local community in generating income, diversifying the local economy, preserving culture, conserving the environment and providing educational opportunities. Therefore, the distribution of income generated from visiting tourists in Eco-marine-tourism village should be in considerable numbers for local people, but the negative impact (it may decrease local wisdom) should be tautly controlled through the deployment of traditional villages and traditional hamlets in the Gerokgak district.

Adapted from (Earth Reminder For Everyone, 2021), the development of an Eco-marine-tourism must follow the basic principles of ecotourism, which are: (1) to educate tourists on the requirements of conservation; (2) to reduce the adverse effects on the environment and culture, which can destroy a point; (3) emphasize the value of accountable local authorities and people to demonstrate community demands and provide conservation benefits; (4) to focus on the requirement for regional tourism zoning plus traveler administration plans for either areas or natural regions, which are expected to turn into eco-destinations; (5) to regulate profits by the maintenance and preservation of the ecosystem and protected zones; (6) follow to know that tourism development doesn't surpass the economic and ecological limitations of acceptable changes as investigators identify in assistance with local communities; (7) for seeking to improve financial benefits for the nation, communities, and local trades, especially individuals who are living near the Eco-marine-tourism areas; and (8) to depend on environment-friendly infrastructures, to reduce the utilization of fossil fuels, preserve local plants and wildlife, and yet support the natural and cultural ecosystem. The estuary of all the descriptions is the Learning model for developing Eco-marine-tourism with blue economy-oriented (see the chart in Figure 4).

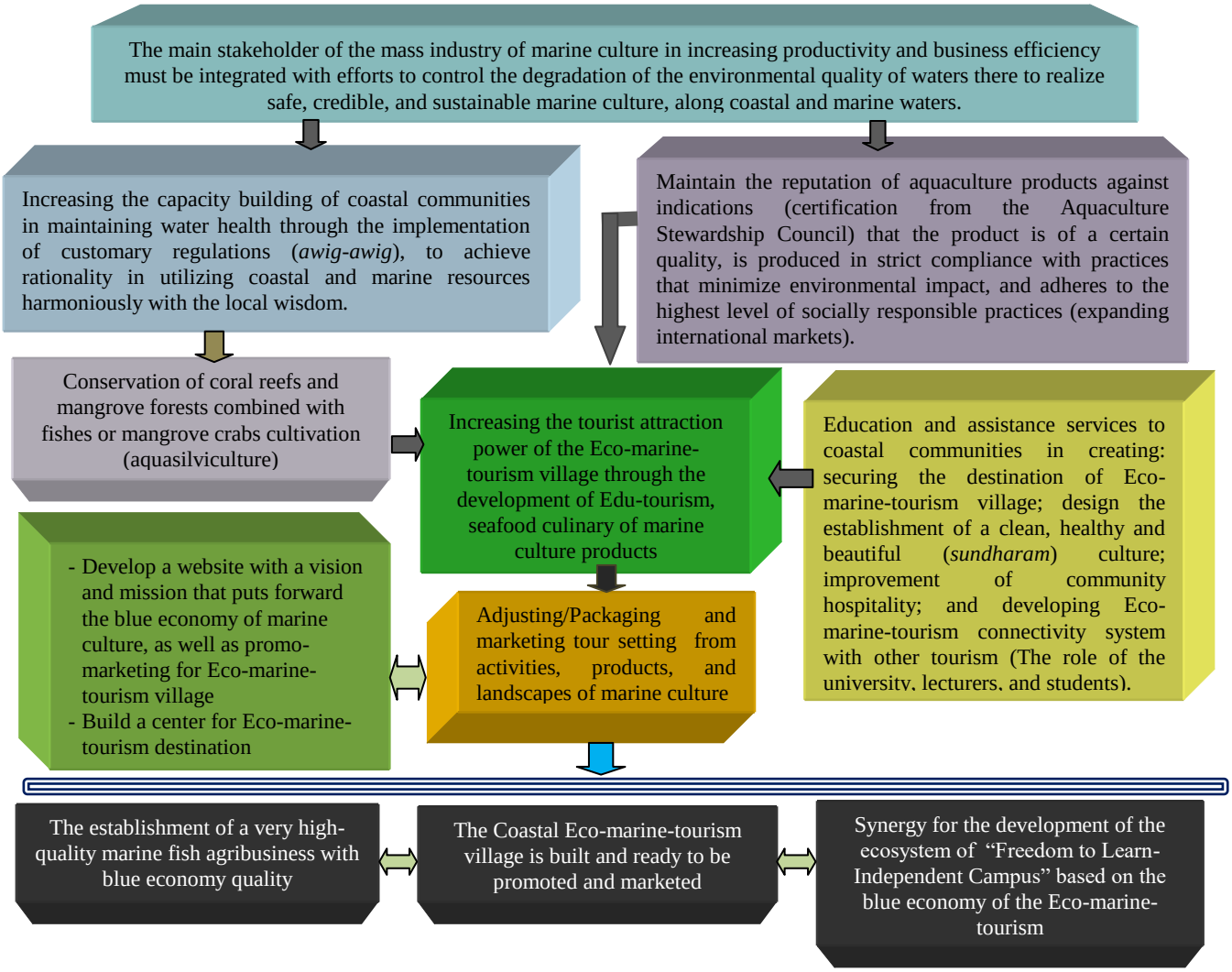

Figure 4. The Learning Model for developing Eco-marine-tourism in the Gerokgak District

