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The Sustainable Development Strategy of Marine-Based Gastronomy Ecotourism at Southern Malang, Malang Regency, East Java

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Covering an area of 334 787 ha, Malang Regency is quite well-known for its coastal ecotourism potential, with various enjoyable tourist attractions and tempting marine-based gastronomy tourism. However, it has not been well-developed and promoted sustainably by the government or the locals. Thus, the research aims to find out the improvement areas to construct a strategy to develop marine-based gastronomy ecotourism that practices pro-nature and cultural behavior. Qualitative methods (in-depth interviews with experts, experienced sources, and literature reviews), food chain analysis, and SWOT analysis were applied in this research. The study shows that the best strategy to develop marine-based gastronomy ecotourism requires penta-helix collaboration with W-O strategic combinations by improving tourism infrastructure, promoting cultural and local-wisdom aspects behind the local seafood, and implementing the added value to fight off overfishing conditions due to the high demand for seafood.

Keywords: coastal eco-tourism, gastronomy tourism, Malang regency, sustainable.

Introduction

Tourism, sports, and recreation have become economic stimuli for the community and global business since the 20th century (Bielánski et al., 2022). The tourism industry has the fastest growth compared to others, giving 9.5% contributions to the gross domestic product (GDP) on a global scale (Brahmanto et al., 2017). Among its many economic benefits, the tourism industry has created job opportunities for small

and medium-sized businesses (Sasongko et al., 2018). Mass tourism gained popularity in the 1980s, especially in Europe. However, fashion has changed, and today's tourists prefer to engage in a peculiar activity known as special-interest tourism (Wardana and Nawiri, 2017). Special-interest tourism allows tourists to have the opportunity to decide on the type of vacation based on their personal preferences, passions, and personal needs (Gupta et al., 2020). The interdisciplinary system, which includes the entire local to global environment, the tourist demand system, and the tourism industry supply system, is closely related to special-interest tourism (Trauer, 2004).

Malang Regency has been popular for its tourism potential, making it the best destination in East Java. As a result, Malang Regency is listed as being between 0–2000 meters above sea level and is considered to be the second-largest regency after Banyuwangi (Malang Regency Government, 2016). There are approximately 57 beaches around Southern Malang, from Sumbermanjing Wetan to Gedangan and Bantur District (Irawan et al., 2022). Indonesia is a megabiodiversity country with 4700 fish species (Ministry of Marine Affairs and Fisheries, 2020) and the Southern Malang beaches, which face the Indian Ocean, also have great biodiversity, and its high tide and high wind tide make for an abundance of wild-captured fisheries. Fisheries activity in Malang Regency is centered at Pondok Dadap Fishing Port, Sendang Biru, and the catch is dominated by big pelagic fish (Khouroh and Pamungkasih, 2019).

The fishing tools used at Sendang Biru are handlines, purse seines, and longlines with *rumpon* as the Fish Aggregating Device (FAD) (Agustina et al., 2020). The wild-captured fisheries are beneficial for the local community's economy, which appears to be fish trading at the auction hall, fresh fish distribution to surrounding cities or regencies, and as a staple food to support businesses in running their seafood outlets. Latuconsina (2010) stated that the fishing method and fishing tools applied to the wild-captured fisheries must comply with the sustainability concept; otherwise, they will cause seabed and environmental damage, thus affecting biodiversity. Non-governmental organisations (NGOs) have founded the Sustainable Seafood Movement, which focuses on empowering a sustainable environment as a response to the government's incapability to regulate and address overfishing issues (Lout, 2022).

Food consumption is motivated by a psychological condition as the human's basic survival skills (Karim, 2006; Guzel and Apaydin, 2016). In these past few years, gastronomy tourism has faced rapid growth as cultural and cooking fusions emerged (Rojas et al., 2022). Gastronomy represents characteristics and intrinsic values of a tourism destination to attract tourists and visitors. Furthermore, gastronomy experience and destination branding are highly related and contribute to forming mutual benefits for promotion (Alcocer and Rojas, 2022). Destination branding helps tourists distinguish each outlet and strengthens their decision-making background. Moreover, the uniqueness of local food would add more value from a tourist perspective. Sukenti et al. (2016) affirmed that food has an essential role rather than fulfilling the humans' primary needs. It is also known that food can become a communication medium, as though the presence of a meal at a traditional ceremony is proof that customs and culture are being maintained and that animal populations are stable.

The global community has recognised the importance of marine resource exploitation and marine economy development in addressing resource scarcity, space constraints, environmental damage, and improving economic vitality (Wan et al., 2022). The local community plays a crucial role in tourism development (Sumarmi et al., 2020; Astina et al., 2021). The local quality of life is the most affected component of sustainable tourism applications, which generate employment and increase gains (Ramandana et al., 2020; Astina et al., 2021). Community-based tourism lies among peculiar societies or communities that require more than one member and are fully managed by members who can influence the private sector's or enterprises' decision-making (Spenceley et al., 2016; Setokoe, 2021).

Currently, the tourism potential at Southern Malang Beaches has not been fully optimised, particularly in the gastronomy tourism sector. Therefore, an adequate strategy for sustainable development must be concise to stabilise the economy and reduce poverty. Prior research has focused on observing the food supply chain's nutrient content, food, cultural relationship, or risk assessment rather than its sustainability. This study addressed the sustainable development of gastronomic tourism in Malang Regency. The result of this study is expected to improve the gastronomy tourism system and acknowledge eco-friendly marine resource utilisation approaches in Malang Regency.

