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Developing sustainable small-scale fisheries livelihoods in Indonesia: Trends, enabling and constraining factors, and future opportunities

Natasha Stacey^{a,*}, Emily Gibson^b, Neil R. Loneragan^c, Carol Warren^d, Budy Wiryawan^e, Dedi S. Adhuri^f, Dirk J. Steenbergen^g, Ria Fitriana^h

^a Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin, Australia

^b Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin, Australia

^c Environmental and Conservation Sciences, College of Science, Health, Engineering and Education and Centre for Sustainable Aquatic Ecosystems, Harry Butler Institute, Murdoch University, Perth, Australia

^d Asia Research Centre, Murdoch University, Perth, Australia

^e Faculty of Fisheries and Marine Sciences, Bogor Agricultural University, Bogor, Indonesia

^f Research Centre for Society and Culture, Indonesian Institute of Sciences, Jakarta, Indonesia

^g Australian National Centre for Ocean Resources and Security, University of Wollongong, NSW, Australia

^h Independent consultant, Jakarta, Indonesia

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ABSTRACT

Small-scale fisheries (SSF) provide crucial contributions to livelihoods, food and nutrition security, and the well-being of coastal communities worldwide. In Indonesia, 2.5 million households are involved in SSF production, yet these households are characterised by high poverty rates and vulnerability due to declining ecosystem health and climatic change. In this study we applied the Sustainable Livelihoods Framework to analyse the characteristics and immediate and longer-term outcomes of 20 SSF livelihood-focused intervention programs implemented in coastal communities across the Indonesian Archipelago over the last two decades. Projects covered a wide range of spatial scales, funding providers and key participants. Factors supporting positive program outcomes included application of inclusive and holistic approaches to sustainable livelihoods, implemented and supported over appropriate time frames; use of participatory capacity development methodologies and locally-situated project facilitators; and collaborative engagement with local government, non-government organisations and private-sector actors. However, it was impossible to identify evidenced successes from a longer-term sustainability perspective. Short project timeframes, absence of baseline or monitoring data, pressure for satisfactory reports to donors, and limited post-project evaluation, together with invisibility of women's work and non-commercial exchanges, affected the adequacy of assessments. Given the lack of post-project assessment among projects studied, a thorough review of longer-term project impacts is recommended, guided by the Sustainable Livelihoods Framework, to evaluate sustained improvements in livelihoods outcomes and environmental sustainability. This would support best-practice design and implementation of SSF livelihood-focused interventions, disseminated beyond academia, to influence policy and development to achieve socio-economic equity and environmental goals.

1. Introduction

The development of sustainable coastal livelihoods is critical in supporting people to move out of poverty, and to achieve broader economic, social and environmental goals [1,2]. Small-scale fisheries (SSF)

make critical contributions to the livelihoods, food and nutritional security, and well-being of predominantly coastal households around the world [3,4]. In Indonesia, conservative estimates indicate that there were around six million fishers and fish farmers in 2014 [5]. Moreover, 2016 estimates indicate 960,000 households were engaged in capture

* Correspondence to: Charles Darwin University, Ellengowan Drive, Casuarina, NT 0810, Australia.

E-mail addresses: natasha.stacey@cdu.edu.au (N. Stacey), emily.gibson@cdu.edu.au (E. Gibson), N.Loneragan@murdoch.edu.au (N.R. Loneragan), C.Warren@murdoch.edu.au (C. Warren), bud@psp-ipb.org (B. Wiryawan), supriadi@lipi.go.id (D.S. Adhuri), dirks@uow.edu.au (D.J. Steenbergen), rfitriana@gmail.com (R. Fitriana).

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fisheries and over 1.5 million households in aquaculture [6]. These households contribute significantly to Indonesia's economic productivity, with the country ranking as the world's second largest producer of both marine fish and farmed seaweeds [1]. And yet one fifth of Indonesia's poor are from fishing households [7].

SSF in Indonesia encompass a wide variety of capture fisheries, aquaculture and mariculture activities, employing labor intensive harvest, processing and distribution technologies. Activities may be undertaken on a full-time, part-time or seasonal basis, mainly for subsistence or local consumption and, more recently, for international export markets [8]. SSF operate at different organizational levels, from self-employed single operators, through informal micro-enterprises to formal sector businesses. Men and women are involved throughout SSF value chains (at input, production and post-production), although local gender norms dictate participation, and in different cultural and spatial contexts [9]. In some coastal communities, fisheries livelihoods are central to the socio-cultural identity of households [10,11], whereas in other contexts fishing adds to a portfolio of household activities for securing an income and/or food throughout the year [12,13].

The sustainability of SSF-based livelihoods is challenged by a range of factors and processes. These include overfishing and destructive fishing practices, inappropriate coastal development [14], and land-based pollution [15,16]; all of which can threaten the productivity of the resource base. Poor fish handling and post-harvest practices, as well as the absence of, or poorly developed, infrastructure, lead to high discards and post-harvest losses [3,17,18]. SSF livelihoods are also being affected by the cumulative impacts of a changing climate, resulting in shifts in species abundance and range, increasing ocean acidity and deoxygenation, as well as increasing weather turbulence, making fishing activities less certain and more risky [19]. In addition, highly productive SSF overlap with globally valuable ecosystems across the equatorial tropics, increasing tension between growth-oriented domestic fisheries policies and the international conservation movement [20].

Given these challenges, considerable investment has been directed to enhance, diversify and/or develop alternative livelihoods for rural coastal households engaged in SSF, including in Indonesia. A livelihood in its simplest sense, according to [21], "is a means of gaining a living". However, gains in national economic productivity are not necessarily accompanied by reductions in domestic poverty rates, and thus it is clear that livelihoods involve more than having a job [78]. A broader understanding of rural livelihoods is reflected in the Sustainable Livelihoods Approach and Framework [22], which provide an integrated view of the processes through which households achieve, or fail to achieve, sustainable livelihoods. The livelihood activities pursued depend upon the livelihood assets (broadly: human, physical, natural, social and financial) that the household owns, controls, claims, or otherwise accesses (including open access resources such as fishing grounds). These assets and activities are in turn enabled or hindered by policies, institutions and social processes, as well as the broader vulnerability context (encompassing shocks, trends and seasonality) [23]. The combination of livelihood strategies employed by a household is sustainable if the household maintains or improves its standard of living in 'outcome areas' such as more income, increased well-being, improved food security, reduced vulnerability to external shocks and trends, while not undermining the natural resource base [22,24]. The sustainable livelihood framework evolved as a valuable tool for analysing the complex and multi-dimensional conditions under which livelihoods are constructed and identifying potential points of entry for livelihood-focused interventions, while also taking account of economic and environmental sustainability [23].

Livelihood-focused interventions, which seek to enhance, diversify or introduce new livelihood activities, are at the core of many coastal development programs seeking to alleviate or reduce household poverty and/or to protect and conserve marine habitats or species. These interventions aim to: i) enhance existing livelihoods by improving productivity and/or sustainability; ii) introduce value adding or alternative

livelihoods options [25]. This might involve a fisher being provided with new gear, facilitating a move to pelagic rather than near-shore fisheries, or the provision of training in mechanics or hairdressing to support small-enterprise development.

Evidence of the effectiveness of these interventions, measured primarily in economic terms and with respect to reduced fishing pressure, in achieving substantial improvements in livelihoods outcomes, is mixed. While internally prepared project evaluation reports provide reflexive assessments, highlighting the most positive outcomes, the limited peer-reviewed literature for Indonesia provides a less positive picture. For example, Von Essen et al. [26] describe repeated attempts extending over 30 years, initially self-initiated, then government-facilitated, as part of the *Indonesian Coastal Resources Management Project (Proyek Pesisir)*,¹ and finally privately-driven, to establish mariculture programs in North Sulawesi, with mixed outcomes. Von Essen et al. [26]'s evaluation of the impacts of *Proyek Pesisir* over time (including up to 10 years after project closure) at four project and control sites in North Sulawesi, found that positive impacts of project activities assessed against three domains of poverty (security, opportunity and empowerment) did not continue after external support was withdrawn. Ferse et al. [27] describe a "discouraging local history of small-scale trainings" to new products for income generation in the Spermonde Archipelago, South Sulawesi due to limited markets.

In this paper we draw on an evaluation of livelihood-focused interventions implemented in Indonesian coastal communities over the last 20 years to outline conditions that offer the most promising avenues for future research and best-practice programming that is cumulative (rather than recurrent) in its learning and implementation. We first ask what has been achieved toward realizing sustainable livelihoods in SSF interventions, with attention to gendered aspects of livelihood development projects. We then identify the characteristics of livelihood-focused interventions, their impact on livelihood assets and outcomes, how gender issues are approached, and what enabling and constraining factors might improve the effectiveness and sustainability of such interventions in the future. Finally, we discuss these factors against themes arising from the evaluation which feature strongly in affecting intervention outcomes and provide a set of recommendations.

2. Methods

The study draws on a desktop review of academic and grey literature by a multidisciplinary research team, applying a qualitative methodology.

2.1. Literature review

A narrative literature review was prepared to provide a comprehensive overview of current approaches to SSF livelihood-focused interventions including best practices, success factors and principles for evaluating the effectiveness of livelihood-focused interventions (see [28]). The review, undertaken between late 2015 and early 2017, involved a keyword search, appraisal, synthesis and analysis of scholarly and grey literature relating to the research questions, with a primary focus on Indonesia. Literature was sourced from standard academic databases (Web of Science, Science Direct), Google Scholar, and open web searches [28]. We subsequently identified and categorized key findings and themes from the literature to interpret and compare apparent trends in, and enabling and constraining factors, of livelihood-focused interventions implemented in Indonesia.

¹ The project was implemented by USAID and Indonesia's National Development Planning Agency (BAPPENAS) between 1997 and 2002, at a cost of US \$1.4 million.

2.2. Search for and selection of projects

An initial list of 32 coastal and fisheries livelihood intervention projects delivered in Indonesia since 1998 was compiled. Donor agency (bilateral aid agencies, development banks, international development agencies, and United Nations agencies) and Indonesian and international NGO websites were searched for inception and final reports, evaluation reports, and project outputs.² Academic literature evaluating various aspects of projects, and grey literature, including Indonesian media websites, and unpublished material accessed directly from donor agencies were also reviewed. A final selection of 20 projects for analysis was made to encompass diversity across project characteristics (see Table 1). Projects were grouped into three broad categories: those funded by the Australian or Indonesian Governments, those funded or lead by an international agency (e.g. IFAD), and those lead by non-government organisations (NGOs).

2.3. Analysis

Data on each project was initially summarized in a standardized template (adapted from [30]) to identify project activities, impacts on livelihood assets and outcomes, and enabling and constraining factors loosely reflecting the key components of the Sustainable Livelihoods Framework [22]. We also added a component to report on the gender approach implemented in projects. These summaries were then reviewed and analyzed during two multi-day workshops by a multi-disciplinary research team, comprising Australian and Indonesian academics and representatives of Indonesian NGOs. The research team reviewed clusters of projects, resulting in the production of an Excel workbook documenting the key attributes of each project in three areas:

- (1) Characteristics (as per Table 1).
- (2) Results: (i) immediate and (ii) long-term outcomes; and (iii) gender approach.
- (3) Lessons learned, including enabling and constraining factors, and recommendations.

Projects were regarded as having ‘immediate outcomes’ if they included activities that (i) enhanced any of the five livelihood assets (human, social, physical, natural and financial); and (ii) contributed to improvements in livelihood outcome areas (increased income, increased well-being, reduced vulnerability, improved food security, and creation of a more sustainable natural resource base). Project documentation generally reported the immediate impact of project activities or their outcomes in a way that allowed categorisation according to those livelihood assets or capitals that were specified as project objectives. Projects were regarded as having ‘long-term outcomes’ if they included activities that contributed to institutional development or improvement at the community, provincial or national level, improved fisheries management, and/or were sustainable; that is, where activities or processes apparently continued beyond the life of the project itself. Projects were assessed for their gender approach (gender reinforcing, accommodating or transformative; see Stacey et al. [29] for a full assessment of gender aspects of this research). Enabling and constraining factors impacting on the effectiveness and sustainability of interventions were identified from project documentation, lessons learned and recommendations.

2.4. Limitations

The analysis of livelihood projects in Indonesia was limited by the

² See Stacey et al. [29]. Sources of information reviewed for the project evaluation can be found at: <https://link.springer.com/article/10.1007%2Fs40152-019-00142-5#additional-information>.

Table 1

Characteristics considered in final selection of projects on livelihood interventions in Indonesian coastal communities.

Characteristic	Variation
Intervention objectives, approach and goal of activities	Community development including livelihood enhancement, conservation management, fisheries management (e.g. improvements in data and technology, market-access)
Scale of project	Regional, national, provincial, district, village
Value of project (\$)	From \$10,000 to \$1000,000 and above
Scope and breadth of project	Large externally-funded international agency projects, national and provincial government initiatives, local NGO projects
Duration / delivery mode	One-off small grants for single activities to multi-component, multi-year projects
Location	Across the Indonesian archipelago
Access to and availability of information	Availability of documents containing comparable data, and/or research team's direct knowledge of projects

availability, quality and variability of comparable project information. We acknowledge that there may be numerous other projects – including small-scale, locally-initiated projects – that have delivered, and are delivering, positive outcomes for beneficiaries. Our analysis was constrained by the information available, and we were not able to independently verify the achievements, nor the sustainability of outcomes, reported in the reviewed data. However, our research team contributed valuable direct knowledge of some projects, their activities, outcomes and challenges.

3. Results

3.1. Project characteristics

The duration, scale and scope of projects varied considerably. The timeframe ranged from 1998 to 2016, and eight projects were still being implemented at the time of our evaluation. Projects funded by governments or international agencies were typically of longer duration (three to five years), involved significant financial investment (> US \$1000,000), and involved activities in several provinces intended to benefit thousands of households. For example, the *ATSEA1 project* [Project #2, Table 2] aimed to prevent further depletion of coastal fisheries resources and decrease poverty and social disadvantage in coastal communities; its activities benefited 5,000 households with fisheries-based livelihoods in two coastal areas of Nusa Tenggara Timur. These projects, funded through international lending mechanisms, were aligned with the Indonesian government's five-year planning and program cycle. In contrast, projects delivered by NGOs were of shorter duration (e.g. one-off activities of 1–2 years), involved smaller levels of investment, and involved activities in one or several near-by sites, intended to benefit a small number of individuals or households. For example, the *Mud crab fisheries improvement project* [#18] works with 140 women fishers in one district.

The focus of projects varied considerably, depending on the theory of change underlying the project. Some projects were associated with major coastal and fisheries resource management initiatives which sought to embed specific management approaches into government policy and had accompanying livelihood components that were intended to address perceived pressures or threats to the resource concerned. For example, *COREMAPII* [#7] introduced a framework for community-based reef ecosystem management that included a livelihoods component aiming to diversify local fishers' livelihood activities to reduce perceived human pressure on coral reefs. This project extended across the provinces of south-east Sulawesi and Raja Ampat.

Table 2
Summary of the 20 livelihood projects in Indonesia reviewed during this study.

Project No.	Name Of Project	Location	Funder	Duration	Main priority of project
1	<i>Alternative Livelihoods Project For Fishers On Rote And In Kupang Bay</i>	Rote and Kupang Bay, NTT	AusAID	2004 – 2006	Development (seaweed grow-out trials), livelihoods
2	<i>Arafura And Timor Seas Ecosystem Action Program (ATSEA1)</i>	Aru and Tanimbar, Maluku	GFF	2010 – 2014	Environment (sea ecosystem management)
3	<i>Diversification Of Smallholder Coastal Aquaculture In Indonesia</i>	South Sulawesi and Aceh	ACIAR	2010 – 2015	Development (trials of aquaculture species)
4	<i>Economic And Welfare Movement Of Coastal Communities</i>	West Sumatra	Provincial Government of West Sumatra	2012 – 2016	Livelihoods (poverty reduction)
5	<i>Coastal Community Development And Fisheries Resources Management Project</i>	Riau, Central Java, East Java, NTT	ADB	1998 – 2005	Fisheries management, livelihoods
6	<i>Sustainable Aquaculture Development For Food Security And Poverty Reduction Project</i>	Northern Sumatera, South Sumatera, West Java, South Sulawesi	ADB	2007 – 2013	Livelihoods (poverty reduction)
7	<i>Coral Reef Rehabilitation And Management Project (COREMAP) Phase II</i>	Selayar, Pangkep, Sikka, Buton, Wakatobi, Biak, Raja Ampat	World Bank and GEF, with ADB and AusAID	2005 – 2011	Environment (coral reef protection)
8	<i>Implementing An Ecosystem Approach To Fisheries In Small-Scale Tropical Marine Fisheries</i>	Lombok	European Commission	2011 – 2014	Fisheries management, livelihoods
9	<i>Regional Fisheries Livelihoods Programme For South And Southeast Asia (RFLP)</i>	Kupang, Alor, Rote-Ndao, NTT	Kingdom of Spain via FAO, Implementation, MMAF district Marine Agency and local NGOs	2009 – 2013	Fisheries management, livelihoods
10	<i>Coastal Community Development Project (Ccdp)</i>	Papua, Maluku, North Maluku, North Sulawesi, Gorontalo, South Sulawesi, NTB, NTT, West Kalimantan	IFAD, Spanish Food Security Trust Fund	2012 – ongoing*	Community development, livelihoods
11	<i>Indonesia Marine And Climate Support Project (IMACS)</i>	Southeast Sulawesi, NTT	USAID	2010 – 2014	Fisheries management
12	<i>Planning For Sustainable Use: Developing Coastal And Marine Spatial Plan To Inform Investment Plan And Sustainable Use Of Marine Resources That Benefit The People And Biodiversity Of Rote-Ndao, NTT</i>	Rote-Ndao, NTT	Australian Government	2013 – 2015	Sustainable community development
13	<i>Coastal Field Schools (A Component Of The Restoring Coastal Livelihoods Program)</i>	South Sulawesi	CIDA	2012 – 2015	Environment (mangrove restoration)
14	<i>Up-Scaling Community-Based Fisheries Management In Biak And Supiori Regencies (I-LMMA)</i>	Biak and Supiori, Papua	A consortium of international conservation NGOs	2015 – ongoing*	Livelihoods, environment
15	<i>Sustainable Aquarium Fishery And Aquaculture Project</i>	Buleleng, Bali	Various small grants, including the Australian Government's Direct Aid Program	2008 – ongoing*	Environment (coral reef restoration), livelihoods
16	<i>Mangroves For The Future – Small Grant Facility</i>	South Sulawesi, North Sulawesi, Gorontalo, Central Java, West Java, North Jakarta, Yogyakarta	IUCN and UNDP	2010 – ongoing*	Environment (mangrove protection)
17	<i>I-FISH And SEAFOOD Pilot Programme</i>	Maluku, West Papua, East Lombok, NTB, NTT, Sulawesi	Various donors	n.a. – ongoing*	Fisheries management, livelihoods
18	<i>Mudcrab Fishery Improvement Project</i>	West Papua	MDPU and CI	2015 – ongoing*	Fisheries management
19	<i>Lovina Dolphin Watching Nature-Based Tourism Project</i>	Buleleng, Bali	N/A	2008 – ongoing*	Livelihoods associated with dolphin tourism
20	<i>Sea Turtle Conservation And Eco-Tourism Development</i>	Jembrana, West Bali	Various small grants and visitor donations	1996 – ongoing*	Environment (sea turtle conservation)

Notes: projects are referred to in this paper by #, e.g. [#1]; see Loneragan et al. [28] for full details of projects. Project status 'ongoing' refers to projects still being implemented as at December 2017. Abbreviations: ACIAR: Australian Centre for International Agricultural Research; ADB: Asian Development Bank; AusAID: Australian Agency for International Development; CI: Conservation International; FAO: Food and Agricultural Organization of the United Nations; GEF: Global Environment Facility; IUCN: International Union of Conservation of Nature; MDPI: Yayasan Masyarakat dan Perikanan Indonesia; MMAF: Ministry of Marine Affairs and Fisheries; n.a.: not available; N/A: not applicable; NGO: non-government organization; NTB: Nusa Tenggara Barat Province; NTT: Nusa Tenggara Timur Province; UNDP: United Nations Development Programme.

3.2. Enhancing or diversifying livelihoods

Projects included activities aiming to both enhance the income-generating potential of existing livelihoods and to introduce new livelihood activities, thus diversifying household livelihood portfolios (Table 3). Enhancements to existing livelihoods included activities such as improvements to post-harvest cold-chain management (e.g. providing

ice-making machines to fisher-cooperatives and cool-boxes to fishers) to increase the quality and value of fish. Alternative livelihoods included new activities based on the existing natural resource base; for example, several projects sought to introduce food-based, value-adding livelihood activities for women (e.g. making fish or shrimp crackers). Other projects involved trialing new aquaculture and mariculture activities. Less commonly projects, such as the *Regional Fisheries Livelihoods Programme*

Table 3
Proportion of projects aiming to enhance or introduce new livelihood activities.

	Project type			All projects
	Government	International	Non-government	
Number of projects in category	4	8	8	20
Enhancements to existing livelihood activities	50%	87.5%	50%	65%
'New' livelihood activities	100%	87.5%	62.5%	80%

Note: This table provides a summary of approaches to livelihoods taken by study projects. For example, 2 of the 4 (50%) government programs aimed to enhance existing livelihood activities. Many projects included both enhancements to existing livelihoods and new 'alternative' livelihoods.

for South and Southeast Asia (RFLP) [#9], provided training in fisheries-aligned areas (e.g. mechanics, fiberglass) as well as in new diversified areas such as hairdressing and IT/computers.

3.3. Immediate project outcomes

3.3.1. Contribution to livelihood assets

As shown in Table 4, all the projects included activities aiming to enhance human assets, for example by providing training to enhance existing livelihoods or facilitate a shift to alternative livelihood activities. Seventeen (85%) projects also sought to enhance social assets, principally through the creation of community-level fisheries, women's livelihood and conservation groups. These groups then became the focal point for further activities. Sixteen (80%) projects provided physical assets to support the uptake of enhanced or diversifying livelihood activities; this included boats, marine safety equipment (e.g. life jackets) and cooking equipment for food processing for women's livelihood groups. Three-quarters of projects included activities aiming to enhance

Table 4
Summary of the reported immediate (assets and livelihood outcomes) and long-term outcomes of 20 livelihood intervention projects in Indonesia.

Outcome measures	Achieved				"Not achieved"	"N/A or not assessable"
	Government (n = 4)	International (n = 8)	NGO (n = 8)	Total projects (N = 20)		
<i>Immediate outcomes</i>						
<i>(a) Livelihood assets</i>						
Human capital	4	8	8	20	0	0
Social capital	4	8	5	17	3	0
Physical capital	4	7	5	16	0	4
Natural capital	2	7	6	15	0	5
Financial capital	2	4	0	6	1	13
<i>(a) Livelihood outcomes</i>						
More income	3	7	7	15	0	5
Increased well-being ^a	0	2	2	3	0	17
Reduced vulnerability ^a	2	4	4	10	1	9
Improved food security ^a	1	3	3	6	4	10
More sustainable use of natural resource base	1	6	6	12	1	7
<i>Long term outcomes</i>						
Institutional development	3	6	5	14	2	4
Capture fisheries management	1	5	5	11	2	7
Sustainability ^a	0	2	0	2	4	16
<i>Gender Approach</i>						
Gender reinforcing	2	3	3	8		
Gender accommodating	2	4	4	10		
Gender transformative	0	1	1	2		

Notes:

^a flags categories that were difficult to evaluate for a number of projects: increased well-being n = 13; reduced vulnerability n = 5; improved food security n = 8; sustainability n = 12. N/A not applicable to a project.

natural assets toward improved management of fisheries or coral reef ecosystems. Only six (30%) projects sought to enhance financial assets, principally through improved financial literacy for household and small enterprises and micro-lending schemes (Table 4).

3.3.2. Contributions to livelihood outcomes

The contribution of project activities to five different livelihood outcomes, based on the available project documentation, was more difficult to assess. Several of these, such as food security, well-being and vulnerability, are difficult to measure because of their multi-dimensional construct, while there are additional challenges in attributing change solely to project activities. Increased income was often assumed to lead to increased food security, however improvements in dietary quality were rarely assessed with recognised indicators such as dietary diversity. Similarly, projects claiming to have increased sustainability of the natural resource base often included activities that increased harvest capacity, thus increasing resource pressure. The difficulty in measuring project performance also occurred because projects lacked clearly articulated theories of change as to how project activities would contribute to the achievement of project goals across livelihood or environmental outcomes. A majority of projects were designed using logical frameworks with quantitative indicators, such as participation (number of persons trained or groups formed, etc.), resources given, number of coastal management plans prepared, or number of hectares of mangroves replanted. In several projects, baseline data were not collected, thus preventing comparative pre- and post-evaluation of project activities against any indicators, while in other projects the indicator chosen did not actually measure the identified factor (Table 4).

3.4. Long-term project outcomes

We assessed long-term project outcomes in three areas: institutional development, fisheries management, and the sustainability of project activities and outcomes (Table 4). Fourteen of the projects (70%) contributed to the development of institutional capacity, principally

through the creation and strengthening of community-level groups, the creation of linkages between fishers, value chain actors and local and provincial government agencies, and through the revitalization of traditional natural resource management systems. The creation of groups was a common strategy, allowing for economies of scale in the delivery of project activities; however there was little information available about the inclusivity of groups (e.g. age, social class), nor evaluation of elite capture of groups and associated benefits (e.g. boats). Several of the larger projects also contributed to institutional capacity development and improved capture fisheries management through knowledge building and the creation of national and provincial fisheries management policy and regulatory frameworks.

There was insufficient information to assess the sustainability of project activities and their claimed outcomes. Evaluation activities were typically conducted in the final phases of or shortly after the conclusion of the project implementation phase, to satisfy donor requirements, thereby limiting the evaluation to delivery of planned activities. In contrast, research team members were able to identify longer term outcomes through their own direct observation or involvement in some projects, including the subsequent collapse of institutions and management frameworks established by several of the projects.

3.5. Gender approach and inclusivity of projects

The approach to gender and involvement of women varied considerably across projects. Eight (40%) of the projects were assessed as having a gender-reinforcing approach, in which there were activities for men and sometimes women, but no indication of the underlying rationale, nor recognition of local gender norms and relations that might hinder or facilitate improvements in gender equity. Half of the projects applied a gender accommodating approach, where there was evidence of consideration of gender norms and relations in project design and activities, but no apparent attempt to challenge these. Only two (10%) of the projects [*Coastal Field Schools* [#13]; *Implementing an ecosystem approach to fisheries in small-scale tropical marine fisheries* [#8]) applied a gender transformative approach in which there was a clear attempt to take account of, promote, and facilitate locally-led equitable transformation of gender norms and relations to support the achievement of local aspirations. While some projects reported basic data about men's and women's participation in project activities (e.g. training, membership of enterprise groups), participation was more often reported at the 'household' level. There was little evidence of broader consideration of the accessibility of activities, the depth of participation, and the implications of engaging women in productive activities on top of their

existing household and informal responsibilities.

3.6. Enabling and constraining factors

A range of enabling and constraining factors were identified from the evaluation and literature review (Table 5). Applying enabling factors could improve the implementation, effectiveness and sustainability of such interventions in the future. Given that many of these projects were externally- or centrally-driven (i.e. top-down), early engagement with provincial and local government agencies, community leaders and potential beneficiaries supported the embedding of project activities within government program cycles and tailoring of activities to the local context (e.g. *ATSEA1 project* [#2]). Projects delivered through well-supported local NGOs (e.g. *Mangroves for the Future* [#16], *Coastal Field Schools* [#13]; *Sea Turtle Conservation and Eco-Tourism Development* [#20]) capitalized on existing social capital, as did those building or strengthening existing local institutions for management of natural resources. The use of capable locally-situated project facilitators provided local focal points for projects, as well as supporting project facilitators' personal capacity development. Participatory capacity development methodologies were beneficial in developing self-actualization and problem-solving skills. A holistic approach to livelihoods and early linkages with private sector value chain actors supported and offered potential rewards for improved/enhanced livelihood activities.

On the other hand, a range of factors constrained project implementation and the achievement of planned outcomes (Table 5). Central among these was the failure to "localize" project activities, such that projects did not include a grounded assessment of feasible or desirable enhanced or alternative livelihoods, value chain analysis, or comprehensive analysis of local gender norms and gender relations, and the differential power relations of value chain actors (e.g. middle men and patrons vis à vis indebted fishers). Some projects were hampered by inconsistencies and incompatibility in overall project goals (e.g. conservation of reef ecosystems) and livelihood activities (e.g. provision of gear which increased catching capacity). Other projects were not aligned with existing government work programs, such that there was limited interest in and capacity to deliver or take ongoing stewardship of project activities in the longer-term (e.g. *RFLP* [#9]). Additional barriers were encountered when activities were implemented where beneficiaries lacked secure tenure over coastal resources, or farming land, or failure to engage with external actors/users, created the potential for conflict and discouraged participants from investing in changed practices. Projects often took a narrow view of a livelihood activity (e.g. training women to make fish-based food items), leaving trainees

Table 5

Factors (a) enabling and (b) constraining project implementation and positive outcomes based on evaluating 20 intervention projects in Indonesia and a literature review.

(a) Enabling

- i. Engagement with and implementation of activities via reputable and respected local NGOs
- ii. Engagement and on-going involvement of local government agency(ies) and educational institutions
- iii. Locally-situated project facilitators
- iv. Use of participatory capacity development methodologies, such as train-the-trainers, field schools
- v. Building/strengthening local institutions, including traditional resource management frameworks
- vi. Linkages with private sector value-chain actors that support and reward improved practices

(b) Constraining

- i. Internal inconsistency/incompatibility in theory of change and project activities
- ii. Lack of alignment with existing government policies and programs
- iii. Failure to conduct gender analysis and assess time burdens of proposed activities
- iv. