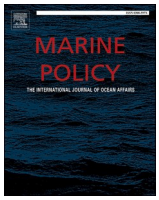
Marine Policy 170 (2024) 106379

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol



Full length article

Alternating livelihoods and coping with shocks: An examination of coastal tourism in Indonesia amidst COVID-19

Ivana Suradja [a,*], Theresia Susanti Asih [b], Basir [c], Dysi Polite Dyspriani [b], Hilda Lionata [d], Aby Marsiyono [d], Bambang Adhitya Nugraha [b], Tiara Intan Palupi [c], Indra Adi Putra Salam [c], Liliana Sierra Castillo [e], Asri Toldo [f], Andi Trisnawati [c], Erendira Aceves-Bueno [a]

[a] School of Marine & Environmental Affairs, University of Washington, Seattle, USA
[b] Directorate General of Marine Spatial Management, Indonesian Ministry of Marine Affairs and Fisheries, Jakarta, Indonesia
[c] Yayasan Konservasi Alam Nusantara, Berau, Indonesia
[d] Yayasan Konservasi Alam Nusantara, Jakarta, Indonesia
[e] Bren School of Environmental Science & Management, University of California, Santa Barbara, USA
[f] Berau Culture and Tourism Agency, Berau, Indonesia

ARTICLE INFO

Keywords:
Fisheries
Tourism
Livelihood diversification
Indonesia
Coping
Shocks

ABSTRACT

Coastal tourism is often presented as an alternative to fishing. Despite the optimistic outlook, tourism development has its own challenges, namely its high susceptibility to market and environmental shocks, the limited evidence demonstrating its supposed benefits, and the new issues that may arise with the introduction of tourism to an area. In countries where coastal tourism plays a notable role in the economy, understanding the consequences of its development and the extent that it is impacted by shocks are critical for the development and implementation of programs and policies that effectively address the needs of local communities. This research used a complementary mixed methods approach to study five rural coastal fishing villages in Indonesia that are in the process of developing marine tourism to better understand the social consequences of tourism development and how it impacts individuals' capacity to cope with shocks, utilizing the COVID-19 pandemic as a case study. Overall, the findings shed light on the advantages of simultaneously engaging in multiple alternative livelihoods under changing conditions and in the face of shocks. The findings also highlight the importance of considering their interconnections and incorporating strategies to cope with potential shocks when planning coastal development strategies worldwide.

1. Introduction

The past few decades have witnessed a significant growth in global tourism. Just between 1995 and 2019, total international tourist arrivals have jumped from 543.02 million to 1.76 billion [36,90]. This is partly driven by the use of tourism as a tool to bring about development and sustainability for many communities around the world [71,86]. Community-based tourism (CBT), a type of tourism that incorporates community involvement and control, equity, as well as socio-cultural sustainability, is sometimes placed at the center of these discussions [50]. In coastal areas, CBT is often proposed as an alternative livelihood to fisheries [12,59].

To study livelihood diversification, the Sustainable Livelihoods Framework (SLF) is particularly useful. The SLF has often been used in discussions on livelihoods at the intersection of development and sustainability [73]. The framework consists of five elements: context, livelihood resources, livelihood strategies, outcomes, and institutional processes [73]. Among the livelihood strategies is livelihood diversification—the process of acquiring alternative livelihoods or additional activities for income generation [73,8]. This allows communities to enhance resilience by reducing their dependency on certain resources [22,23,8], enabling them to better adapt to and potentially transform in response to environmental and social changes.

The resilience of social-ecological systems is defined by their ability to cope with, adapt to, or transform with changing environments and social conditions [15,29,68], including in the event of shocks [22]. Coping refers to the immediate, short-term actions taken by individuals or communities to manage and survive during "unusual, abnormal, and

* Corresponding author.
E-mail address: suradjamdi@gmail.com (I. Suradja).

https://doi.org/10.1016/j.marpol.2024.106379
Received 31 January 2024; Received in revised form 13 August 2024; Accepted 24 August 2024
Available online 5 September 2024

adverse situations" ([89] p.113). Transformation, on the other hand, involves systemic changes that fundamentally alter the structure and functioning of a community [15,29,68]. This often includes shifts in livelihoods, ecosystem services, economic systems, power relationships, and governance arrangements such as exiting a fishery or changing seafood import, export, and supply patterns due to fisheries decline or disruption [16,32]. Adaptation is a more gradual process of adjusting to changes, often through strategies that enhance the system's resilience without drastically altering its fundamental structure [15,29]. Livelihood diversification is a form of adaptation, but if new livelihoods are sustained over time, they can lead to transformation, particularly if they result in significant shifts in the community's economic base and social relationships.

However, it is worth noting that coping and building resilience are not the only drivers of livelihood diversification. In the context of fishing communities, the introduction of alternative livelihoods often rests in incorrect assumptions about fisheries, including that it is always a full-time occupation [3] and that fishers are poor and would replace fishing with higher-earning activities [74]. In reality, other than income-related factors, non-income factors such as gender, enjoyment, and personal attachment to the old livelihood may also influence an individual's likelihood to diversify their livelihoods [23,42,58,70]. Furthermore, other than for survival or last resort, individuals may engage in fishing for other reasons, including recreation [76]. Thus, potential benefits such as higher earning potential and environmental preservation do not guarantee that individuals would fully abandon fisheries for newer livelihoods such as tourism. In fact, the introduction of alternative livelihoods to fishers is more likely to lead to fishers diversifying their income portfolio instead of abandoning fisheries altogether [43].

Despite the optimistic outlook, tourism development has its own challenges. Empirical evidence demonstrating its supposed benefits are scarce [14] and the introduction of tourism to an area may in fact give rise to new issues such as conflicts between stakeholders [19,25], concerns regarding land tenure [26], and environmental degradation from unsustainable tourism practices [31,35,41]. Another shortcoming of the tourism industry is that it appears to be particularly susceptible to shocks. For instance, although the coronavirus disease of 2019 (COVID-19) pandemic was primarily a health crisis, it also shocked the global economy [69] and heavily impacted the tourism industry. Tourism's contribution to global gross domestic product (GDP) plummeted by 50.4 % from US$ 9630 billion in 2019 to US$ 4775 billion in 2020 [92]. At the local level, CBT was not exempt from these detrimental effects [40,53]. In a period of fast-changing markets and an impending climate crisis, more shocks may be expected to occur and further threaten the tourism industry.

In the context of coastal tourism, the situation may be exacerbated by challenges unique to coastal and marine social-ecological systems. Factors such as the higher variability and mobility of marine resources and their users as well as higher potential of natural disasters and conflicts in these systems make them unique, but also expose them to greater risks and uncertainty [27]. Thus, introducing new livelihoods to these systems requires more holistic approaches that are sensitive to local contexts while also adaptive to changing conditions [27,45,83]. In countries where coastal tourism plays a notable role in the economy, understanding the consequences of coastal tourism development to local communities and the extent of the impacts of shocks to the industry is critical. This would facilitate the development and implementation of programs and policies that address the needs of local communities that may be impacted by present and future shocks. This is especially true for areas that are still in the process of developing tourism or are more remote and may have less access to mitigation measures.

To address this need, this research used a complementary mixed methods approach that included field observations and semi-structured interviews in five rural fishing communities in Indonesia that are in the process of developing coastal tourism. Before the pandemic, tourism contributed to 5.6 % of Indonesia's GDP [91] and an estimated 29 % of tourist expenditures in the country occured in coastal, non-urban areas [77], making it an excellent location to conduct this research. Despite the local context of this research, the findings could also be used to the benefit of practitioners of marine tourism and other relevant marine sectors in other regions.

The findings from this research are divided into two parts. The first part explores the extent of tourism development in the five study sites, highlighting the social consequences of the introduction of this alternative livelihood to community members as well as their involvement and views on tourism and fisheries. The second part consists of a case study of the COVID-19 pandemic to understand how individuals with different levels of involvement in the two industries are impacted by and respond to the pandemic. Overall, the findings shed light on the advantages of simultaneously engaging in multiple alternative livelihoods under changing conditions and in the face of shocks, such as the COVID-19 pandemic, as well as the importance of considering their interconnections and incorporating strategies to cope with potential shocks when planning coastal development strategies worldwide.

2. Methodology

2.1. Research design

The SLF, specifically its outcomes and livelihood strategies components, was used as the basis of this research. In particular, this research explored the impacts (outcomes) of livelihood diversification (livelihood strategy) through the introduction of tourism as an alternative livelihood to rural fishing communities in Indonesia. This was done using a complementary mixed methods approach where quantitative and qualitative data were simultaneously collected and analyzed with more emphasis given on the qualitative data [48]. This allowed for the exploration of both general trends among respondents and individual responses which would help create a more in-depth and holistic understanding of the research topic.

2.2. Study sites

Data collection was conducted in Teluk Alulu, Teluk Harapan, Payung-Payung, Bohe Silian, and Teluk Semanting Villages in Berau Regency (Fig. 1). Teluk Alulu, Teluk Harapan, Payung-Payung, and Bohe Silian are located on Maratua Island, an atoll northeast of Kalimantan Island. Teluk Semanting is located on the Berau River delta on mainland Kalimantan Island. Due to their proximity to marine resources, fishing is a prominent occupation in the study sites (Table 1). In Teluk Alulu, the majority of the villagers are fishers [94]. In Teluk Harapan, Bohe Silian, and Payung-Payung it is the third largest occupation group after students and housewives [57,7,79]. In Teluk Semanting, fishers are the fourth largest occupation group after students, housewives, and farmers [81].

Tourism has also been shown to be a notable industry for this area. Tourism has the third largest contribution to Berau Regency's revenues after mining and palm oil [39]. In 2020, the tourism sector contributed IDR 23 billion, or 9.84 % of the regency's total revenue, and provided 2613 jobs [33]. A total of 301,015 domestic and international tourists visited the regency in 2019, though this number dropped to 127,396 in 2020 due to the COVID-19 pandemic [78]. In recent years, the five study sites have also become the target of several coastal tourism development strategies and programs from both the public and private sectors [46,5,62,65]. This, coupled with their status as either current or potential sites for the environmental non-governmental organization (NGO), YKAN's (*Yayasan Konservasi Alam Nusantara*), conservation programs, make the five villages suitable study sites for this research.