Materials and Methods

Study area

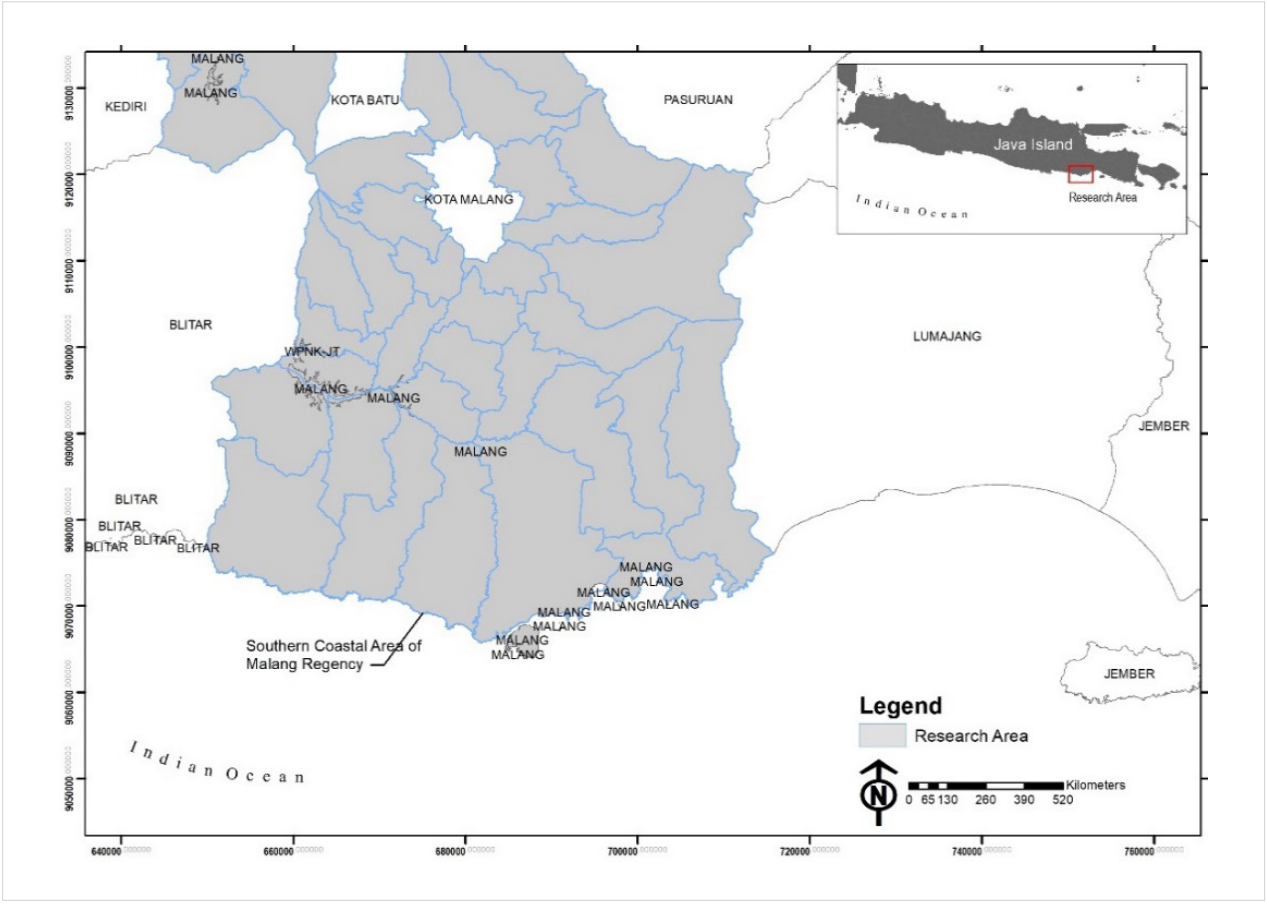
This research was conducted in the southern coastal area of Malang Regency (*Fig. 1*), one of the potential coastal ecotourism areas in East Java Province, Indonesia. The coastal communities in Southern Malang rely upon natural resources and its fine ecosystem, so it becomes their occupation, primarily fishermen, fishmongers, ship owners, net makers, small-business owners, and seafood outlet owners. According to the data from the Ministry of Marine and Fisheries Affairs, there will be 11 568 fishermen living in Southern Malang in 2021. During the preliminary study in 2020, researchers discovered that every south Malang beach has at least 20 seafood outlets where fishermen and seafood outlet owners are essential to marine-based gastronomy tourism. For this reason, the Southern Malang area is a suitable location for research.

Data collection

Data collection was based on the parameters of (a) beaches with good infrastructure; (b) beaches that sell local fish catch; and (c) beaches that provide Malang Regency's signature cuisine. Therefore, three local sample outlets were chosen based on the requirements and aimed to represent the study area, namely: Warung Seafood Mak Sih, located in Kondang Merak Beach, Bantur District; Warung Makan Mak Sum Soponyono, located in JLS/*Jalur Lintas Selatan* (south pass way of South Java), Bantur District; and Warung Pak Hasan Spesial Ikan Bakar, located in Goa Cina Beach, Sumbermanjing Wetan District.

All the data were collected and analysed using descriptive analysis and qualitative approaches through direct observations and a literature review. The study focuses on exploring gastronomic tourism experiences and the sustainability aspects. An interview session with the outlet's owners was conducted separately. The

Fig. 1. *Research area*



questions were limited to the history, background of their outlet establishment, the tourist visits, the cooking process, demand, and the supply processes before the seafood was served on the table. The data were obtained through direct observation (seven beach visits in six months, from October 2021, February, March, June, July, and August 2022).

In further approaches to qualitative research, thematic or data saturation is frequently used as a saturation concept. Saturation occurs when no new issues or insights are discovered, causing the data to become redundant. This means that a sufficient sample size has been exceeded. Saturation is a major indicator that a sample is sufficient to determine the study's current circumstances. The content validity was displayed when saturation was reached, which means the collected data in the study represent the dissimilarity, profundity, and variation. (Hennink and Kaiser, 2022).

Besides the researcher's personal experience, the objectivity value needs special concern. Therefore, tourists' perspectives play an essential role in this research. An online questionnaire was initiated and shared with random respondents following specific criteria: (a) man or woman with an average age of 18–50 years; (b) having visited Southern Malang, especially the beaches. The number of respondents is determined by data saturation, where the collected data is enough to draw a conclusion.

Data analysis

The research applied two analyses: strength, weakness, opportunity, threat (SWOT) and food supply chain analysis. The SWOT analysis is necessary for this research to provide solutions to the marine-based gastronomy tourism development strategy in Malang Regency. The SWOT analysis focuses on processing the internal factors (strengths and weaknesses) and external factors (opportunities and threats) of the targeted issues. Moreover, food supply chain analysis also contributes to defining the pre-production, production, and after-production of Southern Malang's gastronomy tourism. This must be acknowledged to avoid environmental damage by ensuring the relationship between local fisheries, marine-based gastronomy tourism, and environmental sustainability is not causing significant losses and affecting the local economy.

SWOT helps plan the strategy to meet the goals by maximising strengths and opportunities. It also gives the tools and insight to adjust the course during a project to address weaknesses or threats. Rangkuti (2002) stated that in conducting a SWOT analysis, three stages must be carried out, namely the data collection stage, the analysis stage, and the decision-making stage, which are detailed as follows:

- The data collection phase includes data collection, classification, and pre-analysis activities. Data are divided into external data (such as market analysis, competitor analysis, community, supplier, government, and specific interest groups) and internal data (such as financial reports, human resources activity reports, operational activity reports, and marketing activity reports).
- The analysis phase uses quantitative strategy formulation models based on all the data and information obtained, so that this analysis can be done as objectively as possible.
- The decision-making stage is the act of determining the results of the study and taking strategic decisions based on the results of the analysis that has been carried out.

The analysis was based on the questionnaire result and continued with the weighting and ranking calculation described in *Table 1*.

Table 1. *IFAS and EFAS analysis*

Factors	Weight (w)	Rating (R)	W*R
A. Internal Factors			
1 Strengths			
.....	.....	.....	.....
2 Weaknesses			
.....	.....	.....	.....
Sub Total	1.0		
B. External Factors			
1 Opportunities			
.....	.....	.....	.....
2 Threats			
.....	.....	.....	.....
Sub Total	1.0		

Explanation:

