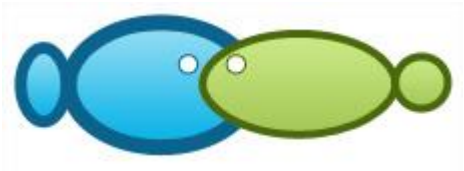

Blue economy accounting model for tuna fisher groups in Maluku Province, Indonesia

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Abstract. The blue economy is a new economic model designed to encourage the implementation of sustainable development with a framework simulating the ecosystems. For the successful implementation of the blue economy concept, a synergy among stakeholders is needed, based on a partnership comprising the community, private sector, academics, researchers, development experts, and national and international institutions. This research aimed to analyze the policy related to the implementation of the blue economy accounting model applied to the tuna fisher groups in Maluku Province, resulting in a higher added value of the fish, fishing products, by-products and waste, and in a stronger social responsibility of tuna fishers. Blue accounting helps reveal the environmental problems and benefits companies in the reporting process related to the environmental conservation. This research has found Tuna's blue economy accounting model called the Internalization of Tuna's blue economy accounting (INABET). This model has been appropriately adopted to support their development, by strengthening fishers' general capacity to manage their business based on environmentally sound accounting. This model can also be deployed by the local government level, specifically within the Marine and Fisheries Service, at the provincial and regency/city levels.

Key Words: tuna fishers groups, blue economy, accounting model, Maluku fisheries.

Introduction. Indonesia is an archipelago with an abundant marine biota. Indonesia's marine potential is highly expected to be utilized for the economic welfare of the people (Susilo et al 2021). However, the governance of the marine resources exploitation still has to consider fishing community's needs (Neitzel et al 2017). Consequently, efforts from various parties are needed to cooperate in the utilization of marine resources optimally and purposefully (Vermonden 2006; Pecoraro et al 2017). Marine fisheries industrialization is should also raise awareness on the preservation of waters' environmental quality and on the conservation of species, as sources welfare. The more critical the waters are to the community, the more diligently the community will compromise for a sustainable management (Wijayanto 2016). Capture fisheries are the most important sector contributing to the food security of the country (Hamilton et al 2011). Indonesia has the world's second-largest marine capture fishery, with more than 8 million people dependent on marine-based economic activities (Hall et al 2013). Meanwhile, Indonesia hosts more than 2.7 million fishers and produces 7 million tons of marine fish products. Its fish stocks are overexploited. This exploitation has led to the extinction of marine species, often following the habitat loss (Dulvy et al 2003).

The blue economy is a new economic model proposed in order to encourage the implementation of sustainable development with a framework similar to ecosystems. (McKinley et al 2019). The blue economy paradigm invites learning from nature and using the logic of the ecosystem in carrying out development. This concept will ensure that development produces economic growth and creates more jobs while ensuring sustainability (Carver 2020). The blue economy concept will rely on the comprehensive development of the people's economy in order to achieve overall national development (Satizábal et al 2020). The concept of sustainable development has become mainstream

in economic development policies in various countries, including Indonesia (Udemba et al 2019).

For the blue economy concept to work well, stakeholders need synergy. Therefore, partnership support from the community, private sector, academics, researchers, development experts, and national and international institutions is necessary. These stakeholders can jointly encourage and oversee the transformation towards sustainable use of marine resources and improve the welfare of coastal communities. The hallmark of the blue economy is its intention to achieve integrated management of the land-sea interface, across multiple sectors and geographic scales (Pace et al 2023). This blue economy concept can be developed in Indonesia to participate in poverty alleviation efforts (Lyons et al 2023), so that community participation gets its rightful and profitable place (Niner et al 2022). The perspective of organizational accountability and performance evaluation through the sustainability accounting related to environmental accounting is put forward in the sustainability reporting milestone towards integrated reporting 2020 (Bosi et al 2022). Environmental accounting is the process of gathering data on how to reduce negative environmental impacts and create positive value for the organization (Larrinaga-González et al 2001; Le et al 2019). Sustainability accounting, as an outcome of various environmental accounting system processes, measures and communicates the progress of the organization in achieving economic performance through environmentally sustainable pathways (Agyemang et al 2021). In economics, blue accounting corresponds to the blue economy, although not as popular as green accounting, (organizations disclose their environmental costs). Blue accounting focuses more on activities that have an impact on the sea (Voyer et al 2018), being used by companies whose main activities are linked to marine waters. Blue accounting is based on the knowledge on marine resources as a blue economic asset (Talento 2016).