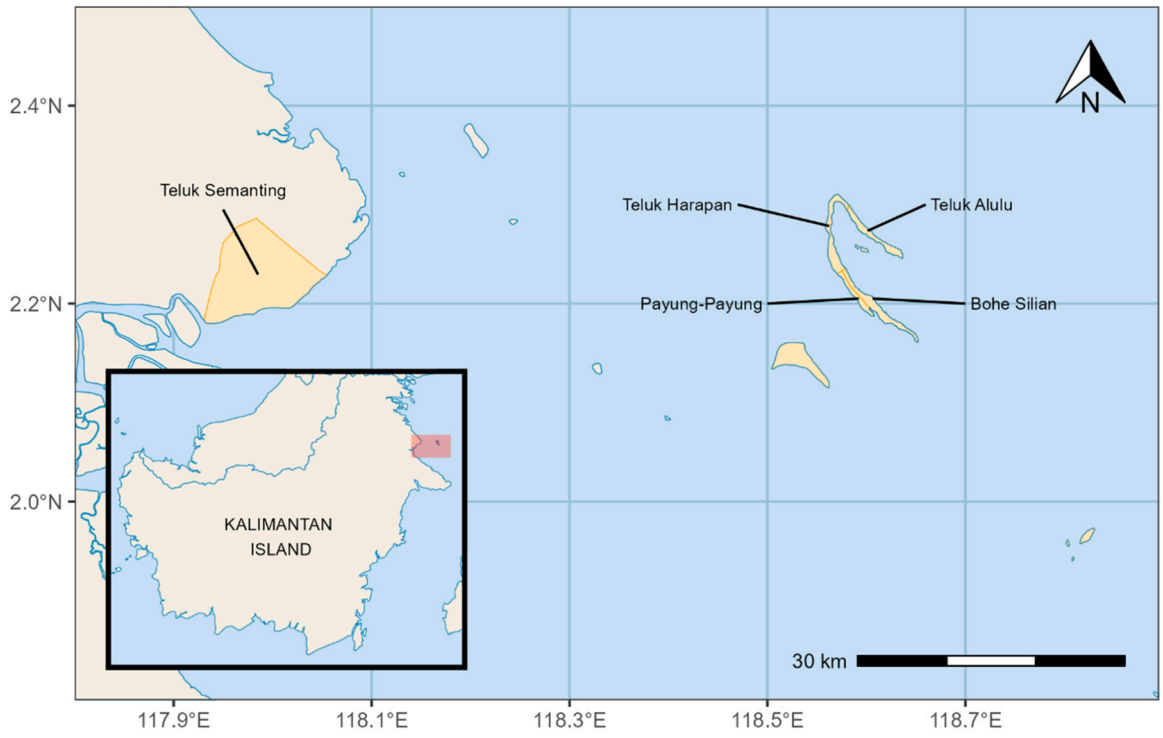


Fig. 1. Map of the study sites (spatial data from [37] and [52]).

Table 1
Summary of population statistics in the study sites.

	Teluk Harapan	Bohe Silian	Teluk Alulu	Payung-Payung	Teluk Semanting
Total Population	1208	1156	820	744	736
Fishers					
Number of fishers	203	237	N/A	142	57
% of total population	16.80	20.50	N/A	19.09	7.74

Data compiled from [7,57,79,81,94].

2.3. Data collection

Fieldwork was conducted between August and October of 2022 and was divided into two periods for methodological purposes. The first period was performed to better understand the extent of tourism development in each site while finalizing research administration, permits, and logistical preparations. During this period, information on tourism development in the study sites was gathered through field observations, a review of government documents, as well as informal interviews with villagers, local government officials, and YKAN staff. The second fieldwork period was dedicated to conducting interviews with the villagers. The interviews were conducted at the individual level to i) investigate respondents' level of participation in fisheries and tourism activities, ii) understand community-level consequences from tourism development, and iii) explore the effects of external shocks, such as COVID-19, on both the fisheries and tourism industries.

The interviews were semi-structured [1], comprising both survey and open-ended questions to allow a certain level of standardization of the type of information collected among respondents, but also to provide room for respondents to share further. All interviews were conducted by the lead author who is an Indonesian national in Indonesian language. Throughout the data collection, the lead author was assisted by at least one YKAN field staff in each study site who are familiar with the area to help provide additional information, including local customs as well as administrative procedures that the author should be aware of as suggested in the frameworks by Buchanan et al. [9] and Johl & Renganathan [38]. Following recommendations provided by YKAN during the research design stage, the interviews were conducted in the respondents' homes, workplaces, or in public settings, and the responses were collected through handwritten notes instead of an audio or video recording device. This was to create a more comfortable ambience and help build rapport with the respondents, although this may have also led to a certain degree of data loss because there were no verbatim records of the responses. After data collection, all the notes were transcribed for data analysis.

Respondents for this research were i) residents of the study site, ii) aged 21 years or above, and iii) experienced in fisheries and/or tourism. Sample selection was done using a snowball sampling method, specifically exponential discriminative snowball sampling where respondents were asked to refer other potential respondents, though not all were necessarily interviewed by the researchers [6,87]. This way, the respondents could help identify other individuals that meet the criteria as they were more familiar with the occupations of other residents. Furthermore, individuals were more willing to be interviewed when they were recommended by people that they know. The first few respondents in each village were key informants who were selected based on recommendations from YKAN field staff, village officials, and other residents. The key informants were individuals who were considered able to provide in-depth insights relating to the research topic, could help provide access to other individuals in the community, and were known to be willing to support initiatives such as this research project. Subsequent respondents were selected from the individuals recommended by respondents based on their compatibility to the respondent criteria as well as availability and willingness to be interviewed.

In total, 55 respondents were interviewed, 10 respondents each from Teluk Alulu and Payung-Payung, 11 respondents from Teluk Harapan, and 12 respondents each from Bohe Silian and Teluk Semanting. The respondents included both male and female individuals. However, gender as well as other social categories of the respondents were not used as variables in the analysis. The following sections describe in

detail other parameters that were used in the analysis. The limited number of respondents per village and use of snowball sampling, a non-probability sampling method, in this research meant that there was a certain level of bias in the sampling [6]. Nonetheless, considering the exploratory nature of this research, the small population size, and that the initial respondents were identified through competent sources, the sample was considered sufficient to represent the study population and appropriate for this research.

2.4. Data analysis

Quantitative data analysis was done through descriptive statistics for the responses to the survey questions using R version 4.3.1 (2023–06-16 ucrt) and RStudio 2023.06.1+524 [60,64]. Qualitative analysis was done by reading through the interview transcripts, identifying codes and themes, followed by finding and interpreting relationships between codes and themes on the responses to the open-ended questions using ATLAS.ti Windows version 9.1.7.0 [17,4].

2.5. Tourism development

Tourism development in the study sites was characterized based on marine tourism potential and attractions, site accessibility, infrastructure and amenities, as well as category of tourism development according to standards from the Ministry of Tourism and Creative Economy (MTCE) and the Ministry of Marine Affairs and Fisheries (MMAF) of the Republic of Indonesia. This allowed for an objective comparison of the extent of tourism development based on actual conditions observed during data collection as well as based on nationwide standardized scoring systems. To better understand the extent of tourism development at the individual level, the respondents were categorized based on i) the industry that they were involved in (tourism-only, fisheries-only, or both), ii) their main source of income (tourism, fisheries, or other), and iii) their own positioning between the two industries.

To determine respondents' involvement in the two industries, they were asked to mention all the tourism and fisheries-related activities that they have participated in their lifetimes. Respondents who have taken part in at least one activity from an industry was considered to be involved in said industry. With regards to the respondents' positioning between the industries, respondents were asked if they felt like they had transitioned to tourism. Considering the variety of potential determinants for diversification, respondents were allowed to have their own interpretation of "transitioned". It should be noted that in the interviews, when the question was asked in Indonesian, the term used was closer to "switched" rather than the literal translation of "transitioned". This was solely for practical purposes as "switch" is more often used in day-to-day Indonesian compared to "transition".

2.6. Fishing behavior

Fishing effort was calculated to study the impacts of the introduction of tourism towards fishing behavior among individuals. Fishing effort can be measured based on the fishing power (nominal fishing effort) and efficiency (effective fishing effort) of fishers [44]. In this research, both were considered by assigning each respondent scores for i) gear selectivity based on the types of fishing gear used and ii) time spent on fishing in a week. Each respondent's total fishing effort was then calculated using the following novel formula:

$$\text{Fishing effort} = \text{gear selectivity} \times \text{fishing time}$$

To generate scores for gear selectivity, each fishing gear was ranked between 1–5 according to their selectivity, i.e., the gear's ability to only capture the intended fish species and size [21]. Rank values were assigned based on a review of existing literature on the selectivity of fishing gears used in Indonesia [11,21,28,54,55,61,75,85,93] and by giving a higher score to less selective fishing gear (Table 2). The resulting values were not scaled to their impact level, i.e., trawls are not five times less selective than octopus hooks. Thus, the values did not represent the actual scale of ecosystem impact each gear can have. However, they allowed for a comparison between fishing gear and individual fishing preferences. Since the objective of this research is mostly to compare results among individuals in different levels of involvement in tourism and fisheries, this was considered an appropriate level of accuracy. For respondents that used multiple gear types, a median score was taken from all the fishing gears used.

To calculate the scores for fishing time, respondents were asked the number of hours per day and number of days per week they dedicate to fishing. As not all respondents were able to state the specific number of hours and days, some providing ranges instead, fishing time was standardized using a scoring system whereby greater time spent on fishing was assigned a higher score (Table 3). A median score was used for respondents without a regular fishing habit. Total fishing time was obtained by multiplying the score for days by the score for hours. The use of scores for fishing time instead of the actual amount of time spent was appropriate given that this research only compared fishers within the same study area and with relatively similar fishing patterns.

2.7. Response to the COVID-19 pandemic

For the case study on the COVID-19 pandemic, respondents were asked about their personal experiences of or observations on how the pandemic affected the fisheries and tourism industries in their communities. In the thematic analysis, the effects were then categorized as the *impacts* of the pandemic towards the industries and *responses* to those impacts.

3. Results

3.1. Tourism development

Field observations, interviews with the villagers as well as local government and YKAN, complemented with a review of government and YKAN documents provided information on the history and extent of tourism development in the study sites (Table 4). The development of Maratua Island as a tourism destination was part of the national and regional governments' tourism development master plans [46,62,65]. On the ground, tourism development on the island began when a resort company from the neighboring island of Derawan expanded their resort chain to one of the smaller islands within the jurisdiction of one of the villages. Tourism growth was also stimulated by the various CBT development programs conducted by multiple government agencies, companies, universities, and NGOs. The villagers on Maratua Island are involved in the tourism industry by working at tourist accommodations or attractions, opening their own businesses, working freelance as a dive guide or speedboat motorist, or volunteering in local tourism interest groups.

Tourism development in Teluk Semanting, on the other hand, began around 2015, when an environmental non-profit organization worked together with the local village government to transform the village into a mangrove ecotourism village. Over the years, Teluk Semanting has also

Table 2
Gear selectivity.

Fishing gear	Score
Octopus hook, speargun, arrow, spear, slingshot	1
Handline	2
Longline, crab trap, lift net, net (unspecified)	3
Seine, gillnet, kelong	4
Trawl	5

Table 3
Fishing time.

Fishing time	Score
Number of days/week	
1–4	1
5–7	2
No pattern	2
Multiple-days trips	3
Number of hours/day	
< 8	1
8	2
No pattern	2
>8	3

received support in tourism development from multiple government agencies, companies, universities, and NGOs. However, much of the tourism initiatives in the village, including the construction of some tourism facilities, were conducted through the collective action of the villagers, spearheaded by a group of youths from the village who are dedicated to protecting and managing the village's mangrove forest. The villagers of Teluk Semanting are involved in tourism by participating in the local mangrove management team and tourism awareness group, opening shops and homestays, as well as producing snacks that are marketed towards villagers and tourists alike. In 2022, the mangrove ecotourism area and its management team were officially recognized through the regulations from the government of Berau Regency [66,67].

The marine tourism potential across the four villages on Maratua Island could build upon the island's natural features, namely coral reefs, beaches, outlying islands, lakes, caves, and mangrove forests, whereas Teluk Semanting only relies on its mangrove forest and beaches. All five villages can be accessed by sea. Payung-Payung has a small airport with a few scheduled flights to the island throughout the week, making it the only village on Maratua Island that can also be accessed by air, although upon landing, passengers may continue their journey to the other villages on the island. Due to its location on the mainland, Teluk Semanting can also be accessed by land, though the roads surrounding the village have only been recently constructed in the past few years. On Maratua Island, freshwater is only found in Teluk Harapan, meanwhile residents from the other three villages obtain it by harvesting rainwater or purchasing it from Teluk Harapan. Teluk Semanting has its own source of freshwater, but villagers also harvest rainwater as a supplement. 24-hour electricity and mobile network coverage can be acccessed in Teluk Harapan, Payung-Payung, Bohe Silian, and Teluk Semanting, though coverage at Bohe Silian and Teluk Semanting is relatively weak. Teluk Alulu, on the other hand, only has mobile network coverage, which at times is not stable, and electricity is generated through solar panels or household-owned generators. With regards to tourist accommodations, Payung-Payung and Teluk Harapan have homestays, cottages, resorts, and inns, while Bohe Silian and Teluk Alulu do not have inns, and Teluk Semanting only has homestays. Part of the tourism revenue generated from these tourist accommodations as well as the sale of tickets for tourism attractions on Maratua Island are directed to the villages.

All five villages are registered as tourism villages under the MTCE, but only Payung-Payung holds the title of marine tourism village under the MMAF [20,84]. Under the MTCE's tourism village program, villages are categorized in increasing level of tourism development as pioneer, developing, developed, and independent villages [84]. At the time of writing, Payung-Payung, Teluk Harapan, and Teluk Semanting are categorized as developing villages, while Bohe Silian and Teluk Alulu are pioneer villages. The MMAF's tourism village program is a separate program from that of the MTCE and focuses on villages with marine tourism potential. Villages can apply to participate in the program and receive different levels of support to further develop marine tourism in their villages based on their score at the time of application, whereby a score of 5 is assigned to villages with the highest level of tourism development and 1 to the lowest [47]. Payung-Payung is categorized as a level 1 village [20].

3.2. Consequences of tourism development

3.2.1. Individual participation and positioning

The introduction of tourism in the five villages led some of its residents to get involved in tourism activities. All 55 respondents interviewed for this research have had at least some experience in a type of fisheries or tourism activity in their lifetimes (Table 5). Out of 55 respondents, 8 were only involved in fisheries, 18 only in tourism, and 29 in both fisheries and tourism in their lifetimes. Respondents that were involved in fisheries have an average experience of 21 years (SD = 14.28 years, $n = 29$) in the industry, while those in tourism have an average of

Table 4
Tourism development, infrastructure, and potential at Payung-Payung, Teluk Harapan, Bohe Silian, Teluk Alulu, and Teluk Semanting, where "✓" denotes the presence of the marine tourism potential, access, or infrastructure in the corresponding village.

	Payung-Payung	Teluk Harapan	Bohe Silian	Teluk Alulu	Teluk Semanting
Marine tourism potential					
Beaches	✓	✓	✓	✓	✓
Islands	✓		✓	✓	
Coral reefs	✓	✓	✓	✓	
Mangrove	✓	✓	✓	✓	✓
Caves	✓	✓	✓	✓	
Lakes	✓	✓			
Access					
Water	✓	✓	✓	✓	✓
Land					✓
Air	✓				
Infrastructure					
Freshwater source		✓			✓
24-hour electricity	✓	✓	✓		✓
Mobile network coverage	✓	✓	✓	✓	✓
Tourist accommodations					
Homestay	✓	✓	✓	✓	✓
Inn	✓	✓			
Resort and cottage	✓	✓	✓	✓	
Tourism village category					
MTCE	Developing	Developing	Pioneer	Pioneer	Developing
MMAF	Level 1				

Compiled from field observations, interviews, and data from [7,20,57,79,81,84][94].

Table 5
Fisheries and tourism activities that respondents were involved in.

Activities
Fisheries
Fish near shore
Fish far from shore
Process fish (e.g., salted fish and fish fillet)
Sell or transport fish or fish products to other islands
Buy fish or fish products from other individual fishers
Build fishing boats
Participate in fish aquaculture
Tourism
Own or work at a homestay or other types of accommodation for tourists
Own or work at a restaurant that is visited by tourists
Own or work at a tourist attraction or destination
Own or work at a store that is visited by tourists
Own or work at a travel agency
Produce packaged food that is bought by tourists
Produce crafts or other products that are bought by tourists
Own and rent transportation for tourists (e.g., car, motorcycle, boat)
Drive transportation for tourists (e.g., car, bus, boat)
Rent equipment for tourists (e.g., dive gear, camera)
Guide or accompany tourists (e.g., dive guide, travel guide)
Work at a resort or other company that provides tourism services
Participate in tourism-related community events (e.g., interest group, volunteering)

7.69 years (SD = 5.97 years, n = 39) (Fig. 2). Just by comparing the years of experience in the two industries, it is evident that tourism was introduced later into the villages.

Of the 43 respondents who categorized their level of transition, 24 (55.81 %) felt that they have transitioned from fisheries to tourism, while 17 (39.53 %) felt that they have not transitioned, and 2 (4.65 %) felt that they were still in between or in the process of transitioning to tourism. Involvement in tourism appeared to be related to respondents' positioning between fisheries and tourism (Fig. 3a). Respondents who have only been involved in fisheries did not feel like they have transitioned, whereas those who were only involved in tourism were more likely to feel like they have transitioned. There also appears to be a relationship between the respondents' major source of income and positioning between the two industries (Fig. 3b). Respondents who earned most of their income from tourism tend to feel like they have transitioned compared to those who earned more from fisheries.

3.2.2. *Change in individual fishing behavior*

Given the strong overlap between respondents' positioning between fisheries and tourism, involvement between the two industries, and main source of income, for simplicity, only major source of income was used in assessing how it impacts the current fishing effort of respondents. Fig. 4 shows that respondents who received most of their income from fisheries were exerting greater fishing effort (mean = 11.96, n = 14) compared to those who received more from tourism (mean = 1.50, n = 2). Looking at fishing effort in greater detail, respondents with a major source of income from fisheries had higher and a greater range of gear selectivity (mean = 2.60, n = 15) and fishing time scores (mean = 4.37, n = 15) compared to respondents with incomes mostly from tourism (gear selectivity: mean = 1.67, n = 3; fishing time: mean = 1.00, n = 2) (Figure S1). This implies that they exerted more effort and used a wider variety of gears and fishing patterns, explaining the pattern in Fig. 4.

3.2.3. *Community-level consequences*

At the community level, tourism presented many new opportunities for the communities. These include giving rise to new occupations, as listed in Table 5, though shifting to tourism activities was not necessarily

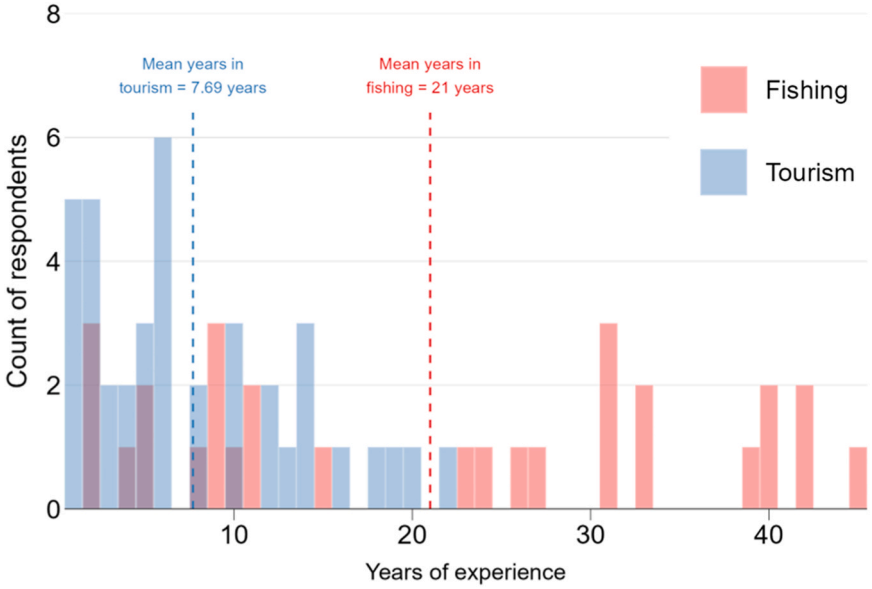


Fig. 2. Distribution of years of fishing and tourism experience among respondents. The dotted lines represent the mean years of experience.