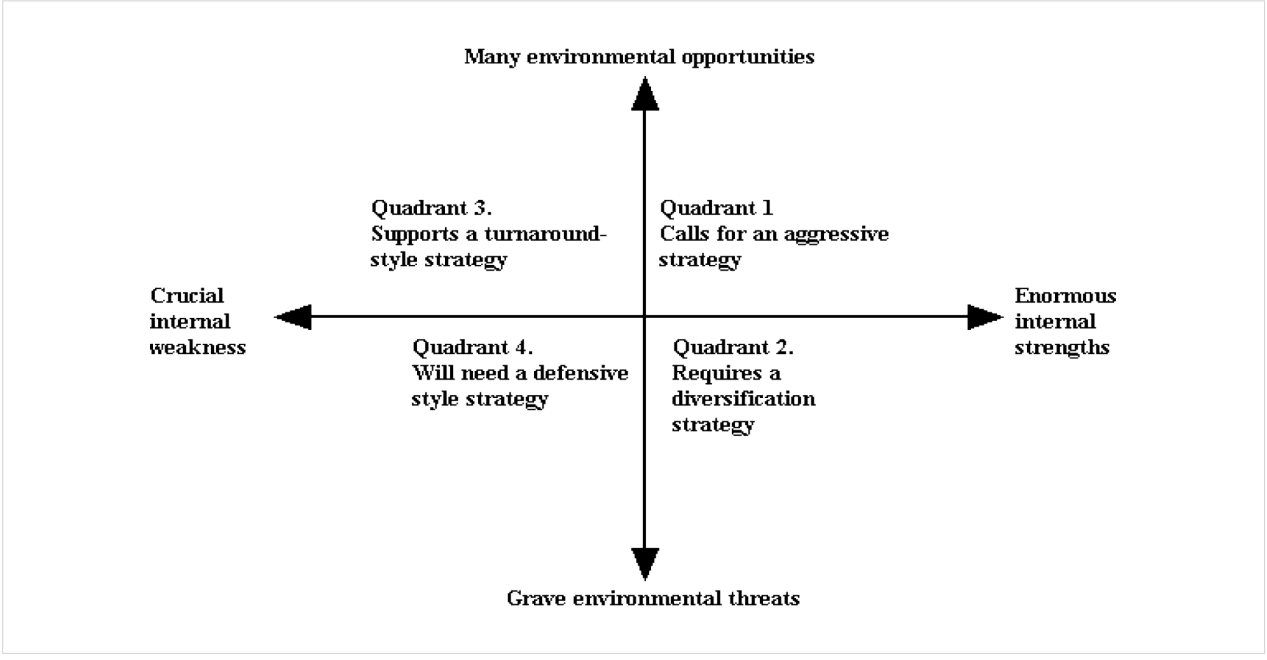
- In column 2, the weighting is between 0–1 for factors considered very important and 0.0 for factors deemed unimportant.
- Column 3 indicates the assigned rating value based on factors, with a score of 1 representing a minimal impact and a score of 4 indicating a significant effect.
- In column 4, the result of multiplying the weight by the rating is calculated.
- Add up the total score obtained from column 4. The total score shows the organisation's reaction toward internal and external factors. A value of 1.00–1.99 indicates a low internal or external position, and a value of 2.00–2.99 indicates an average internal or external position, while the value of 3.00–4.00 indicates a strong internal or external position.

The larger the weight acquired, the more contribution it makes toward achieving a marine-based gastronomy tourism development strategy. Then, the results number are applied to the Cartesian diagram to ensure the calculation is accurate (*Fig. 2*). The final score obtained indicates positive or negative values until it is applied to 4 quadrants in the Cartesian diagram, a recommendation to a marketing strategy decision-making.

According to Haerawan and Magang (2019), the Cartesian diagram for SWOT analysis is explained below:

- Quadrant I (aggressive strategy) best describes a beneficial position where the businesses, companies, and activities have strength and opportunity. This strategy can be implemented in the quadrant I condition, a strategy that is equivalent to a growth-oriented strategy principal or a strategy that mainly focuses on the perspective of rapid growth.
- Quadrant II (turn strategy). Even though there are some dangers, businesses, companies, and activities will continue to rely on the strength that comes from internal factors. This strategy can be implemented to push the strength and utilise the opportunity with product or service diversification offered.
- Quadrant III (defensive strategy). The opportunity for businesses, companies, and activities is quite potent, but on the other hand, they must deal with weaknesses as an internal factor. This strategy mainly focuses on avoiding and preventing internal problems so that opportunity could dominate.
- Quadrant IV (diversification strategy): This quadrant puts people in the most unbeneficial situation, where businesses, companies, and activities must defend themselves from numerous threats and internal weaknesses. This strategy is shaped as a defensive response.

Fig. 2. *SWOT analysis diagram*



Moreover, the food supply chain analysis has been coined to depict the activities or operations from production, distribution, and consumption to keep the safety and quality of various food under efficient and effective modes (Marsden et al., 2000; Blandon et al., 2009). Food supply management has gained a huge attention from researchers. The term *food supply chain management* refers to the processes involved in producing, distributing, and consuming food products while ensuring their safety and quality through efficient and effective means (Pawar and Mali, 2020). The food supply chain analysis is needed to determine the correlation between fisheries activities, marine-based gastronomy tourism, and environmental sustainability (preventing ecological damage in coastal areas and the ocean due to irresponsible tourism and overfishing caused by the high demand in the fish market). Previous studies underlined the importance of addressing issues related to supply chain integrated function, sustainability, and model development of decision-making (De et al., 2022). Cuisine identified as a marine-based gastronomy tourism object that qualifies to be observed must be well-known by the locals, cooked and consumed daily by the family and relatives in the long term, consist of local ingredients, and have a signature taste.

Results and Discussion

Seafood outlet's comparison

There are more than 20 marine tourism destinations in Southern Malang, and some are well-known as the centre of fishing activities, Sendang Biru Coastal Fishing Port and Kondang Merak Beach. People are able to see natural tourism and experience fresh seafood thanks to the Southern Malang area, which features a perfect combination of breath-taking views, a wide variety of tourist attractions, and a delicious cuisine. It is worth remembering that the Southern Malang area has the potential to be a platform for gastronomy tourism, where the tourism business brings prosperity to the coastal community for a long time through local cuisines.

According to Rojas et al. (2022), gastronomy tourism has become a related topic in academia, as much as business and tourism destination management. Koerich dan Müller (2022) also states that the epistemology of gastronomy varies, which is closely related to the concept of cooking, cuisine, knowledge and practicality, and everything in between. Sufa et al. (2020) state that ideal gastronomy tourism is required to have something to see, something to do, and something to buy.

Based on the locals' interview, returning visitors mostly come on weekends. Beside paid attractions, tourists can enjoy free ones, such as camping, sightseeing, canoeing, picnicking, and culinary. People who desire a short vacation would prefer to go to the Southern Malang area, where the affordable beach vacation has become the identic branding. Kamim (2017) believes that gastronomy from a distinct place is a characteristic and intrinsic value used by a destination to captivate tourists and visitors so that it will acquire a relationship between the gastronomy experience and destination branding. Based on the researcher's direct observation in four months, the sample cuisine was taken at the three most visited destinations with popular culinary tourism and its unique selling point (*Table 1*). Each place also offers a special menu (*Table 2*) that attracts the visitor and is the reason why they come.

Although culinary and marine tourism have contributed to keeping the coastal community's economic sector alive, uncontrolled visitors and inadequate coastal area maintenance might cause serious problems and concerns, such as environmental damage, marine litter, overfishing, and destructive fishing triggered by the high fish demand. According to Zondervan and Zondervan (2022), with the escalation of the global population, which will reach approximately 9 billion people in 2030 and 9.7 billion in 2050, the pressure for fish supplies to be able to fulfil the food necessity will also rise. Thus, fish and seafood production must be focused on the sustainability concept. Sustainable fisheries mainly discuss socioeconomic sectors such as population explosion, climate change, increased market demand for sustainable seafood, and food scarcity in most developing countries.