Maluku Province is a province that is better known as the Province of Islands, where the fisheries are a leading sector, due to the livelihood situation of the people in Maluku Province, dominated by fishing activities. Maluku Province as an archipelago is within the circle of 3 Fisheries Management Areas (WPP) namely, WPP 715 which covers the Seram Sea, WPP 714 which covers the Banda Sea and WPP 718 which covers the Arafura Sea, totalizing a sustainable potential of around 4.9 million tons per year or around 39.62% of the total national sustainable potential. Concerning the average utilization rates per WPP, the WPP 714 is at 89%, the WPP 715 is at 95%, and the WPP 718 is at 89%. These figures indicate that the status of the utilization rate of fish resources in the 3 WPPs is fully-exploited. Thus, utilization efforts are maintained with strict monitoring (KKP 2017). The potential of yellowfin tuna, *Thunnus albacares*, tuna fisheries caught traditionally by small-scale fishers in Maluku Province explains the interest of world ecolabel certifications (Fair Trade Certification in America and MSC Certification in the European Union). It is the highest achievement of Indonesia, more specifically in Maluku Province, dominated by handline small-scale tuna fisheries. Tuna, a species of large pelagic fish, is a superior fish with a high export potential for the country's foreign exchange (50-60%), supporting extensive fisheries worldwide (Muhling et al 2017). From an agribusiness perspective, fisheries businesses can develop into market-oriented companies tailored to the potential of marine fisheries resources (Lesman & Yapanto 2021).

The blue economy can be applied to the sector of tuna fisheries in Maluku Province to add value to fish, fishing products, waste, and to increase the social responsibility of tuna fishers. Based on the above study, this research aimed to analyze the policy of implementing the blue economy accounting model for tuna fishing groups in Maluku Province.

Material and Method. The samples of the current research are fishers in the areas of 1) West Seram Regency (located in Kawa Village, Buano Village, and Waisala Village), 2) Central Maluku Regency (Tulehu Village, Asilulu Village, Ureng Village, Hitu Village, Mamala Village, Amahai Village, Ruta Village), 3) Buru Regency (Wailihang Village, Waprea Village, Pasir Putih Village), 4) North Seran Regency (Parigi Village, Wahai Village), 5) Ambon City (Latuhalat Village, Hukurila Village). This research used a quantitative research method.

Path diagram design. Path diagram design is an activity of describing the interaction of the selected components in a diagram illustration. In structural equations model (SEM) analysis, the interacting components are called research constructs, and each construct is equipped with a characterizer or construct dimension. In this regard, the literature review and related research results are essential to determine the correct dimensions. The design of the path diagram was conducted using the Smart PLS 3 program. The design of the path diagram for the blue economy accounting model for tuna fisher groups is presented in Figure 1.