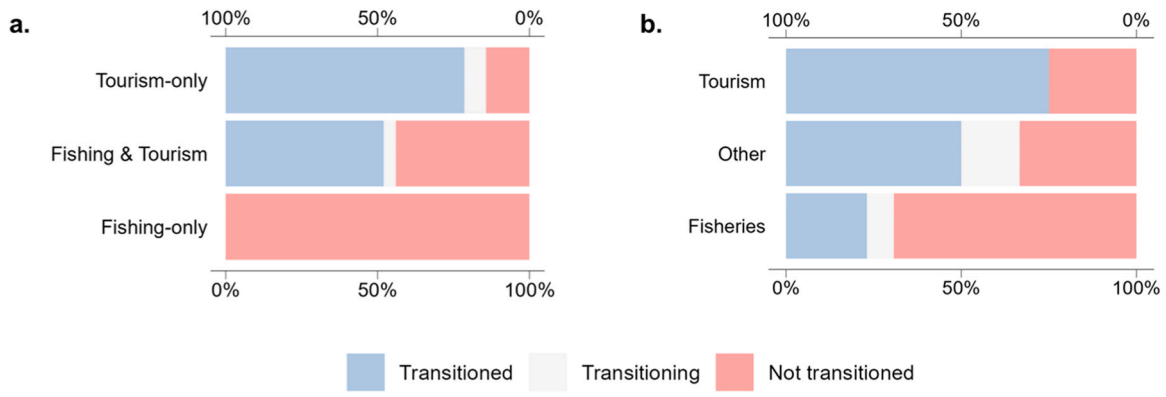


Fig. 3. Comparison of positioning between fisheries and tourism with a) industry involvement and b) major source of income.

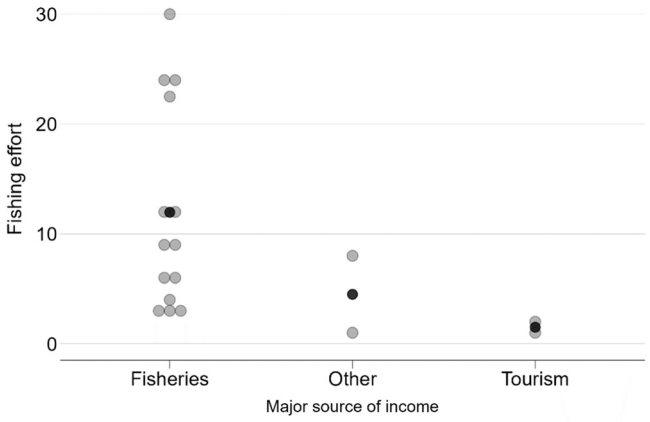


Fig. 4. Relationship between fishing effort and major source of income. Each gray dot represents one respondent. The black dots represent the mean fishing effort for each category.

an easy process, as exemplified by this experience from a fisherman from Teluk Semanting:

> They borrowed boats for fishing. There used to be a lot, but I rejected them. Fishing guests asked me to bring them, but I did not know the right spots and they could not catch the fish. The spot they want is different than where I would fish. I felt bad. So, I get other people to take the guests.

Indeed, several respondents viewed catering to the needs of and being responsible for the safety of their guests as one of the challenges of working in tourism.

Nonetheless, tourism also brought other benefits to the communities, including opportunities to develop new skills and interact with people outside of their villages, infrastructure development, as well as increased traffic into the villages which in turn helped grow the local economy. These benefits were observed and approved even by respondents who did not work in tourism, such as a fisherman from Bohe Silian who mentioned:

> Tourism in the village still needs to be further developed. Land should be developed into resorts so there are jobs and more tourists. Can sell fish and octopus to the resorts.

However, the villagers of Teluk Semanting were still not able to fully benefit financially from the tourism development in the village. At the time of data collection, the village was still not able to generate income from mangrove ecotours because they lacked the legal documents from the village government to authenticate the tourism activity. Without this document, fees imposed on tourists for the ecotours would be considered illegal fees. As a result, respondents that showed an interest in participating in the mangrove ecotours needed to take on other occupations where they could generate higher income to support their living. During the time this manuscript was prepared, the authors were informed that this legal document was released at the beginning of 2023 [80].

The introduction of tourism also gave rise to new issues. For example, ten respondents from Maratua Island commented on the topic of workers at the cottages and resorts on the island. Many of the cottages and resorts on Maratua Island preferred to hire people from outside of the island, sometimes to the dismay of the islanders, as expressed by a homestay owner from Bohe Silian:

> Tourism should first meet the villagers. Resorts should hire local people. People from outside later unless they are experienced. For example, a chef to cook western dishes.

It was only after complaints from the villagers and the intervention of the local government that resorts and cottages began to increase local employment. Indeed, the lack of skills or experience in tourism among the islanders appeared to be one of the reasons resorts were reluctant to hire them, as observed by a respondent from Teluk Harapan:

> Most only do contract work in resorts. Only their energy is taken, not their skills. They are not there yet. The constraint here is human resources whereas the government says that they must take in local people. Resorts have a dilemma.

However, at the same time, some local residents were said to be hesitant to work in resorts because they were not comfortable with or felt restrained by the obligations and rules of working in resorts.

The issue of ownership of tourism businesses and land on Maratua Island was also brought up by five respondents. A respondent from Teluk Alulu said that the tourism on the island was more of the outsiders, than the locals, while a respondent from Payung-Payung mentioned that as much as 50 % was owned by outsiders. Two respondents specifically commented on the selling of land. One of them, from Teluk Alulu, when asked what comes to mind when thinking of the island's natural environment said that he was sad and that it was a pity to see the lands get sold off. Though the researchers were not able to obtain official records on this, the YKAN staff on the island corroborated the statements of the respondents and mentioned that there was information that some of the land on the island have been sold, potentially to make way for more tourism businesses.

Another issue arising from tourism development was the overlapping use of resources, such as ocean space, between tourism and fisheries which have resulted in some tension or conflict between the two industries. Five respondents from Maratua Island mentioned disputes between fishers and divers who were utilizing the same area. A resort staff from Teluk Alulu provided a detailed account of a confrontation between the two groups:

> Case between resort guests and the people of Teluk Alulu in 2008. At low tide, guests are not allowed to dive because the fishers of Teluk Alulu always fish there. That place is the spawning ground for spotted coral groupers. When people were fishing, a speedboat passed by. Divers under the water were thrown anchor and a circular metal. It hit the diver's BCD (buoyancy control device). The anchor line was cut by the diver.

To avoid future conflicts, the fishers and dive operators came to an agreement. One respondent mentioned that there was a written agreement between the villagers of Teluk Alulu and one of the resorts stating that fishers can fish during low tide, while divers can use the area during high tide. Others talked of agreements based on tide movements or a "first come, first served" basis. Another conflict that was mentioned involved the differing ways of the use of shared resources between individuals from the two industries and their impacts as told by a respondent from Payung-Payung who worked at a tourist attraction adjacent to the sea about an incident at his workplace:

> There was a boat using potassium [cyanide] in 2016. Anchovies soaked in potassium [cyanide]. Since then, fish has been rare. The perpetrators were not found because they escaped.

The results also indicated the potential for the loss of local fishing knowledge. Although all five villages have long been known as fishing villages and their residents have lived off of the ocean's resources for generations, when asked if they would pass on the knowledge of tourism or fisheries to the next generation, only 2 out of 47 respondents (4.26 %) indicated that they would pass down their fishing knowledge, while 6 respondents (12.77 %) chose both fishing and tourism, 9 respondents (19.15 %) would pass down knowledge of tourism, and 30 respondents (63.83 %) chose neither. When comparing respondents' involvement between the two industries (Figure S2a) and their major source of income (Figure S2b), at least 50 % of the respondents in each category preferred to pass down neither knowledge of fishing nor tourism to the next generation or encourage them to pursue other careers. As many as 15 respondents said that they would encourage the younger generation to focus on education. Ten respondents even mentioned that they did not want the next generation to be fishers. For instance, a fisher from Bohe Silian said:

> If possible, my children and grandchildren don't become fishers. Just go to school. Being a fisher is hard, just surviving. Not forcing, but neither [i.e., neither fisheries nor tourism]. If capable, go to school. If not, pick up a fishing rod.

In Teluk Semanting, a respondent expressed difficulties in procuring milkfish to produce snacks to be sold to both tourists and local villagers. This was mostly due to its seasonal availability in the wild and the fact that the fishers in the village mostly caught fish in the wild. However, she would sometimes purchase the fish from the neighboring village of Kasai. Additional conversations with the local YKAN staff revealed that there was a milkfish fishmonger in Kasai and wild milkfish sometimes entered the villager's shrimp aquaculture ponds. Although this situation was mostly due to the specific fisheries activities in the two villages, issues of seafood procurement such as this can be expected to worsen, potentially affecting food security, if more and more villagers from Teluk Semanting transition away from fishing and choose to not pass fishing their skills to the next generations. This would cause them to be even more reliant on Kasai for milkfish and become more susceptible should certain events were to happen that would negatively affect this supply.

3.3. Impacts of and responses to the COVID-19 pandemic

3.3.1. Impacts

This research investigated the individual's capacity to respond to the COVID-19 pandemic according to their level of involvement in tourism and fisheries. The tourism industry was generally thought to be most impacted by the pandemic, but interviews with the respondents indicated that the pandemic also impacted the fisheries industry in the study sites (Table 6).

The main impact of the COVID-19 pandemic on tourism expressed by the respondents was the closing down of the tourism industry. In March 2020, the Indonesian Government implemented large-scale social restrictions to prevent the further spread of COVID-19, shutting down public places and restricting travel [63]. The social restriction led to the closing down of the tourism industry in the study sites. The implementation of the restriction was relatively strict for both tourists and tourism operators. A staff of a local tourism destination in Payung-Payung described:

> 2019 to 2020, two years, zero tourists, nothing. Completely closed. The front gates were boarded and given a sign from the Public Health Office. If they find out that you open, you get a penalty.

Even until the time of the data collection, some resorts and tourism attractions were still closed.

The restrictions implemented during the pandemic also made it challenging for fishers to sell their catch to markets beyond their villages. This was particularly true for fishers that relied on sales beyond their villages, as noted by a fisher from Payung-Payung:

> Live fish anglers' catches for export to Hong Kong were not bought for about one year. Markets stopped, prices dropped. Rotten fish get thrown away.

Within the villages, fishmongers stopped purchasing fish, partly because they were unable to sell the fish to larger markets. Additionally, many individuals began fishing for themselves during the pandemic which in turn reduced the local demand for fish.

As a result of the closure and interruption of the markets, fish prices declined. The most extreme case of a price drop was mentioned by a respondent from Teluk Alulu:

> We could not sell as we wanted. We were not hungry but were still worried. It was hard to sell fish. We could only sell around here, people from the outside could not enter. Prices that used to be IDR 200.000,- to IDR 300.000,- became only IDR 30.000,-.

The price drops were particularly challenging for fishers who targeted high-quality fish since they were unable to sell to their usual buyers whereas selling in regular markets would not cover their operational costs. Even during the data collection period, some respondents mentioned that prices had not yet returned to their pre-pandemic levels, indicating a persistent impact on the pricing dynamics within the industry.

3.3.2. Responses

The responses to the impacts of the COVID-19 pandemic to tourism and fisheries can be categorized into four: i) no change, ii) financial aid, iii) partial modification of activities, and iv) livelihood diversification (Table 7).

Table 6
Impacts of COVID-19 on tourism and fisheries.

Impact	Description
Impact on tourism	
Closing of the tourism industry	Tourism businesses were closed and tourists did not come.
Impact on fisheries	
Hard to sell fish	Fishers had no access to regular markets and faced increased competition as more people started to fish during the pandemic.
Fish sold at lower price	Fish was sold at prices lower than pre-pandemic times.

Table 7
Responses to the impacts of COVID-19.

Response	**Description**
No change	Respondents continued their fisheries and tourism activities despite the impacts of the COVID−19 pandemic.
Financial aid	Financial aid was distributed to the communities, some targeting specific industries.
Partial modification of activities	
Change work pattern	Respondents remained in the fisheries or tourism industries but modified their activities or reduced the amount of work.
Pursue new markets	Respondents pursued new markets to sell their products.
Pursuit of new activities	
Livelihood diversification	Respondents changed or supplemented their productive activities by working in construction, gardening, or fishing.
Destructive fishing	Respondents mentioned destructive fishing practices.

3.3.2.1. No change. Six respondents indicated that the pandemic had minimum to no impact on tourism activities. A respondent from Teluk Semanting who was an active member of the village's mangrove management team said that the pandemic did not make a big difference because at that time, the village was still building the infrastructure and facilities for their ecotourism initiative. Three snack producers claimed that their sales were not affected by the pandemic, though it should be noted that their target market did not only consist of tourists. They also sold their products to locals and sometimes also other towns or villages, which could be a contributing factor to why their sales were not heavily impacted by the pandemic. For instance, a respondent from Teluk Semanting who would usually take his snack products by car to other towns and villages stated:

> Not impacted. The price of ingredients stayed the same. Amplang [the name of the snack] was affected by cooking oil, but it is rare. Sales as usual, can still take the car.

The other two respondents were a homestay owner and a driver who said that they were able to continue their operations though they needed to follow the health and safety protocols. Six respondents mentioned that fishing activities carried on as usual. A part-time crab fisher noted:

> Not impacted. People still eat crabs. Income from fisheries was also not impacted, just a different market. What I observed in the village was that people sell fish for the same price. Resorts did not buy catch, but they only bought them seasonally anyways.

3.3.2.2. Financial aid. Eight respondents from Maratua Island mentioned financial aid being distributed. Some were directed at individuals, while others specifically at businesses. The distribution of the aid was not equal, with some individuals receiving them on multiple occasions, while others not receiving at all. For instance, a restaurant owner from Teluk Harapan said:

> We received aid during COVID three times. Me and my wife each once from the village. I had to sort out documents at Tanjung to get aid for businesses.

In comparison, a respondent who worked for the public school in Teluk Harapan but also owned an inn:

> I am a civil servant, so we still had enough to eat. We are saving money for my child to go to college. No aid during COVID because I was considered capable [financially].

Although it was not mentioned by the respondents, this unequal distribution of aid could be due to certain eligibility requirements. The local YKAN staff member on Maratua Island explained that everyone was given financial aid except civil servants, police, and owners of medium to large businesses, though the means of determining the size of businesses was not explained to the researchers. The respondent from Teluk Harapan likely did not receive financial aid as Indonesian public school staff are considered civil servants and inns fall under the category of medium to large businesses.

3.3.2.3. Partial modification of activities. Due to the closing of the tourism industry and lack of tourists, some resorts on Maratua Island implemented new policies that affected the work patterns of their employees. A respondent from Teluk Alulu observed that the policies were different for different workers:

> COVID-19 had an impact. Guests decreased and were rare. I noticed that daily workers were cut off. Contracted workers received basic salaries.

Two resort employees mentioned that they were able to keep their jobs in the resorts but had to carry out tasks that were out of their regular job descriptions. One of them, from Bohe Silian, recounted:

> I was not sent home [i.e., fired], but doing odd jobs, cleaning. It is better than getting sent home.

Seven respondents who ran their own tourism businesses said that they were still able to continue their operations by slightly changing their work patterns to adjust to the slow market. One example was a store owner from Teluk Harapan who sold groceries for residents as well as souvenirs and rented out equipment and transportation for tourists:

> The shop was still open. Turnover was only 50 %, relying on groceries. No one was hungry, we were helped by nature. We, husband and wife, only focused on the shop.

A restaurant owner from Teluk Harapan said that he still accepted take-away orders, but sales were lower than pre-pandemic times. Respondents who produced snacks to sell to both locals and tourists slowed down production due to lower demand or only produced by order.

The closing of markets and dropping of prices also caused some individuals in fisheries to modify their work patterns. A fisher from Teluk Semanting reduced his fishing time because he was having trouble selling his catch, while an octopus fisher from Bohe Silian even stopped for some time because no one would buy her catch. In contrast, a boat builder from Payung-Payung turned to fishing during the pandemic:

> I still can make boats, but I worried that due to limited money, people won't buy them. No one ordered boats. I went to sea. I looked for lobster and octopus to sell to the villagers.

Six respondents reported responding to the closure of markets by finding new markets beyond their village. A respondent from Teluk Alulu who both fished and was also a fishmonger said that he was still able to sell fish on the mainland, but it came with additional costs:

> No tourists bought fish. I only sold fish in Berau. Even for that, I had to pay to rent a boat. Fish prices dropped, income dropped.

Respondents from Teluk Semanting took advantage of their location on the mainland to access new markets. A fisher went to the neighboring village of Kasai to sell his fish. A snack producer told of selling products in a bigger town with the help of relatives:

> The pandemic was very influential to the products. We limited production because few people came [to buy the products]. We asked a relative in Tanjung to help with marketing there and we sent the products from here.

3.3.2.4. Pursuit of new activities. Twelve respondents mentioned instances of individuals who changed or supplemented their tourism activities during the pandemic with construction work, gardening, or returning to fishing. A speedboat owner from Teluk Harapan that would

usually transport tourists from the mainland to Maratua Island said:

> I really sat down, fishing only for [personal] consumption because no one would buy. We stayed in a garden that a friend entrusted to manage. As long as there is rice, we still can [survive]. We can look for side dishes. My speedboat did not operate at all.

A resort employee from Teluk Alulu who still came to work at the resort for a couple of days per week spent his free time fishing:

> Tourism totally stopped for about 2 years from 2019 to 2020. Some are still not open until now. I was forced to turn to fishing, mostly looking for fish in front of the house. I went to the resort only 1 to 2 days per week for cleaning.

There were two indications of destructive fishing occurring during the pandemic, both from respondents from Payung-Payung. One was mentioned by a freelance dive guide who was a member of a community environmental and tourism organization, who mentioned that some people used any possible way to get fish to survive, though it was unclear who he was referring to. A respondent who worked in the village government but was actively involved in the same organization mentioned:

> [Tourist] guides did not have any other sources of income. They returned to fishing. They fished with potassium [cyanide].

4. Discussion

This research used the SLF framework to examine the outcomes of livelihood diversification, specifically the social consequences of tourism as an alternative livelihood and its impact on communities' ability to cope with shocks in five coastal fishing villages in Indonesia. At the individual level, the introduction of tourism led to differing levels of participation in the industry and an indication of reduced fishing effort. At the community level, the introduction of tourism gave rise to certain benefits and new opportunities, but also challenges, namely issues relating to employment and ownership of land and tourism businesses, conflict over shared resources between fishers and tourism operators, as well as potential loss of fishing knowledge and difficulty in meeting seafood demand. The case study of the COVID-19 pandemic shows that access to multiple livelihoods, or not being overly reliant on one particular livelihood, was beneficial in coping with the shock. Although this research only focused on five coastal villages in Indonesia, the findings may provide valuable insights for marine tourism development initiatives in other coastal communities around the world.

Although the respondents from this research may not be fully representative of the communities in the five villages due to the sampling method used, it is worth noting that most respondents in this research were simultaneously involved in fisheries and tourism instead of just in tourism, the introduced alternative livelihood, showing that "diversification does not always mean substitution" ([8], p. 6). Moreover, there was evidence of respondents going back and forth between the two industries, and even diversifying to other activities, especially during the COVID-19 pandemic. This points out a misassumption that may sometimes come or is associated with modernization theories (e.g., [51]) that movements between productive activities happen only once and in a single direction. On the contrary, Carter and Garaway [10] have found that due to the different reasons for engaging in fisheries, individuals may enter and exit the industry multiple times over their lifetimes.

Despite the limited sample size, there was indication that tourism led to reduced fishing effort at the individual level. The impact of the introduction of an alternative livelihood to fishing effort has also been explored in other studies with mixed results [10,74]. While this change in fishing behavior may imply less pressure on the marine environment, caution should be taken in interpreting this finding as tourism has also been proven to have its own detrimental effects [31,35,41]. For example, villagers were already struggling to get freshwater, which is a basic need, in Bohe Silian, Payung-Payung, Teluk Alulu, and Teluk Semanting whereby the villages did not have their own sources of freshwater or supply was limited. The situation will only worsen as more tourists come to the village, further raising the demand for freshwater.

This reduction in fishing effort may be better interpreted as a shift in the specific type of marine resources used. For instance, although the respondents working in tourism were fishing less, they were still utilizing the same ocean space for other activities, such as diving, which gave rise to the conflict between fishers and tourism operators as mentioned in the interviews and observed in past studies in other locations [19,25]. Another example relates to the impacts on the species of fish that was on demand, as mentioned by the respondent from Teluk Semanting who said that she had to procure the milkfish to make snacks from a neighboring village as it was only caught seasonally by fishers from her village. Garcia Rodrigues and Villasante [30] have also noted the difference in seafood demands among local residents and tourists. Though it should be noted that the snacks produced by the respondent were not exclusively sold to tourists. In the long term, this change in the type of marine resources used should be closely studied to avoid overexploitation and other potential conflicts.

An equally important point to discuss is how tourism was introduced in the communities, specifically, the driver of the initiatives and their priorities. In all five study sites, tourism development has been primarily driven by external agents, with most of the initiatives aiming for CBT with a focus on economic growth and environmental sustainability. While CBT does not necessarily have to originate from within the community, it is important to ensure that their participation is self-directed and not solely because they were instructed to [34,49]. However, to truly achieve equitable development and management, it is necessary to acknowledge local communities and their customs, incorporate transparent and inclusive procedures, as well as have an equitable distribution of burdens and benefits [72,95]. This is especially true in coastal areas where social-ecological systems are more dynamic and have higher uncertainty, thus requiring livelihood approaches that are holistic, reflective of the reality on the ground, and also adaptive [27]. Ota et al. [56] stipulate that communities may benefit more when development initiatives take a bottom-up approach as it allows them to prioritize their well-being and let their voices be heard. Perhaps if equity and social well-being were indeed prioritized in the tourism development process in the five villages, some of the abovementioned consequences, especially those that were less favorable, could be buffered or avoided altogether.