Local fishing activity at Pondok Dadap Fishing Port

At Sendang Biru Beach, there is a Pondokdadap Sendang Biru Fishing Port and Fish Auction Hall. The coastal economic growth in Malang Regency for marine fisheries sectors is centred at Sendang Biru beach. According to the Ministry of Marine Affairs and Fisheries Statistic Data obtained at Pondokdadap Coastal Fishing Port, tuna *(Thunnus sp)* with 3 852 919 tonnes,

Table 2. *Seafood outlet comparisons in Southern Malang*

Outlets	Location	Tourist Attractions	Menu List	Seafood Species	High-demand Species	Overall Species Weekly Stock (kg)
Warung Seafood Mak Sih	Kondang Merak Beach, Bantur District, Malang Regency	Picnicking, camping, sightseeing, swimming, snorkelling, culinary	Tuna satai, oyster sauce crab, crab, lobster, dan squid satay, prawn satay, and various grilled fish	Parrot fish (*Scarus ghobban*), GT (*Caranx ignobilis*), tuna (*Thunnus sp*), red snapper (*Lutjanus artifrontalis*), milkfish (*Chanos chanos*), squid (*Loligo sp.*)	Tuna (*Thunnus sp*) and squid (*Loligo sp*)	Each species is approximately 100 kg or adapts to market demand. Tuna stock alone is a minimum of 10 kg or 100 kg during its high-season
Warung Makan Mak Sum Soponyono	JLS, Bantur District, Malang Regency	Culinary	Pecel, lodeh, grilled fish, fried fish, lobster, squid, coffee, coconut, tea, and soft drinks.	Octopus (*Octopus spp*), grouper fish (*Epinephelus sp.*), snapper (*Lutjanidae malabaricus*), baronang fish (*Siganus javus*), parrot fish (*Scarus ghobban*), mullet (*Liza vaigiensis*), skipjack tuna (*Katsuwonus pelamis*), baby tuna (*Thunnus sp.*), and shrimp (*Paneaus monodon*), indian mackarel (*Sardinella brachysoma*) and chub mackerels (*Pterocarsio diagrama*).	Octopus (*Octopus spp*), Indian mackerel (*Sardinella brachysoma*) and chub mackerels (*Pterocarsio diagrama*).	Each species is approximately a minimum of 10 kg or 100 kg, depending on the season or market demand
Warung Pak Hasan Spesial Ikan Bakar	Goa Cina Beach, Sumbermanjing Wetan District, Malang Regency	Picnicking, camping, sightseeing, swimming, snorkelling, culinary	Soto rice, chicken soto rice, sweet-soy beef rice, sweet-soy chicken rice, Ayam penyet with rice, pecel with egg and rice, mixed rice, fried indomie, mie sedap Soto flavoured, iced coconut, iced coconut in glass, iced orange, iced tea, iced Joshua, iced coffee, iced soda milk, hot tea, and hot coffee.	Snapper (*Lutjanidae malabaricus*), tuna (*Thunnus sp*), milkfish (*Chanos chanos*), grouper (*Ephinephelus sp.*), pomfret (*Parastromateus niger*), carp (*Osphronemous gouramy*), lobster (*Panulirus versicolor*), shrimp (*Paneaus monodon*), and cuttlefish (*Sepia sp.*).	Snapper (*Lutjanidae malabaricus*) and grouper (*Ephinephelus sp.*)	Each species is approximately 25 kg

skipjack tuna *(Katsuwonus pelamis)* with 2 328 464 tonnes, and Bali sardinella *(sardinella lemuru)* with 1 417 265 tonnes have reached the highest production volume along 2021.

On the other side, based on the interview with the Fishermen Leader, the fishing boats used by fishermen in Sendang Biru are the following: (a) *sekoci* (240 boats) = ± *15 days fishing;* (b) *slerek* (250 boats) = *1 day of fishing;* and (c) *jukung* (23 pairs, one pair contains two boats) = *1 day of fishing*. The fishing boats, known as *Jukung* fleets, are typically constructed in pairs, with one vessel serving as a vessel for fishermen and the other serving as a vessel for transporting fish.

Sendang Biru's fishermen utilise diverse fishing gears: handlines, spearfishing, longlines, and nets. Fishing activities in Sendang Biru depend on fish aggregating

Fig. 3. *Seafood Menu from (a) Warung Seafood Mak Sih, Kondang Merak Beach; grilled fish, satai tuna, squid satai, rice, and chilli sauce;(b) Warung Makan Mak Sum Soponyono, JLS (south passway of south Java): Octopus with rice; and (c) Warung Pak Hasan Spesial Ikan Bakar, Goa Cina Beach: Grilled fish, squid, rice*

a *b* *c*

devices (FADs) or *rumpon* as the local name. The FAD is an artificial object used to attract ocean-going pelagic fish. They usually consist of buoys or floats tethered to the ocean floor with concrete blocks. There are hundreds of *rumpon* operating in Sendang Biru Fishing Port during the small-scale fishing activity. Aside from *rumpon*, an echosounder is also helpful for fishermen to detect the location of the fish and determine the fishing ground.

Most fishermen use *sekoci* for catching squid (*Loligo spp*) and cuttlefish (*Sepia pharaonis*) as baits for catching primary species, such as tuna (*Thunnus sp.*), albacore (*Thunnus alalunga*), skipjack tuna (*Katsuwonus pelamis*), figrate tuna (*Auxis thazard*), mahi-mahi (*Coryphaena hippurus*), and slug fish (*Thiciurus lepterus*). To catch octopus (*Octopus spp.*), fishermen use handline gear with handmade baits that intentionally look like a crab *(Scylla serrata)*. *Sekoci* is the second most fishing boat in Sendang Biru, which holds 240 units. The fishing activities are considered traditional, eco-friendly, and sustainable, using selective fishing gear such as handlines and spearfishing.

Gastronomy tourism and eco-friendly fishing activities relationship

Fishing activities in Indonesia are deemed full of complexity and conflicts due to geographic condition assortment, fish species diversity, fishing tools variety, cultural/ethnic diversity, and the distribution of fishing grounds. Indonesia is located at the crossing point between two oceans (the Pacific and Indian), and the Regional Fisheries Management Organizations (RFMOs) have unique characteristics. There are 2000 countless fish species in Indonesian seas. Despite the government categorising 11 general fishing gears, each fisherman from a particular coastal area still uses different fishing tools. The other problem in the fisheries sector is that most fishing tools are handmade. Therefore, the government can only regulate the mesh size of each fishing gear.

The differences and diversity of Indonesian cultures create variations in thought patterns, behaviour, and perception (such as the types of fishing vessels used, the names given to fish, and the fishing tools used) that occur among communities in different regions. Then, the cultural divide is inevitable, and it has implications for the equitable regulation of the fisheries sector. On top of that, using various fishing tools in a specific coastal community causes conflict to emerge. Since the fishing ground is limited, they believe it belongs to them, and they will not share at all. The problem is also supported by the catch disparity and low accuracy data the government obtains. The difficulty of fixing those issues is rooted in the primary food, which is never based on marine resources. Indonesians prefer to cook chicken and beef rather than fish for daily meals.

Indian Ocean Tuna Committee (IOTC) in 2013 studied that the length at first maturity (L_m) value of yellowfin tuna *(Thunnus albacares)* is 100 cm. If the catch of yellowfin tuna is below 100 cm, it can be considered a condition where fishing is against the preserving principle. The prohibited caught fish must be spawned, which has entered gonad maturity level (GML) phase III–IV. According to the research data obtained in 2019 at Sendang Biru Fishing Port, the morphology of GML showed that yellowfin tuna *(T. albacares)* caught in February 2019 was at GML phase II–III, while in March

and April 2019 was at GML phase III–IV with a gonadosomatic index (GSI) 0.01%–1.29%. On the other hand, GML shows that skipjack *(K. pelamis)* caught in February 2019 was at GML phase II with a GSI 1.83%, and in April 2019, it was at GML phase V (spent), which was considered spawned. Nevertheless, the tuna *(Thunnus sp)* price at a size of length at first capture (L_c) > 100 cm is quite expensive in the market. These conditions contribute to high demand for a size L_c < 100 cm per each. The data relationship between L_m, L_c, and GML implies that fishermen remain catching inappropriate and immature fish, although it is unintentional and by accident.