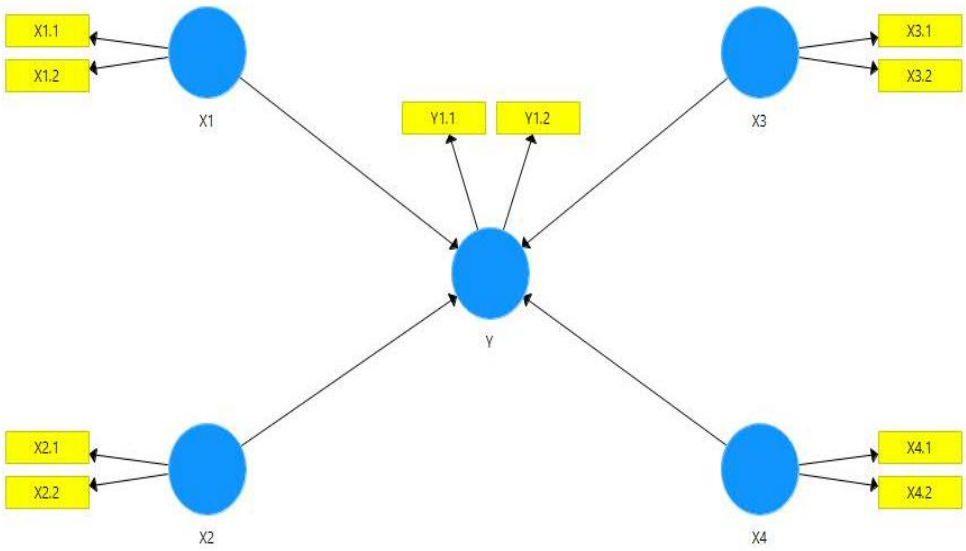

Figure 1. Basic model design of an internalization tuna fisheries' blue economy accounting model (INABET) in Maluku Province (X1 - Tuna fisheries business activity, X2 - spending rate, X3 - distribution and marketing, X4 - income, Y - blue economy added value).

The first variable, namely Tuna fisheries business activity (X1), consists of two indicators, namely the type of fishing gear (X1.1) and the second indicator the status of the fishing gear (X1.2). The second variable is the spending rate (X2) consisting of 2 indicators, namely the cost spent once at sea (X2.1) and the amount of market spending in one boat (X2.2). The third variable is the distribution and marketing component of tuna (X3), consisting of the market location (X3.1) and the daily fish price fluctuation (X3.2). The fourth variable is income (X4). The income variable consists of two indicators, namely the catch of one ship in one go (X4.1) and the result of selling one time out to sea (X4.2). Variable Y (blue economy added value) is influenced by tuna fishing business activities (X1), spending rate (X2), distribution and marketing (X3), and fishers' income (X4).

The data was analyzed using several analytical approaches: 1) Analysis of tuna fisheries business diversity in Maluku Province using a descriptive statistical method. 2) Analysis of tuna fisheries business accounting in Maluku Province using the standard accounting analysis method. 3) Analysis and design of blue economy accounting model of tuna fishery-related fishers' community in Maluku Province using the Smart PLS 3. 4) Formulation of the policy implications of implementing the blue economy accounting model for tuna fishery on fisher groups in Maluku Province using the Adaptive Strategic Policy Analysis Model approach fisher groups. The research procedure includes nine stages, as stated in Figure 2.