The case study of the COVID-19 pandemic observed individuals working in tourism, the more recently introduced livelihood, returning to fishing to cope with the impacts of the pandemic. Although the fisheries industry was not exempt from the impacts, it provided a lifeline for respondents during the pandemic by providing an easily accessible source of food. In literature on shocks and disasters, the acquisition of an alternative source of income is mentioned as one of several coping strategies [22]. Having more than one livelihood also helps reduce susceptibility to shocks by reducing reliance on a particular resource [22,23,8]. This research observed instances of diversification by turning to an existing livelihood option such as fisheries instead of acquiring a new one. Considering the abundance of available marine resources, fisheries is an accessible coping strategy for coastal communities whose livelihoods are impacted by shock [24]. It was not entirely surprising to hear accounts of destructive fishing in the communities during the pandemic as coping strategies are not always sustainable and may even lead to environmental damage [18,2]. This is a form of delay discounting, a phenomenon where smaller, short-term rewards are valued more than larger, long-term ones [82].

Considering the roles of fisheries as an additional source of income and coping mechanism in times of shock, maintaining fisheries amid tourism development is therefore not only beneficial, but may also be crucial to coastal communities because fisheries as a coping strategy relies on the communities' knowledge to use those resources [24].

Beyond those roles, in areas with coastal tourism, fisheries also contributes to food security by meeting the seafood demands of both tourists and local residents [30]. Thus, the issue is not a matter of whether to choose between fisheries or tourism, but of how the two may coexist. This means that development and management initiatives in the study sites should acknowledge their identities as fishing villages and encourage them to maintain and pass on fishing knowledge to future generations despite the emergence of newer and potentially more compelling alternative livelihoods. This would also require both industries to collaboratively manage the use of shared marine resources to avoid future conflicts [41].

One important point to note is that the findings relating to communities' ability to cope with shocks may not necessarily apply to other types of shocks, such as natural disasters, where the impacts go beyond market closures and may also include the loss of or reduced access to marine resources. Regardless of the type, understanding the varying impacts of shocks towards different livelihoods in a community, as in this research, is crucial to provide appropriate types of aid and recommendations of coping strategies [13]. Incorporating this knowledge in planning development programs and policies will be especially useful in the face of incoming shocks such as climate change which has already been shown to have significant detrimental effects to multiple industries at present and are expected to worsen in the future [88].

5. Conclusion

The findings from this research provide a glimpse into the social consequences of introducing tourism as an alternative livelihood in fishing communities. While tourism appeared to provide exciting and lucrative opportunities, it also gave rise to a number of new challenges to the communities. During the COVID-19 pandemic, fishing allowed individuals to take advantage of existing marine resources to survive, showing that it was beneficial to maintain fisheries knowledge and more broadly alternative livelihood options, in the communities. Based on these findings, the following recommendations are suggested to further develop tourism that is equitable, conscious of its social consequences, and could help increase communities' resilience in times of shock. Due to the rapid spread of tourism development around the globe, despite the local context of the research, the following recommendations may be of global relevance.

The first recommendation is to consider the complexities of livelihood diversification in development policies and programs that involve the introduction of alternative livelihoods. Understanding the role of fisheries, or other existing forms of livelihoods, in the target communities as well as the factors determining diversification may help increase program effectiveness. This can be achieved by continuously engaging with the local communities, providing them with opportunities to truly express their views, priorities, and concerns, as well as opportunities for their self-directed involvement in the decision-making process. This process helps to ensure that communities receive the benefits that they want out of tourism development and that their social well-being is prioritized, and not just considered an afterthought.

Secondly, studies of the potential impacts of shocks should be incorporated into development policies and programs to help increase the resilience of communities and their livelihoods. For the study sites in this research, fisheries was shown to have an important role in the communities, particularly as a way to cope with shocks such as the COVID-19 pandemic by providing a source of food. Thus, tourism development initiatives should seek the integration, instead of exclusion or replacement, of fisheries. Communities should be encouraged and supported to maintain culture and knowledge, including of traditional food production systems, both in the current and future generations. This also involves understanding the opportunities and challenges to maintaining these systems, including in terms of resource availability and access to markets. In particular, tourism and fisheries industry actors should collectively manage shared resources to create opportunities for collaboration and avoid clashes and resource overexploitation.

Funding sources

This research was supported by the Nippon Foundation Ocean Nexus (Grant ID: 2021001028).

Data Availability

The data that has been used is confidential.

Acknowledgements

The authors wish to thank the village residents and government staff in the study sites as well as all the respondents who have supported and participated in this research. The authors are also thankful to Yoshitaka Ota, PhD, Dr. Mifhatul Huda, Muhammad Ilman, PhD, and Kiki Anggraini for their contributions.

Data statement

Data for this research cannot be made publicly available as it involves human subject research and the researchers have agreed to maintain the privacy of the respondents. Furthermore, during ethical clearance applications, the researchers have mentioned that the data will be kept by the researchers and not made publicly available.

Human subjects research compliance information

This research was conducted in accordance with human subject research requirements from the UW Human Subject Division (IRB ID: STUDY00015897), YKAN Human Subject Research Division, and the Indonesian National Research and Innovation Agency's Ethics Committee on Social Studies and Humanities (Application No.: 20072022000001).

Conflicts of interest

There are no conflicts of interest to declare in this research.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.marpol.2024.106379.

References

[1] W.C. Adams, Conducting semi-structured interviews, in: J.S. Wholey, H.P. Harty, K.E. Newcomer (Eds.), Handbook of Practical Program Evaluation, 4th ed., Jossey-Bass, New Jersey, 2015, pp. 492–505, https://doi.org/10.1002/9781119171386.ch19.

[2] I. Ahmed, S. Ayeb-Karlsson, K. van der Geest, S. Huq, J.C. Jordan, Climate change, environmental stress and loss of livelihoods can push people towards illegal activities: a case study from coastal Bangladesh, Clim. Dev. 11 (10) (2019) 907–917, https://doi.org/10.1080/17565529.2019.1586638.

[3] E.H. Allison, F. Ellis, The livelihoods approach and management of small-scale fisheries, Mar. Policy *25* (5) (2001) 377–388, https://doi.org/10.1016/S0308-597X(01)00023-9.

[4] ATLAS.ti Scientific Software Development GmbH. (2020). ATLAS.ti version 9 9.1.7.0 [Computer software]. ⟨https://atlasti.com⟩.

[5] Berau Online (2021, Juni 30). *Mangrove Semanting wisata mangrove wilayah pesisir utara* [Semanting's mangroves tourism of the northern coastal area]. Berau Online. Retrieved May 1, 2024, from ⟨https://www.berauonline.com/mangrove-semanting-wisata-mangrove-wilayah-pesisir-utara/⟩.

[6] A.E. Berndt, Sampling methods, J. Human Lactat. *36* (2) (2020) 224–226, https://doi.org/10.1177/0890334420906850.

[7] Bohe Silian Village Government. (2021). *Profil Kampung Bohe Silian tahun 2021* [Bohe Silian Village Profile 2021].

[8] Brugère, C., Holvoet, K., & Allison, E.H. (2008). *Livelihood diversification in coastal and inland fishing communities: Misconceptions, evidence and implications for fisheries management* (Working Paper). Sustainable Fisheries Livelihoods Programme. Rome: FAO/DFID.

[9] D. Buchanan, D. Boddy, J. McCalman, Getting in, getting on, getting out and getting back, in: A. Bryman (Ed.), Doing Research in Organisations, Routledge, New York, 1988, pp. 53–67.

[10] C. Carter, C. Garaway, Shifting tides, complex lives: the dynamics of fishing and tourism livelihoods on the Kenyan coast, Soc. Nat. Resour. *27* (6) (2013) 573–587, https://doi.org/10.1080/08941920.2013.842277.

[11] M.A. Chaliluddin, M. Ikram, D. Rianjuanda, Identifikasi alat penangkapan ikan ramah lingkungan berbasis CCRF di Kabupaten Pidie, Aceh [Identification of environmental friendly fishing gears based on CCRF at Pidie District, Aceh], Jurnal Galung Tropika *8* (3) (2019) 197–208, https://doi.org/10.31850/jgt.v8i3.504.

[12] S.M. Cheong, Korean fishing communities in transition: limitations of community-based resource management, Environ. Plan. Econ. Space *37* (7) (2005) 1277–1290, https://doi.org/10.1068/a37139.

[13] S.M. Cheong, Fishing and tourism impacts in the aftermath of the Hebei-Spirit oil spill, J. Coast. Res. *28* (6) (2012) 1648–1653, https://doi.org/10.2112/JCOASTRES-D-11-00079.1.

[14] S. Chok, J. Macbeth, C. Warren, Tourism as a tool for poverty alleviation: a critical analysis of 'pro-poor tourism' and implications for sustainability, Curr. Issues Tour. *10* (2-3) (2007) 144–165, https://doi.org/10.2167/cit303.

[15] J.E. Cinner, M.L. Barnes, Social dimensions of resilience in social-ecological systems, One Earth 1 *1* (1) (2019) 51–56, https://doi.org/10.1016/j.oneear.2019.08.003.

[16] J.E. Cinner, T. Daw, T.R. McClanahan, Socioeconomic factors that affect artisanal fishers' readiness to exit a declining fishery. Conserv. Biol. *23* (1) (2009) 124–130. ⟨http://www.jstor.org/stable/29738698⟩.

[17] J.W. Creswell, J.D. Creswell. Research design: Qualitative, quantitative, and mixed methods approaches, 5th ed.), SAGE, Los Angeles, 2018.

[18] S. Davies, Are coping strategies a cop out? IDS Bull. *24* (4) (1993) 60–72, https://doi.org/10.1111/j.1759-5436.1993.mp24004007.x.

[19] A.B. de Andrade, M. de Oliveira Soares, Offshore marine protected areas: divergent perceptions of divers and artisanal fishers, Marine Policy *76* (2017) 107–113, https://doi.org/10.1016/j.marpol.2016.11.016.