In 2021, the Central Bureau of Statistics (CBS) figured out that the fisheries sector has contributed to a gross domestic product (GDP) of 2.83%. Due to the positive impact, the Ministry of Marine Affairs and Fisheries fixes the regulation and monitors fisheries activities in all regions through the Scalable Fisheries Capture Agenda to accelerate the society's economy while keeping the ecosystem balanced at the same time.

Additional solutions can be considered to support the existing plans in the Scalable Fisheries Capture Agenda:

1 Improvement of fisheries data disparity by enabling captured fish tagging at the Fishing Port or Fish Auction. To delay the environmental damage, preserving marine natural resources must be realised by expanding and enhancing highly restricted conservation areas. Marine protected area (MPA) is one of a kind. It consists of the primary, utilisation, and buffer zones. MPA itself should only comprise conservation and research activities.

2 The coastal community perspective and their awareness of the limited natural resources are key in influencing the policy setting. Hence, changing the coastal community's perspective and raising awareness would matter. The program will be initiated and led through massive socialisation, a direct approach to raising awareness, proper education that is held regularly, and infrastructure development and urban planning will also need to be executed.

3 Changing the demand and market trends to reduce the inappropriate allowed size to catch. This regulation tries to replace the revolve fish trades in the market, from immature to mature fish.

4 Adding value through gastronomy tourism can preserve nature and prevent the uncontrolled seafood demand that will affect traders, business owners, and fishermen's impulsive behaviour. A creative economy can reinforce the added value implementation within the coastal community.

Food supply chain analysis

Besides offering culinary experience, gastronomy tourism also becomes a communication medium, connecting culture and local wisdom from the locals to tourists. The data were obtained from direct observation and the questionnaire using a Google form was spread to 48 respondents with the following criteria: (1) men or women aged 18–50 years old; (2) have been visiting Southern Malang Area, especially beach tourism. The respondents consisted of 30 women (68.2%) and 14 men (31.8%) with details as follows: 30 respondents were 21–25 years old (68.2%), 24 respondents worked in the private sector (54.5%), and 25 respondents stayed in Malang Raya for 1–5 years long (56.8%). The result implies that the gastronomy tourism potential must be developed and given further attention (*Table 3*). Apart from environmental sustainability, the distinctive and adequacy of economic, social, and cultural aspects play an essential role in enticing visits. Without all that, the potential will remain hidden, other tourism destinations might have a bigger opportunity to stand out, and the poverty in Southern Malang's coastal communities might increase.

According to an in-depth interview with Sendang Biru's Fishermen Leader, the Department of Marine Affairs and Fisheries' contribution to pre-production and production of capture fishing activities provides scales useful for the auction process in the Fish Auction Hall. The outlet owners did not join the auction process, and they got the supply by purchasing at the traditional fish market or ordering directly from fishermen under the supplier-purchaser partnership through a down payment to lock the unofficial agreement. The weight of the fish will determine the selling price, so the auction process is not using a retail system.

Problem identification in marine-based gastronomy tourism food supply has been explained through the Koaru Ishikawa diagram, also known as the fishbone

Table 3. *Questionnaire questions about marine-based gastronomy tourism in Malang Regency*

No	Questions	Respondents answered		Results
		Yes	No	
1	Did you know that the Southern Malang area has few culinary destinations to visit?	36	12	75% of respondents agreed they knew the Southern Malang beaches have attractive culinary destinations.
2	Do you think that Southern Malang cuisine has intrinsic cultural value?	14	34	70.8% of respondents agreed that Southern Malang cuisine has a weak intrinsic cultural value.
3	In your opinion, is a cuisine in the Southern Malang area considered local cuisine impossible to find elsewhere?	14	34	70.8% of respondents agreed that culinary tourism in Southern Malang is not considered a unique local cuisine and is hardly found elsewhere.
4	In your opinion, does local cuisine participate in your decision-making to go on culinary tourism in the Southern Malang area?	29	19	60.4% of respondents agreed that local cuisine is vital in tourists' decision-making to visit Southern Malang culinary areas.
5	Do you feel a unique experience while eating seafood in Southern Malang rather than elsewhere (restaurants or cafés in the town)?	29	19	60.4% of respondents agreed that they felt a unique experience while visiting culinary tourism in the Southern Malang area.
6	Are you familiar with the existence of Warung Seafood Mak Sih at Kondang Merak Beach, Bantur District, Malang Regency?	14	34	70.8% of respondents agreed that they were unfamiliar with the existence of Warung Seafood Mak Sih.
7	Are you familiar with Warung Makan Mak Sum Soponyono at JLS, Bantur District, Malang Regency?	12	36	75% of respondents agreed tha they were unfamiliar with the existence of Warung Makan Mak Sum Soponyono.
8	Are you familiar with the existence of Warung Pak Hasan Spesialis Ikan Bakar at Goa Cina Beach, Gedangan District, Malang Regency?	16	32	66.7% of respondents agreed that they were unfamiliar with the existence of Warung Pak Hasan Spesial Ikan Bakar.
9	Are you interested in culinary tourism at Southern Malang if tourist attractions offer cultural and educational experiences related to seafood cuisine? (Example: the tourism destination provides a tour guide that helps to inform tourist and enlighten their knowledge by explaining the outlet's history, cooking process philosophy, or spice ingredients, cooking process that involves local customs and wisdom, cooking class enablement, and education session about pre-production, which address the wild-captured fisheries activities).	46	2	95.8% of respondents agreed that Southern Malang culinary tourism would be more appealing if the seafood cuisine's cultural and educational experience was provided.
10	If Southern Malang culinary tourism was developed using seafood's cultural and educational experience, would you like to recommend the tourist destinations to your friends, relatives, and families?	47	1	97.9% of respondents agreed to recommend the Southern Malang culinary to their friends, relatives, and friends if the attractions choices were equipped with seafood's cultural and educational experience.
11	Do you think the highly visited natural tourism destination would most likely have a higher risk of damage?	46	2	95.8% of respondents agreed that highly visited natural tourism destinations would likely have a higher risk of damage.
12	Do you support the idea of developing seafood culinary tourism in Southern Malang with an environmental approach to achieve a sustainable goal by applying conservation area or tourist visit limitation (reservation prior arrival required, i.e., in high-season or public holidays)?	47	1	97.9% of respondents support the development idea for Southern Malang's seafood culinary tourism through an environmental approach.

Data source: researcher's questionnaire spread to 48 respondents

diagram or cause-effect diagram (*Fig. 5*). The findings form a sustainable framework (*Fig. 4*) that offers a marine-based gastronomy tourism sustainable development strategic solution and will be useful for the government to draft a new policy related to seafood consumption in beach tourism for the Malang Regency area. Community involvement and empowerment strongly control fisheries activities: fishing, production, distribution, processing, marketing, market and trading, consumption, waste management, and fish stock recovery. Assuming that seafood demand is uncontrollable, the fish stock will be depleted, and ecosystem imbalance will happen because of overfishing and destructive fishing. Collaboration between stakeholders must be shaped, for example, by giving added value to high-demand seafood products in seafood outlets to limit and reduce uncontrolled demand due to beach tourism activities and suppress irresponsible tourism (destructive acts, contributing to add more marine litter, tourist visits number that exceed the carrying capacity, etc.).

Yu and Nagurey (2012) have studied that supply and demand needs have escalated throughout the years, indicating that global competition growth is inevitable. The associated distance between food production and consumption location in the chain drives new challenges to design new models, management, analysis, and food supply chain solutions. Food supply identification problems using the Kaoru Ishikawa diagram have been done before by Chemielewska et al. (2021) to illustrate the cause-effect relationship and are useful to see a broader picture and problem complexities. Six components are used in the Kaoru Ishikawa diagram: manpower, methods, machinery, materials, management, and environment (5M+E). In this research, the Ishikawa diagram represents the problem in marine-based gastronomy tourism development (*Fig. 6*). Research findings have obtained six components that affect the sustainable development of gastronomy tourism: (1) manpower: local communities; (2) materials: raw fish; (3) measurement: policy; (4) environment: beach; (5) machinery: facility and accessibility; and (6) methods: marketing.

The sustainable marine-based gastronomy tourism schema was conceived, and it implies that enhancement and development in various sectors include social, economic, cultural, and environmental enhancement and development. In the social sector, this could take the form of human development along the beaches of Southern Malang, while in the economic sector, this could take the form of creative economic training and the differentiation of seafood products. Moreover, Southern Malang's culture and conventional wisdom have the potential to become tourist attractions. Sustainable

Fig. 4. *Fishbone diagram for unsustainable marine-based gastronomy tourism*

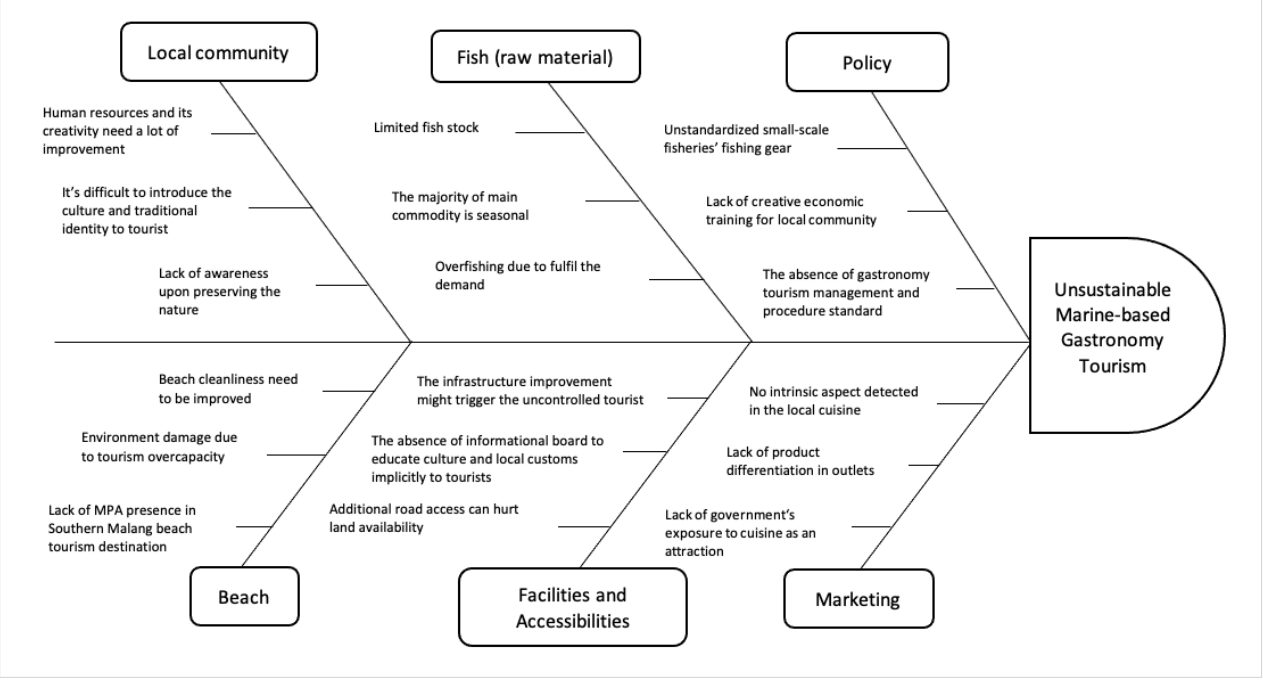
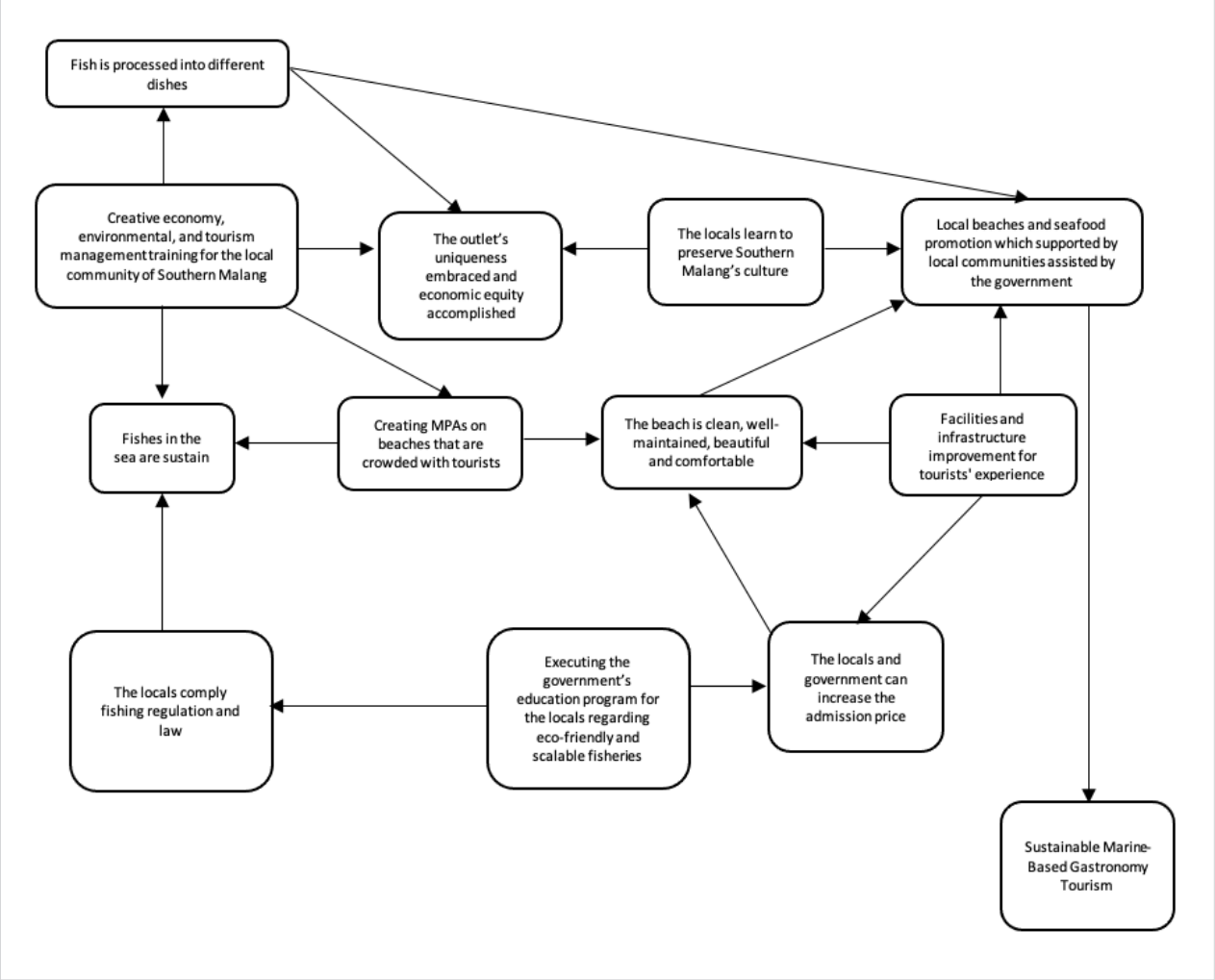