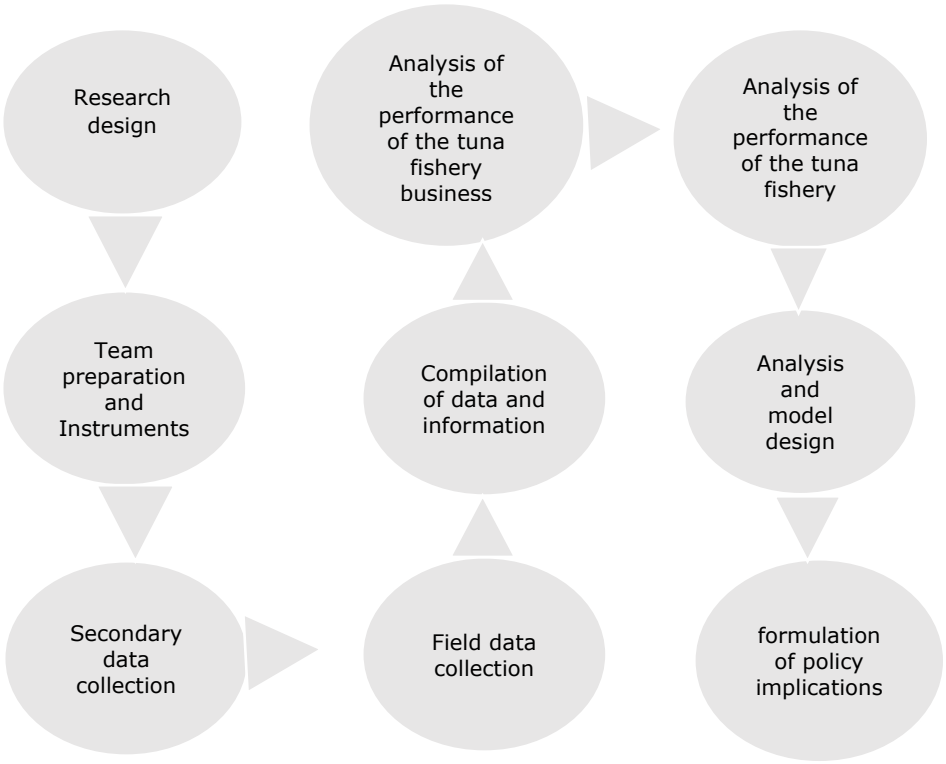

Figure 2. Research procedure.

Results and Discussion

Condition of tuna fisheries business in Maluku Province

Fishing vessels used. The identification results found that the vessels used by tuna fishers are divided into 1) Vessels of a size <10 GT, owned by both individuals and companies, and vessels of a size <5 GT, owned by individuals. 2) Vessels >10 GT owned by companies or individuals are used in Galala, Hative Kecil Ambon City, Tulehu Village, Salahuttu sub-district, and Tehoru sub-district, Central Maluku district. The average size of tuna fishing vessels <10 GT found in the research location ranges from 14 to 19 meters, with a width of 3-4 m and a depth of 1.4-1.75 m. Most of huhate vessels are built of of FPR (Fiber Reinforced Plastic), using an inboard biodiesel-fired engine system with a capacity of 115 HP-225 HP. Vessels <5 GT were found in Latuhalat Village, Ambon City, Buru Regency, Ureng Village, Asilulu, Hitu Village, Leihittu Subdistrict, Wahai Village, West North Seram Subdistrict, Tehoru Subdistrict, Amahai Subdistrict, Salahuttu Subdistrict, Central Maluku Regency, West Seram Subdistrict, West Seram Regency (Kawa Village), and Sesar Village, East Seram Regency. The size of the vessels varied between 7 and 9 m (average 8.3 m) length, 0.9 to 1 m width and 0.7-0.9 m depth. The overall gross weight of tuna fishing boats is 1.2-1.5 GT. Fiberglass (FPR) is used for boat construction, whose engines are of 15-40 HK, being fueled by Gasoline/Pertalite and Kerosene.

Tuna fishing gear. Tuna fishing gear at the research site depends on the type of vessel size used, namely:

- In Galala Village and Hatiwe Kecil Ambon City, vessels are above 10 GT, while the fishing gear used is Tonda, Huhate (pole and line), and Long Lines (Rawai Tuna). Tonda fishing gear consists of fishing rods, roller ties, and hooks. The size of ties and hooks varies depending on the targeted catch and on the type of huhate fishing gear. Long lines fishing gear consist of baskets using floats and hooks, with a distance of 60 meters between branch lines.
- At the Latuhat, Ureng, Asilulu, Hitu, Kawa, Wahai, Parigi, Sesar villages and the villages in Buru Regency, fishing is performed mostly by vessels under 5 GT with tonda or hand line fishing gear.

Tuna fishing area. Tuna Fishing Areas in Maluku Province are located in fisheries management areas 714 (Banda Sea) and 715 (Seram Sea). On average, tuna fishers from Galala, Hative Kecil, and Tulehu villages who have fishing grounds up to the southern part of Seram Island and Buru Island, are using fishing boats above 30 GT. Meanwhile, tuna fishers with fishing grounds around the location of residence, up to 25 miles from the coast, use boats below 5 GT.