[20] Director General of Marine Spatial Management (2022). *Keputusan Direktur Jenderal Pengelolaan Ruang Laut Nomor 65 Tahun 2022 tentang Penetapan Desa Wisata Bahari* [Decree of the Director General of Marine Spatial Management No. 65 of 2022 concerning the Designation of Marine Tourism Villages].

[21] Directorate General of Marine Coasts and Small Islands. (2006). *Panduan jenis-jenis penangkapan ikan ramah lingkungan* (Volume 1). Department of Maritime Affairs and Fisheries. Jakarta: PT. Bina Marina Nusantara.

[22] F. Ellis, Rural livelihoods and diversity in developing countries, Oxford University Press, Oxford, 2000.

[23] F. Ellis, The determinants of rural livelihood diversification in developing countries, J. Agric. Econ. *51* (2) (2000) 289–302, https://doi.org/10.1111/j.1477-9552.2000.tb01229.x.

[24] H. Eriksson, J. Albert, S. Albert, R. Warren, K. Pakoa, N. Andrew, The role of fish and fisheries in recovering from natural hazards: Lessons learned from Vanuatu, Environ. Sci. Policy *76* (2017) 50–58, https://doi.org/10.1016/j.envsci.2017.06.012.

[25] M. Fabinyi, Dive tourism, fishing and marine protected areas in the Calamianes Islands, Philippines, Marine Policy *32* (6) (2008) 898–904, https://doi.org/10.1016/j.marpol.2008.01.004.

[26] M. Fabinyi, The role of land tenure in livelihood transitions from fishing to tourism, Maritime Stud. *19* (1) (2020) 29–39, https://doi.org/10.1007/s40152-019-00145-2.

[27] D. Ferrol-Schulte, M. Wolff, S. Ferse, M. Glaser, Sustainable livelihoods approach in tropical coastal and marine social–ecological systems: a review, Marine Policy *42* (2013) 253–258, https://doi.org/10.1016/j.marpol.2013.03.007.

[28] I. Firdaus, A.D.P. Fitri, Sardiyatmo, F. Kurohman, Analisis alat tangkap ikan berbasis code of conduct for responsible fisheries (CCRF) di tempat pelelangan ikan (TPI) Tawang, Kendal [Analysis of fishing gears based on code of conduct for responsible fisheries (CCRF) at Tawang fish auction, Kendal], Indonesian J. Fish. Sci. Technol. *13* (1) (2017) 65–74, https://doi.org/10.14710/ijfst.13.1.65-74.

[29] C. Folke, S.R. Carpenter, B. Walker, M. Scheffer, T. Chapin, J. Rockström, Resilience thinking: Integrating resilience, adaptability and transformability, Ecol. Soc. *15* (4) (2010). ⟨http://www.ecologyandsociety.org/vol15/iss4/art20/⟩.

[30] J. Garcia Rodrigues, S. Villasante, Disentangling seafood value chains: Tourism and the local market driving small-scale fisheries, Mar. Policy *74* (2016) 33–42, https://doi.org/10.1016/j.marpol.2016.09.006.

[31] K. Gazta, Environmental impact of tourism, AGU Int. J. Profession. Stud. Res. *6* (2018) 7–17.

[32] J.A. Gephart, L. Deutsch, M.L. Pace, M. Troell, D.A. Seekell, Shocks to fish production: identification, trends, and consequences, Glob. Environ. Change *42* (2017) 24–32, https://doi.org/10.1016/j.gloenvcha.2016.11.003.

[33] Ghofar, M. (2021, November 8). *Pariwisata Berau berkontribusi 9,84 persen ke PAD* [Berau tourism contributes 9.84 percent to regional income]. ANTARA News Kalimantan Timur. Retrieved January 4, 2024, from ⟨https://kaltim.antaranews.com/berita/130101/pariwisata-berau-berkontribusi-984-persen-ke-pad⟩.

[34] A. Giampiccoli, M. Saayman, Community-based tourism development model and community participation, Afr. J. Hospital.Tour. Leisure *7* (4) (2018).

[35] S. Gössling, The consequences of tourism for sustainable water use on a tropical island: Zanzibar, Tanzania, J. Environ. Manag. *61* (2) (2001) 179–191, https://doi.org/10.1006/jema.2000.0403.

[36] Herre, B., & Samborska, V. (2023). Tourism. Retrieved 4 September, 2024, from ⟨https://ourworldindata.org/tourism⟩.

[37] [dataset] Hijmans, R.J. (2022). *GADM database of global administrative areas* (Version 4.1) [Digital geospatial data]. ⟨http://www.gadm.org⟩.

[38] S., K. Johl, S. Renganathan, Strategies for gaining access in doing fieldwork: Reflection of two researchers, Electr. J. Business Res. Methods *8* (1) (2010) 42–50. ⟨https://www.proquest.com/docview/856419413⟩.

[39] Kaltim Post (2022, April 4). *Padahal amat sangat potensi, Berau masih kesulitan kembangkan pariwisata* [Even though it has so much potential, Berau still struggles in developing tourism]. Kaltim Post. Retrieved January 4, 2024, from ⟨https://kaltimpost.jawapos.com/kaltim/04/04/2022/padahal-amat-sangat-potensi-berau-masih-kesulitan-kembangkan-pariwisata⟩.

[40] C. Kungwansupaphan, The socio-economic impact of COVID-19 on Khunchaitong elephant community-based tourism in Surin Province, Thailand, J. Mekong Soc. *17* (2) (2021) 29–49.

[41] L. Lachs, J. Oñate-Casado, Fisheries and tourism: Social, economic, and ecological trade-offs in coral reef systems, in: S. Jungblut, V. Liebich, M. Bode-Dalby (Eds.), YOUMARES 9 – The oceans: Our research, our future, Springer Open, Cham, 2020, pp. 395–404, https://doi.org/10.1007/978-3-030-20389-4_13.

[42] N.A. Marshall, P.A. Marshall, J. Tamelander, D. Obura, D. Malleret-King, J. E. Cinner, *A framework for social adaptation to climate change*: *Sustaining tropical coastal communities and industries.*, IUCN, Gland, 2010.

[43] S.M. Martin, K. Lorenzen, N. Bunnefeld, Fishing farmers: Fishing, livelihood diversification and poverty in rural Laos, Human Ecol. *41* (5) (2013) 737–747, https://doi.org/10.1007/s10745-013-9567-y.

[44] S.M. McCluskey, R.L. Lewison, Quantifying fishing effort: A synthesis of current methods and their applications, Fish Fish. *9* (2) (2008) 188–200, https://doi.org/10.1111/j.1467-2979.2008.00283.x.

[45] D.J. Mills, A. Tilley, M. Pereira, D. Hellebrandt, A. Pereira Fernandes, P.J. Cohen, Livelihood diversity and dynamism in Timor-Leste; insights for coastal resource governance and Livelihood Development, Marine Policy *82* (2017) 206–215, https://doi.org/10.1016/j.marpol.2017.04.021.

[46] Minister of Marine Affairs and Fisheries (2018). *Peraturan Menteri Kelautan dan Perikanan No. 4/Permen-KP/2018 tentang Rencana Zonasi Kawasan Strategis Nasional Tertentu Pulau Maratua dan Pulau Sambit di Provinsi Kalimantan Timur Tahun 2018-2037* [Regulations of the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia No. 4/Permen-KP/2018 concerning Zoning Plan for Certain National Strategic Area of Maratua Island and Sambit Island in East Kalimantan Province 2018-2037].

[47] Minister of Marine Affairs and Fisheries (2020). *Peraturan Menteri Kelautan dan Perikanan Republik Indonesia Nomor 93/Permen-KP/2020 tentang Desa Wisata Bahari* [Regulations of the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia No. 93/Permen-KP/2020 concerning Marine Tourism Villages].

[48] D.L. Morgan, K. Hoffman, Searching for qualitatively driven mixed methods research: a citation analysis, Qual Quant *55* (2021) 731–740, https://doi.org/10.1007/s11135-020-01025-2.

[49] O. Mtapuri, A. Giampiccoli, Towards a comprehensive model of community-based tourism development, S. Afr. Geogr. J. *98* (1) (2016) 154–168, https://doi.org/10.1080/03736245.2014.977813.

[50] O. Mtapuri, A. Giampiccoli, Tourism, community-based tourism and ecotourism: a definitional problematic, S. Afr. Geogr. J. *101* (1) (2019) 22–35, https://doi.org/10.1080/03736245.2018.1522598.

[51] L. Nahuelhual, O. Defeo, X. Vergara, G. Blanco, S.L. Marín, F. Bozzeda, Is there a blue transition underway? Fish Fish. *20* (3) (2019) 584–595, https://doi.org/10.1111/FAF.12354.

[52] [dataset] Natural Earth. (n.d.). Natural Earth [Digital geospatial data]. ⟨https://www.naturalearthdata.com/⟩.

[53] N. Noorashid, W.L. Chin, Coping with covid-19: the resilience and transformation of community-based tourism in brunei darussalam, *Sustainability 13* (15) (2021), https://doi.org/10.3390/su13158618.

[54] E. Nurdin, Hufiadi, Selektivitas alat tangkap ikan pari di perairan Laut Jawa [Selectivity of stingray fishing gear in the Java Sea], Bawal Widya Riset Perikanan Tangkap *1* (1) (2006) 25–30, https://doi.org/10.15578/bawal.1.1.2006.25-30.

[55] S. Nurhakim, A.A. Widodo, B.I. Prisantoso, Penggunaan alat tangkap yang selektif untuk pemanfaatan sumber daya ikan pari di Laut Jawa [Use of selective fishing gear for utilization of stingray resources in the Java Sea], Bawal Widya Riset Perikanan Tangkap *2* (4) (2009) 185–192, https://doi.org/10.15578/bawal.2.4.2009.185-192.

[56] Y. Ota, G.G. Singh, T. Clark, M.S. Schutter, W. Swartz, A.M. Cisneros-Montemayor, Finding logic models for sustainable marine development that deliver on social equity, PLoS Biol. *20* (10) (2022) 1–17, https://doi.org/10.1371/journal.pbio.3001841.

[57] Payung-Payung Village Government. (2021). *Profil Kampung Payung-Payung tahun 2021* [Payung-Payung Village Profile 2021].

[58] R.B. Pollnac, R.S. Pomeroy, I.H.T. Harkes, Fishery policy and job satisfaction in three southeast Asian fisheries, Ocean Coast. Manag. *44* (7–8) (2001) 531–544, https://doi.org/10.1016/S0964-5691(01)00064-3.

[59] B.A. Porter, M.B. Orams, M. Lück, Surf-riding tourism in coastal fishing communities: a comparative case study of two projects from the Philippines, Ocean Coast. Manag. *116* (2015) 169–176, https://doi.org/10.1016/j.ocecoaman.2015.07.015.

[60] Posit Team. (2023). *RStudio: Integrated development environment for R* [Computer software]. PBC. ⟨http://www.posit.co/⟩.

[61] T.D. Pramesthy, R.S. Mardiah, Analisis alat penangkap ikan berdasarkan kode etik tatalaksana perikanan bertanggung jawab di Perairan Dumai [Analysis of code of conduct responsibilities fisheries (CCRF) on fishing gear in Dumai], J. Perikanan dan Kelautan *9* (2) (2019) 151–164.

[62] President of the Republic of Indonesia (2011). *Peraturan Pemerintah Republik Indonesia Nomor 50 tahun 2011 tentang Rencana Induk Pembangunan Kepariwisataan Nasional Tahun 2010-2025* [Government Regulation of the Republic of Indonesia

No. 50 of 2011 concerning National Tourism Development Master Plan 2010-2025].
[63] President of the Republic of Indonesia (2020). *Peraturan Pemerintah Republik Indonesia Nomor 21 tahun 2020 tentang Pembatasan Sosial Berskala Besar dalam Rangka Percepatan Penangangan Corona Virus Disease 2019* (COVID-19) [Government Regulation of the Republic of Indonesia No. 21 of 2020 concerning Large-Scale Social Restrictions to Accelerate the Management of the Corona Virus Disease 2019 (COVID-19)].
[64] R Core Team, R: *A language and environment for statistical computing* [Computer software], R Found. Stat. Comput. (2023). ⟨https://www.R-project.org/⟩.
[65] Regent of Berau (2018). *Peraturan Daerah Kabupaten Berau Nomor 3 Tahun 2018 tentang Rencana Induk Pembangunan Kepariwisataan Daerah Tahun 2016-2031* [Berau Regency Regional Regulation Number 3 of 2018 concerning Regional Tourism Development Master Plan 2016-2031].
[66] Regent of Berau (2022a). *Keputusan Bupati Berau Nomor 483 Tahun 2022 tentang Penetapan Ekosistem Mangrove di Areal Penggunaan Lain (APL) Kampung Teluk Semanting sebagai Ekowisata Mangrove Berkelanjutan Berbasis Masyarakat* [Regent of Berau's Decree No. 483 of 2022 on the Designation of a Mangrove Ecosystem in the Other Use Area of Teluk Semanting Village as a Community-Based Sustainable Mangrove Ecotourism].
[67] Regent of Berau (2022b). *Keputusan Bupati Berau Nomor 484 Tahun 2022 tentang Penunjukkan Tim Pengelola Mangrove Kampung Teluk Semanting sebagai Pengelola Ekowisata Mangrove Berkelanjutan Berbasis Masyarakat* [Regent of Berau's Decree No. 484 of 2022 on the Appointment of the Mangrove Management Team of Teluk Semanting Village as Community-Based Sustainable Mangrove Ecotourism Managers].
[68] B. Reyers, M.-L. Moore, L.J. Haider, M. Schlüter, The contributions of resilience to reshaping sustainable development, Nat Sustain. *5* (2022) 657–664, https://doi.org/10.1038/s41893-022-00889-6.
[69] Roubini, N. (2020, Mar 25). *Coronavirus pandemic has delivered the fastest, deepest economic shock in history*. The Guardian. Retrieved January 4, 2024, from ⟨https://www.theguardian.com/business/2020/mar/25/coronavirus-pandemic-has-delivered-the-fastest-deepest-economic-shock-in-history⟩.
[70] D. Salgueiro-Otero, M.L. Barnes, E. Ojea, Transformation in times of climate change: What makes a fisher diversify livelihoods? Front. Mar. Sci. *9* (2022) https://doi.org/10.3389/fmars.2022.888288.
[71] R. Scheyvens, Exploring the tourism-poverty nexus, Curr. Issues Tour. *10* (2-3) (2007) 231–254, https://doi.org/10.2167/cit318.0.
[72] K. Schreckenberg, P. Franks, A. Martin, B. Lang, Unpacking equity for protected area conservation, PARKS *22* (2) (2016) 11–26, https://doi.org/10.2305/iucn.ch.2016.parks-22-2ks.en.
[73] Scoones, I. (1998) Sustainable rural livelihoods: A framework for analysis (Working Paper No. 72). Institute of Development Studies. Brighton: IDS.
[74] L. Sievanen, B. Crawford, R. Pollnac, C. Lowe, Weeding through assumptions of livelihood approaches in ICM: Seaweed farming in the Philippines and Indonesia, Ocean Coast. Manag. *48* (3-6 SPEC. ISS.) (2005) 297–313, https://doi.org/10.1016/j.ocecoaman.2005.04.015.
[75] J. Silaban, Mustaruddin, D.A. Soeboer, Penentuan alat tangkap unggulan untuk ikan pelagis kecil di Palabuhanratu Sukabumi [Determination of best fishing gear for small pelagic fisheries at Palabuhanratu Sukabumi], Albacore Jurnal Penelitian Perikanan Laut *1* (2) (2017) 225–234, https://doi.org/10.29244/core.1.2.225-234.
[76] L.E.D. Smith, Nguyen, S. Khoa, K. Lorenzen, Livelihood functions of inland fisheries: policy implications in developing countries, Water Policy *7* (4) (2005) 359–383, https://doi.org/10.2166/wp.2005.0023.
[77] M. Spalding, L. Burke, S.A. Wood, J. Ashpole, J. Hutchison, P. zu Ermgassen, Mapping the global value and distribution of coral reef tourism, Mar. Policy *82* (2017) 104–113, https://doi.org/10.1016/J.MARPOL.2017.05.014.
[78] Statistics Indonesia of Berau (2022). *Statistik daerah Kabupaten Berau 2022* [Regional Statistics of the Regency of Berau 2022].
[79] Teluk Harapan Village Government. (2021). *Profil Kampung Teluk Harapan tahun 2021* [Teluk Harapan Village Profile 2021].
[80] Teluk Semanting Village Chief (2023). *Peraturan Kampung Teluk Semanting No. 4 Tahun 2023 tentang Pungutan Retribusi Kampung,* Kampung Teluk Semanting, Kecamatan Pulau Derawan, Kabupaten Berau [Teluk Semanting Village Regulation No. 4 of 2023 concerning Village Retribution, Teluk Semanting Village, Derawan Island District, Berau Regency].
[81] Teluk Semanting Village Government. (2021). *Profil Kampung Teluk Semanting tahun 2021* [Teluk Semanting Village Profile 2021].
[82] A.D. Tesch, A.G. Sanfey, Models and methods in delay discounting, Ann. N. Y. Acad. Sci. *1128* (1) (2008) 90–94, https://doi.org/10.1196/annals.1399.010.
[83] E. Torell, C. McNally, B. Crawford, G. Majubwa, Coastal livelihood diversification as a pathway out of poverty and vulnerability: experiences from tanzania, Coast. Manag. *45* (3) (2017) 199–218, https://doi.org/10.1080/08920753.2017.1303718.
[84] Tourism and Creative Economy Agency. (n.d.). Desa wisata [Tourism Village]. Ministry of Tourism and Creative Economy of Indonesia. Retrieved January 4, 2024, from ⟨https://jadesta.kemenparekraf.go.id/search?type=7&submit=1⟩.
[85] A. Tupamahu, Haruna, B.G. Hutubessy, S.R. Siahainenia, A.C. Nanlohy, K. Hehanusa, Alat penangkapan ikan karang unggulan di Kabupaten Seram Bagian Barat [Superior fishing gear for coral reef fishes in Western Seram Regency], AGRIKAN Jurnal Agribisnis Perikanan *14* (1) (2021) 44–54, https://doi.org/10.29239/j.agrikan.14.1.44-54.
[86] UN World Tourism Organization (2022, February 11). *Call for urgent action to protect the oceans* [Press release]. ⟨https://www.unwto.org/news/tourism-leaders-call-for-urgent-action-to-protect-the-oceans⟩.
[87] M. Voicu, A. Babonea, Using the snowball method in marketing research on hidden populations, Challenges Knowledge Soc. *1* (2011) 1341–1351.
[88] L.V. Weatherdon, A.K. Magnan, A.D. Rogers, U.R. Sumaila, W.W. Cheung, Observed and projected impacts of climate change on marine fisheries, aquaculture, coastal tourism, and human health: an update, Front. Mar. Sci. *3* (2016), https://doi.org/10.3389/fmars.2016.00048.
[89] C. Wisner, P. Blaikie, T. Cannon, I. Davis, *At risk: Natural hazards, people's vulnerability and disasters* (2nd ed, Routledge, London, 2003.
[90] World Tourism, Organization, 145 Key Tourism Statistics, UNWTO, Madrid, 2024, https://doi.org/10.18111/wtobarometerenghttps://www.unwto.org/tourism-statistics/key-tourism-statistics.
[91] World Travel & Tourism Council. (2022a). Indonesia 2022 annual research: Key highlights [Fact sheet]. ⟨https://wttc.org/DesktopModules/MVC/FactSheets/pdf/704/131_20220613162338_Indonesia2022_.pdf⟩.
[92] World Travel & Tourism Council. (2022b). Travel & tourism economic impact global trends 2022. [Fact sheet]. ⟨https://wttc.org/Portals/0/Documents/Reports/2022/EIR2022-Global%20Trends.pdf⟩.
[93] J.F. Wuaten, I. Bawias, Y.V. Tatontos, Y. Sambeka, D. Kapai, Alat tangkap ikan tradisional berdasarkan parameter selektivitas dan hasil tangkapan sampingan code of conduct for responsible fisheries di Pulau Mahumu [Traditional fishing gears based on selectivity and by-catching parameters in code of conduct for responsible fisheries on Mahumu Island], Jurnal Ilmiah Tindalung *8* (1) (2022) 7–11, https://doi.org/10.54484/jit.v8i1.496.
[94] Yayasan Konservasi Alam Nusantara. (2022). Kajian kerentanan iklim partisipatif kampung Teluk Alulu – Kecamatan Maratua, Kabupaten Berau, Provinsi Kalimantan Timur [Participatory climate vulnerability assessment of Teluk Alulu Village – Maratua Subdistrict, Berau Regency, East Kalimantan Province].
[95] N. Zafra-Calvo, U. Pascual, D. Brockington, B. Coolsaet, J.A. Cortes-Vazquez, N. Gross-Camp, I. Palomo, N.D. Burgess, Towards an indicator system to assess equitable management in protected areas, Biol. Conserv. *211* (2017) 134–141, https://doi.org/10.1016/j.biocon.2017.05.014.