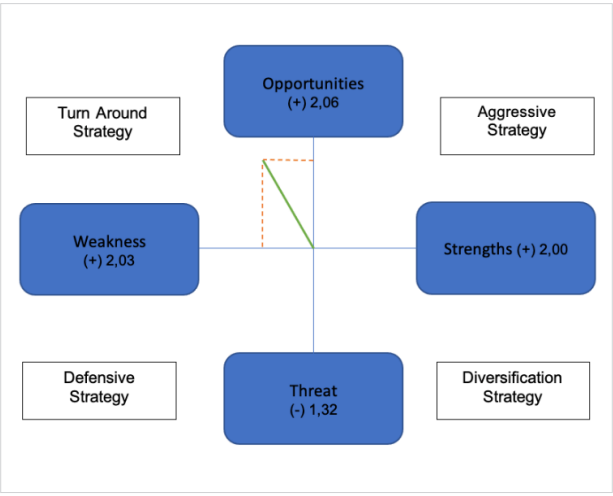
Fig. 5. *Marine-based gastronomy tourism sustainability schema*



marine-based gastronomy encourages the involvement of locals and the government in the preservation of the natural environment through the implementation of education programs, policymaking to regulate activities conducted by small-scale fisheries, and the establishment of marine protected areas (MPA) in certain beaches that are frequented by large numbers of people.

Lout (2022) have found that there are choices to address the operational scope of fishing activities, considering seafood diversities and complexities. Ambitions to initiate social, economic, and cultural movements will be complete if the sustainability understanding among the whole sector is well delivered. This would help the system to better plan and execute sustainability concepts in a broader picture. Future research must focus on integrating social, economic, and cultural rights to

Fig. 6. *Cartesian diagram result*



achieve sustainable seafood goals and how to point out arguments so it will be worth discussing. Woodhouse et al. (2018) argue that the disposal and consumers stages are difficult to control by the food producers in general food production, but they do have an essential role in affecting the environment. Gallegos et al. (2022) have strengthened the evidence through the research stating that sustainable goals could be achieved by a sufficient supply selection and assimilating with a convenient production arrangement and distribution schema. The result shows that stakeholders are expected to be involved deeper in marine-based gastronomy tourism development. Schulte and Hallstedt (2020) have studied that stakeholders can connect the sustainable impact with the business risk. Two things that need to be noticed are the internal and external stakeholders' roles that must be carefully considered. A product that contributes to sustainable development offers a high-value experience and drives the willingness to purchase from consumers can create opportunities for a company.

SWOTa

Strength, weakness, opportunity, and threat (SWOT) analysis in this research is based on the researcher's judgment that will be compared to that in the existing journals. The SWOT analysis appeared to help the decision-making process in a long-term marketing strategy to fulfil market necessities. Identification must proceed before analysing the internal and external factors of the SWOT analysis (*Table 1*). The results are explained below:

1 Strengths

- The abundance of coastal and marine tourism attractions outspread the Southern Malang Beaches coastal line as Malang Regency is the second longest coastal line after Banyuwangi Regency in East Java.
- The community-based tourism (CBT) system is applied in the Southern Malang Beaches area.
- The existence of several famous outlets with their signature seafood cuisines.

2 Weaknesses

- Damaged road access and improper facilities burden and put tourists in an inconvenient situation.
- Seafood in Southern Malang is perceived as non-local and common food.

3 Strengths

- The abundance of coastal and marine tourism attractions outspread the Southern Malang Beaches coastal line as Malang Regency is the second longest coastal line after Banyuwangi Regency in East Java.
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- The existence of several famous outlets with their signature seafood cuisines.

4 Weaknesses

- Damaged road access and improper facilities burden and put tourists in an inconvenient situation.
- Seafood in Southern Malang is perceived as non-local and common food.
- Most tourists consider that Southern Malang's seafood has no cultural aspects.

5 Opportunities

- Southern Malang beaches are tourists' favourite to spend a holiday and enjoy nature.
- The society's retribution fees on beach ticketing, fresh fish trade, and economic activity at the outlet keep the spinning wheel of economics.
- It is possible to reassure implementation of coastal and marine conservation in some areas in Southern Malang beaches.

6 Threats

- Tourism activities that exceed the natural carrying capacity, irresponsible tourism, and the lack of coastal and marine tourism destination maintenance can potentially contribute to environmental damage.
- Non-reliant seafood high demand may cause eco-unfriendly and destructive fishing.
- The negative economic growth emerges as the beaches are damaged, causing a lack of tourist visits.

The opportunity rating was shaped based on the influence of external factors throughout the situation and the objective following the development strategy of marine-based gastronomy tourism. The rating value ranges between 1 (very low), 2 (low), 3 (enough), 4 (high), and 5 (very high). Internal factors, strengths, and weaknesses have opposite values, opportunities, and threats.

The final score obtained will indicate positive or negative values until it is applied to 4 quadrants, a recommendation to a marketing strategy decision-making. *Table 4* shows the internal factors value; the strength is 2.00, and the weakness is 2.03. The same formula applies to external factors in *Table 5* and shows the value of the opportunity is 2.06 and the threat is 1.32.

Thus, an internal factor score value, strength, is below weakness and has a difference of (–) 0.03 point.

Meanwhile, the external factor value, the opportunity, is above threat and has a difference of (+) 0.74. The entire factor identification results are translated into Cartesius SWOT Diagram (*Fig. 2*). The SWOT analysis scoring table is described in *Table 4* and *Table 5*. Moreover, *Table 6* illustrates the SWOT strategy combination to find the strategy quadrant (*Figure 5*).

The combination (*Table 6*) indicates that the W-O strategy or strength opportunity has the highest score, which is 4.09, compared to S-O, S-T, and W-T strategies (*Table 7*).

Table 4. *Internal strategic factor (IFAS)*

Strategic factors		Weight	Rating	Score
Strengths	The abundance of coastal and marine tourism attractions outspread the Southern Malang Beaches coastal line as Malang Regency is the second longest coastal line after Banyuwangi Regency in East Java.	0.20	5	1.00
	The community-based tourism (CBT) system is applied in the Southern Malang Beaches area.	0.13	4	0.53
	The existence of several famous outlets with their signature seafood cuisines.	0.13	3,5	0.47
Subtotal		**0.46**		2.00
Weaknesses	Damaged road access and improper facilities burden and put tourists in an inconvenient situation.	0.13	4	0.53
	Seafood in Southern Malang is perceived as non-local and common food	0.20	4	0.80
	Most tourists consider that Southern Malang's seafood has no cultural aspects	0.20	3,5	0.70
Subtotal		**0.53**		2.03
TOTAL		1.00		**4.03**

Table 5. *External strategic factor (EFAS)*

Strategic factors		Weight	Rating	Score
Opportunities	Southern Malang beaches are a tourists' favourite choice to spend a holiday and enjoy nature.	0.18	5	0.88
	The society's retribution fees on beach ticketing, fresh fish trade, and economic activity at the outlet keep the spinning wheel of economics.	0.18	4	0.71
	It is possible to reassure implementation of coastal and marine conservation in some areas in Southern Malang beaches.	0.12	4	0.47
Subtotal		**0.47**		2.06
Threats	Tourism activities that exceed the natural carrying capacity, irresponsible tourism, and the lack of coastal and marine tourism destination maintenance can potentially contribute to environmental damage.	0.18	1	0.18
	Non-reliant seafood high demand may cause eco-unfriendly and destructive fishing.	0.18	3	0.53
	The negative economic growth emerges as the beaches are damaged, causing a lack of tourist visits.	0.18	3,5	0.62
Subtotal		**0.53**		1.32
TOTAL		1.00		**3.38**

Table 6. *SWOT matrix strategic combination*

External Factor/ Internal Factor	Strengths	Weaknesses
Opportunities	(S-O) Strategy; 2.00 + 2.06 = 4.06	(W-O) Strategy; 2.03 + 2.06 = 4.09
Threats	(S-T) Strategy; 2.00 + 1.32 = 3.32	(W-T) Strategy; 2.03 + 1.32 = 3.35

Table 7. *SWOT matrix*

Internal factor strategy / External factor strategy	Strengths	Weaknesses
	1 The abundance of coastal and marine tourism attractions outspread the Southern Malang Beaches coastal line, as Malang Regency is the second longest coastal line after Banyuwangi Regency in East Java. 2 The community-based tourism (CBT) system is applied in Southern Malang beaches. 3 The existence of several famous outlets with their signature seafood cuisines.	1 Damaged road access and improper facilities burden and put tourists in an inconvenient situation. 2 Weakened regulations relate to waste management, and no punishment is applied for those who disobey the rules and litter. 3 Low-priced seafood menu, but natural resources are limited.
Opportunities 1 Southern Malang beaches are the tourists' favourite choice to spend a holiday and enjoy nature. 2 The society's retribution fees on beach ticketing, fresh fish trade, and economic activity at the outlet keep the spinning wheel of economics. 3 It is possible to reassure implementation of coastal and marine conservation in some areas in Southern Malang beaches.	S-O Strategy a Initiating the conservation area development at each crowded beach, following gastronomy tourism's high popularity. This development aims to preserve the coastal and marine environment so that sustainable tourism can be established and remain to attract tourists. b Encouraging the seafood product variety from each outlet so economic equity can occur and keep fish stock stable. c Open education tourism that showcases the cooking process or seafood processing at some outlet to raise awareness and cultivate love for the coastal and marine environment.	W-O Strategy a Improve and fix road access and other public facilities, following three of seven principles written in SAPTA PESONA (7 Charms): safety, cleanliness, and beauty. SAPTA PESONA is a seven concept that highlights Indonesia's distinctive cultural and natural beauty. It was initiated by the Indonesian Ministry of Tourism and Creative Economy to foster the expansion of the country's tourism sector and highlight the myriad of attractions that can be discovered all over the archipelago. The SAPTA PESONA framework consists of seven charms or elements, each representing a particular aspect of Indonesia's cultural and natural heritage. These are: 1 Safety. One of the most essential factors for tourists is the assurance of safety in the area they plan to visit. The government should ensure security, while the local community should support this effort. 2 Orderliness. Providing a well-organised environment for tourism activities, which can offer efficient and consistent services to tourists. Discipline plays a crucial role in maintaining orderliness. 3 Cleanliness. Establishing a hygienic environment for tourism activities that can provide good services to tourists. The value of cleanliness should be instilled from an early age. 4 Comfort. Creating a comfortable environment for tourists during their stay, which fosters a sense of relaxation and ease. This promotes more extended visits and encourages tourists to stay longer. 5 Beauty. Offering an aesthetically pleasing and captivating environment for tourists, which creates a memorable experience and encourages promotion to a wider market, leading to potential revisit. 6 Hospitality. Providing a warm and welcoming environment for tourists akin to being in their homes. The friendly nature of Indonesian people is their signature trait. 7 Memorable experience. Creating a unique and unforgettable experience for tourists, which leaves a lasting impression and encourages them to return. Physical souvenirs also play an important role in creating memories. b Take advantage of tourist visits to introduce and widen the cultural values and local communities' identity through seafood cuisine in the coastal outlets so that Southern Malang can have one of SAPTA PESONA (7 Charms) principles, which is memorable. Leaving a remarkable experience that possibly makes them revisit the place due to authenticity and unique impression of Southern Malang's seafood, distinguishing it from other seafood. c Put added value into some seasonal species; control the market demand and keep the fish stock stable.

Threats	S-T Strategy	W-T Strategy
1 Tourism activities that exceed the natural carrying capacity, irresponsible tourism, and the lack of coastal and marine tourism destination maintenance can potentially contribute to environmental damage. 2 Non-reliant seafood high demand may cause eco-unfriendly and destructive fishing. 3 Negative economic growth emerges as the beaches are damaged, causing a lack of tourist visits.	a Improve the maintenance and supervision of the entire coastal and marine environment in Southern Malang areas, with regular monitoring or close the tourism destination daily each month, which all stakeholders can agree upon. b Strengthen the catch regulation that follows illegal, unreported and unregulated (IUU) Fishing. c Hold socialisation to encourage a creative economy in the Southern Malang area so that the coastal community does not solely rely on fishermen or outlet owner jobs.	a Improve all facilities and access to increasing the entrance fees to limit the number of daily visits, especially on national holidays and weekends. b Collaborate with communities or non-government organizations to carry out routine maintenance and campaigns for environmental care disseminated through social media so that the waste we throw on the beach and the sea will return to our plates through marine-based gastronomy tourism that we consume in urban areas or in tourist destinations. c Together with the government, limite the permitted catch amount to suppress the circulation of products and fishing activities that are massive and destructive due to high market demand.

W-O strategy that needs to be applied to marine-based gastronomy tourism is as follows; (a) fixing accessibility access and public facility; (b) utilising tourists visits to introduce the culture and the local's identity through seafood cuisine, so tourists would have an unforgettable and authentic experience that makes Southern Malang's culinary unique; (c) implementing added value to some seasonal marine-species to control the seafood demand and avoid future seafood scarcity.

According to research by Ellis et al. (2018) and Park and Widyanta (2022), the commercial activities in the culinary industry are significantly evolving into adjusted cuisine and arranged dinner with the local families to enrich an individual experience. On the other hand, cooking classes, market tours, farm tours, and street food tours are developed for group or mass tourism experiences. Other studies conducted by Juncá et al. (2021) show that in order to create socio-cultural and gastronomy tourism, the locals must be well educated about promoting the product and health and good consumption customs among producers, consumers, and restaurants. These indicate that proper promotion in the tourism sector must be supported by human development, one of the W-O strategies aimed to introduce the culture, local wisdom, and local customs. Therefore, a particular tourism management and promotion education program must be conducted to support the W-O strategies.

Conclusions

Since the global community knows the gastronomy tourism sector's beneficial impact on increasing society's income, wealth, and open employment, strategic development must be considered to make it sustainable, even in developing countries. The Southern Malang area in Malang Regency has the potential to be developed into marine-based gastronomy ecotourism. However, the gastronomy ecotourism concept has not been fully implemented in the potential culinary area, for example, seafood outlets. In contrast, gastronomy ecotourism not only becomes a tourist attractor but also can preserve the cultural heritage and local wisdom. Understanding how gastronomy ecotourism is supposed to be appropriately implemented would benefit the coastal communities by highlighting the socio-cultural and environmental aspects.

From a questionnaire shared with 48 respondents during the research, 70.8% agreed that Southern Malang's seafood has no intrinsic cultural elements and is not considered a local yet unique cuisine. While speaking from a sustainability perspective, the seafood from pre-production to after-production has not been done with a careful process. The evidence can be seen in the captured fisheries data disparity and the interview with outlet owners and a fisherman. Fact checking from the science side is supported by interview results with a Fisheries and Marine Science lecture and literature reviews. From the reasons above, the research findings using food supply chain analysis and SWOT analysis show that the best strategic development based on W-O strategies and educating the locals on how to make the local wisdom, culture, and customs infamous through

culinary business is highly recommended. Research related to the potential marine ecotourism area mapping and its economic analysis will be the future research.

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