Tuna production. Tuna Fisheries Production in Semester 1 of the Year 2022 in 5 regencies/cities, which are the research locations, amounted to 17,806 tons, with the most significant production in Central Maluku Regency by 49.7% and West Seram Regency by 24.7%. The lowest Tuna Fisheries Production in the Buru district was 3.22% or 574 tons, with 87.6% of the fishing gear used being Tonda Fishing rods. Table 1 shows tuna production per regency/city in Maluku, Indonesia.

Table 1

Tuna production by fishing gear, by regency/city in Maluku, Indonesia

Regency/City	*2022*					
	Tonda	*Line fishing*	*Rawai tuna*	*Huhate*	*Kite fishing line*	*Total production*
Buru	230	191	-	-	153	574
Ambon City	2.907	-	99	-	-	3.006
Central Maluku	7.888	257	6	699	-	8.850
Seram Bagian Barat	3.685	12	-	672	31	4.400
Seram Bagian Timur	882	-	94	-	-	976
Total	15.592	460	199	1.371	184	17.806

Accounting for tuna fisheries business. Based on the results of the research conducted, the accounting process carried out by tuna fishers in Maluku Province is a simple recording process of cash inflows and cash outflows. Cash inflows results from catches multiplied by the price received by fishers. The amount of income depends on the number of fish caught, the fish's size, and the fish's price (Tai et al 2017). The price of fish depends on the size of the fish. Large fish are more expensive than small fish.

$$\text{Revenue} = \text{Total Catch Revenue} - \text{Total Cost}$$

$$\text{Total Catch Revenue} = \text{Number of Fish Caught} \times \text{Fish Price}$$

Cash outflows include the costs incurred, both fixed and variable. Fixed costs incurred by fishers are the cost of maintaining fishing gear and machinery. The status of fishing gear used by fishers is all privately owned, so fishers must carry out maintenance costs for the sustainability of their business. Variable costs incurred by fishers include daily operational costs used by fishers at sea. The variable costs are food, fuel, bait, and cigarettes. The total cost can be calculated using the formula (Chen et al 2017):

$$\text{Total Cost} = \text{Variable Cost} + \text{Fixed Cost}$$

The results of interviews with tuna fishers in Maluku Province indicate that they have an average operational time at sea of 15-20 days a month, so the calculation of income and costs is adjusted to the number of fishing days. Operational time at sea also depends on natural weather conditions in the Maluku region. Therefore, the total income and costs are also very dependent on the operations of fishers at sea. Based on the study's results, the net income (Table 6) of tuna fishers can be calculated based on the costs (Tables 2-4) and revenues (Table 5).

Table 2

Variable costs of tuna catch fishers business

Description	*Total (USD/Day)*	*Total (USD/Month)*
Food costs	3.3	50
Fuel cost	20	300
Feed cost	3.3	50
Cigarette cost	2.8	43
Total variable cost	29.4	443

Table 2 illustrates the variable costs of fishers used once at sea, including the cost of food or consumption at sea per day USD 3.3. The total monthly operation for food costs is USD 50. This food cost does not include the cost of drinks because fishers bring their drinks from home. The fuel cost of diesel or gasoline for the engine, while at sea, is USD 20 per day, so that the total monthly operation cost is USD 300. Bait costs include fish bait for one fishing trip, which is USD 3.3 per day, -so the total monthly operations cost is USD 50. Cigarette costs during fishing are of USD 2.8 per day, so the total operational costs per month are USD 43. The total variable cost fishers incur for one day at sea is USD 29.4, so the total operational cost per month is USD 443.

Table 3

Fixed costs of tuna catch fishers business

Description	*Total (USD/Day)*	*Total (USD/Month)*
Maintenance cost of fishing gear and machinery	6.67	100
Total fixed cost	6.67	100

Table 3 shows the total fixed costs of fishers that must be incurred to maintain personally owned fishing gear and machinery. The cost of maintaining fishing gear and machinery used once at sea amounts to USD 6.67, so the total fixed cost for a month is USD 100.

Table 4

Table of total variable costs and fixed costs of tuna catch fishers business

Description	*Total (USD/day)*	*Total (USD/month)*
Total variable cost	29.53	443
Total fixed cost	6.67	100
Total cost	36.2	543

Table 4 shows the total variable and fixed costs, so that the total cost per day incurred by fishers is USD 36.2 - and the total cost for a month is USD 543.

Table 5

Business income of tuna catch fishers

Description	*Total (USD/day)*	*Total (USD/month)*
Number of catches	100 kg	1.500 kg
Price	1.2	1.2
Total catch receipts	120	1,800

Table 5 illustrates the fishers' income per day obtained from the number of catches x price with a total of USD 120 - so the total income per month is USD 1,800.

After calculating the costs and income experienced by fishers, their profit/loss can be calculated with the formula (Jayathalika 2020):

Profit/loss = revenue - total expenses

Table 6

Table of business income of tuna catch fishers

Description	*Total (USD/day)*	*Total (USD/month)*
Revenue	120	1,800
Total cost	36,2	543
Profit/Loss	83,8	1,257

Table 6 is the profit per day and per month generated by fishers once at sea. The income value is based on the results of Table 5 and total costs are based on table 4, so that fishers profit/loss per day, once at sea, is USD 83.8 (USD 120-USD 36.2) or USD 1.257 per month (USD 1,800–543).

The profit/loss value calculated in the current study is based on questionnaires and interviews with fishers at the research location. The profit owned by fishers only sometimes matches the study's calculation due to other factors related to the condition of the fishers. Internal factors include fishers' health conditions or religious holidays, and external factors are usually due to uncertain weather conditions or fluctuating fuel costs.

In addition to carrying out business activities at sea, fishers also make simple records every time they do fishing business. The record includes all expenses and fish sales results to obtain the profit or loss, as illustrated above. Fishers perform their bookkeeping based on:

- Individual Record Book (individuals/business groups level), containing records of fishers every time they go to sea, such as expenses, catches, and sales.
- Goods Inventory Book (individuals/business groups level), containing the type of goods, condition of goods, and acquisition of goods from purchases or grants.
- Minutes of Meeting (business groups level), containing the meeting's day/date/place, meeting agenda, discussions held, solutions, and recommendations for the fisher group and its members.
- Activity Plan (business groups level) contains a description and volume of activities, time of implementation, and place of implementation of activities by fisher business groups.
- Savings and Dues Book (business groups level) contains the name of the fishers, the savings that are deposited each time and the membership fees that must be paid monthly by members of the fisher business group.
- Loan Book (individuals/business groups) contains the fishers' name, loan date, loan amount, and repayment made by the fishers.

The existing records and books are expected to be a tool for better control, documentation, decision-making, monitoring and evaluation, also improving the business viability.

Model. The Tuna Fisheries Blue Economy Accounting Internalization Model (INABET) in Maluku Province is a Smart PLS 3 developed on the path diagram design in Figure 1 above, without too many modifications to improve the model fitting. The modifications made at this stage are only to accommodate the field data pattern so that the coefficient of influence that characterizes the interaction pattern in the model can be read. The results of the Smart PLS 3 of the Tuna Fisheries Blue Economy Accounting Innovation Model called the Internalization of Tuna's blue economy accounting (INABET) in Maluku Province, using the field data collected, is presented in Figure 3.

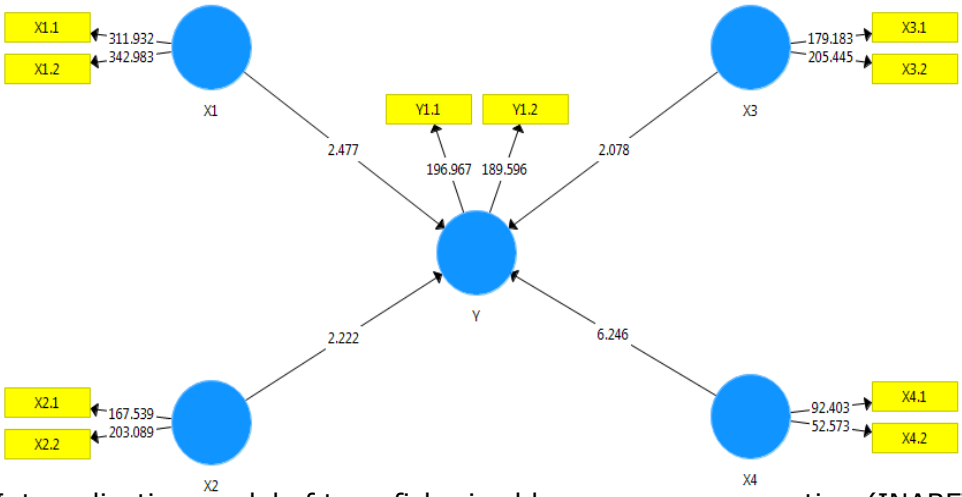

Figure 3. Internalization model of tuna fisheries blue economy accounting (INABET) in Maluku Province, Indonesia.

Table 7

Validity and reliability

Constructs	*Items*	*Loading*	*AVE*	*CR*	*A*
Fishing business	FB 1 FB 2	0.991 0.992	0.983	0.992	0.983
Spending rate	SR 1 SR2	0.978 0.980	0.958	0.979	0.956
Distribution & marketing	DM 1 DM 2	0.995 0.995	0.990	0.995	0.990
Income	IM 1 IM 2	0.983 0.979	0.962	0.981	0.961
Blue economy added value	BEA 1 BEA 2	0.978 0.978	0.957	0.978	0.955

The result of the validity and reliability checks are exhibited in Table 7 below. To test the internal consistency, the values for composite reliability (CR) and Cronbach's α was checked. The results in Table 7 indicate that the constructs have internal consistency: the values for CR and Cronbach's α are greater than 0.70. As well, indicator reliability was checked by analyzing factor-loading values. According to Hair et al (2016), factor loading should be greater than 0.70 to ensure indicator reliability. In this case, the values for all indicators are greater than 0.70. This shows that all indicators meet their loading goals in their respective constructs. Furthermore, the convergent validity was confirmed of the constructs by checking the values for average variance extracted (AVE). The AVE values for all constructs were greater that recommended threshold level of 0.50, indicating that all constructs were convergently valid.

Table 8

Fornell-Larcker criterion

	X1	*X2*	*X3*	*X4*	*Y*
X1	0.992				
X2	0.737	0.979			
X3	0.376	0.456	0.995		
X4	0.561	0.625	0.261	0.981	
Y	0.695	0.743	0.412	0.781	0.978

The Forner-Larcker criteria were applied to ensure discriminant validity, as shown in Table 8. According to those criteria, the square root values of the AVE were greater than the inter-construct correlations. In this study was confirming discriminant validity, because the square root values of the AVE were greater than the inter-construct correlations.

Table 9

Result of the structure model

	Original sample (O)	*Sample mean (M)*	*Stand. Dev. (STDEV)*	*T Statistics (|O/STDEV|)*	*P values*	*Result*
X1 -> Y	0.207	0.208	0.084	2.477	0.014	Significant
X2 -> Y	0.240	0.230	0.108	2.222	0.027	Significant
X3 -> Y	0.097	0.103	0.047	2.078	0.038	Significant
X4 -> Y	0.489	0.499	0.078	6.246	0.000	Significant

The results of the structure model testing are showed in Table 9. They exhibited that fishing business (T=2.477, P values=0.014<0.05) had a significant on blue economy added value. Then spending rate on blue economy added value (T=2.222, P values=0.027<0.05), had a significant influence. Likewise, distribution & marketing (T=2.078, P values=0.038<0.05) had a significant on blue economy added value. However, income had a significant influence on blue economy added value (T=6.246, P values=0.000<0.05). Thus, the fishing business, spending rate, distribution and marketing, income have a significant effect on the blue economy added value.

Policy implications of implementing the blue economy accounting model for tuna fisheries in Maluku Province. The principles of the blue economy aim to generate economic growth in the marine and fisheries sector while ensuring the sustainability of resources (Techera 2018). The blue economy concept is based on a comprehensive development of the people's economy in order to achieve overall national development. Sustainable development, including the blue economy concept, has become mainstream in economic development policies in various countries, including Indonesia. The principle of the Blue Economy emphasizes the innovation and creativity in processing raw materials into other derivative products without leaving waste (Smith-Godfrey 2022). Policy implications of the blue economy accounting model for tuna fisheries in Maluku Province are derived from the results of the study, such as the intensity of business activities (concentration of tuna fisheries), expenditure levels, distribution and marketing, and income, along with the various dimensions described above, as well as the INABET model that has been generated. Several policy implications are generated, namely: 1) Development of assistance to tuna fishing groups; 2) Development of appropriate technology for handling tuna catches; 3) Increased tuna fisheries production; 4) Development of tuna fisheries infrastructure; 5) Capacity building of fishers in the development of fishing fleets; 6) Optimization of marketing of catch products; 7) Increased access of fishers in reaching fishing areas; 8) Provision of supporting facilities and infrastructure for fishing; 9) Improving and strengthening the capacity of Human Resources (HR) through training, education, and institutions; 10) Increasing the independence of fishers in fishing business investment; 11) Increased supervision at the government and community levels. The blue economy principles applicable to the INABET Model for policy elaboration in Maluku Province that can be done includes:

Minimum waste principle. Fish head waste generated at TPI is large, some reaching as much as 1,000 kg day^{-1}. The waste can only be processed by boiling and drying it into kroposan. Thus, kroposan is a processed product from fish waste in the form of flour. The kroposan cannot be processed by the fishing community itself, but it is sold to mills for making animal feed. The water used to boil fish scraps is a problem in itself. In addition to the smell of used cooking water that disturbs the environment and invites many flies, processors throw the used cooking water to the beach, causing pollution around the beach.

Based on the above problems, the blue economy principles can be applied by introducing the technology of stew processing of the fish head and bones waste into ingredients for making fish meal.

Social inclusion principle. Social, as a blue economy principle, is an activity that all people can carry out, not limited to specific groups. Opportunities for applying blue economy principles in Maluku Province include using liquid waste in the form of old water in salt ponds, crab cooking water, and solid waste left over from fish in the form of fish heads and livers. In addition, many fish also fall into waste at the TPI that can be collected to be utilized. In principle, all the opportunities identified can be done by anyone and all community members without complicated technology and inexpensive costs. The management of liquid waste in the form of old water, for example, can be used for tofu-making water. Similarly, solid waste in the form of remains of fish heads and fish wasted at TPI can be a source of income for anyone who wants to dry and process as raw material for fish meal. They can do this economic activity opportunity without using complicated technology and expensive costs.

Adaptation and innovation. The form of adaptation and innovation carried out by the tuna fishing community in Maluku Province is to use chicken feather lure as replacement for live bait. Also, using artificial bait with live bait is a form of adaptation by fishers to make fishing efficient which can reduce the operational costs incurred.

Multiple effects. The tuna fishery commodity in Maluku Province has the opportunity to create multiple effects. The multiple effects mean that the business can create alternative livelihoods that can improve the household economy. It can be a strategy for tuna fishers facing famine in tuna fisheries in Maluku Province.

Conclusions. The tuna fisheries blue economy accounting internalization model (INABET) in Maluku Province it has been appropriately adopted to support the development of tuna fisheries in Maluku Province. The urgency of this research is that the application of blue accounting helps revealing the environmental problems, through a reporting process related to the environmental conservation status. The results of this study can provide a blue economy accounting model for fishers in Maluku Province. This model can also be implemented by the local government, specifically within the Marine and Fisheries Service, at the provincial and regency/city levels. The implication is the strengthening fishers' general capacity to manage their business based on an environmentally sound accounting.

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Conflict of interest. The authors declare no conflict of interest.

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