The development program initiated by the main stakeholders of the en mass industry of marine aquaculture in increasing productivity and business efficiency must be integrated with efforts to control the degradation of the environmental quality of waters there to realize safe, credible, and sustainable marine culture. The amalgamation of various ethnicities (Balinese, Madurese, Javanese, Bugis, Mandar, and Foreigners) and the cultural background of the coastal communities have cultivated a potential social capital group to support an Eco-marine-tourism village that is advanced and oriented toward the blue economy. The touch of science and technology (using 4.0 technology and being environmentally friendly) and community empowerment through ABCC collaboration are expected can realize the Eco-marine-tourism village. While formulating a combination of various processes, outputs, and outcomes of the matching fund program between ABCC stakeholders, this became a study material to build a learning ecosystem for “Freedom to Learn-Independent Campus".

5. Conclusions

The marine aquaculture business in the district of Gerokgak meets the blue economy principles both from ecological determinants and from socioeconomic determinants of the community in managing aquaculture resources. This potential along with the natural, and cultural landscape in the coastal and marine areas of the Gerokgak District is really beautiful and attractive as an object or village for Eco-marine-tourism.

The deal and running of Eco-marine-tourism should go after the open and instinctive type to build destinations that are incorporated with the configuration of life, both space, and model according to the home community (community-based tourism). Each party of ABCC stakeholders should build an integrated matching fund program to build a marketable Eco-marine-tourism village as well as a learning ecosystem for "Freedom to Learn-Independent Campus".

In building the image of the Eco-marine-tourism destination, it is necessary to comply with the policies of the security model for tourist destinations; design models for the establishment of a clean and healthy culture (including the health of marine waters for aquaculture); and model to increase hospitality among Eco-marine-tourism actors. These three models should be actualized firmly in a customary regulation or *awig-awig* for the coastal village. These policies can reinforce the *Nyegara-Gunung* culture in Bali.

Even though the phenomenon of serious environmental degradation that threatens marine aquaculture in the Gerokgak District has not yet occurred, integrated control and anticipation efforts need to be continuously carried out to achieve integrated marine culture which can support sustainable Eco-marine-tourism. In this case, future research is expected to be more agile and careful in studying the effective methods and installations for managing aquaculture wastewater to maintain good and healthy water quality for sustainable aquaculture in the Gerokgak District.

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Cening Kardi. Graduated with a Bachelor's degree at IPB University in 1987, and a Master's degree at Udayana University in 2005. Previously worked as a Data Analyst at PT Tiga Buana Group in Bogor. The present job is as an Indonesian government lecturer, which was employed at the Agribusiness Department at the University of Mahasaraswati Denpasar from 1990 until now, with an academic position as an Associate Professor. Has won many Research and Community Service Grants from the Directorate General of Higher Education and from the private sector on the development of marine aquaculture agribusiness, and on the development of ecosystems and culture of subak institutions in Bali. Has produced 10 scientific articles published in international journals and national journals, as well as 3 reference books with local publishers. Best Paper at The 3rd Bali International Tourism Conference in 2019. The current research interests is Eco-marine-tourism. Active in the associations of the Indonesian Aquaculture Society, BioMarine Community, and the Indonesian Agricultural Economics Association.

Nyoman Utari Vipriyanti. Graduated with a Bachelor's degree at IPB University in 1987, a Master's degree at IPB University in 1996, and a Doctor's degree at IPB University in 2007. The present job is as an Indonesian government lecturer, which was employed at Department of Regional Planning, University of Mahasaraswati Denpasar from 1989 until now, with an academic position as an Associate Professor. Has won many Research Grants from the Directorate General of Higher Education and from the private sector on the regional planning and rural development, and on the development of subak institutions landscape in Bali. Has produced 12 scientific articles published in international journals and national journals, as well as 4 reference books with local publishers. Active as a Regional Facilitator of the Indonesian Quality Assurance System, Ministry of Education, Culture, Research and Technology (Kemdikbudristek).

Anak Agung Ngurah Amrita. The job is as an Indonesian government lecturer, which was employed at Department of Electrical Engineering, Udayana University from 1995 until now. Mastered in Power Systems of Electrical Engineering. A member of Institute of Electrical and Electronics Engineers (IEEE).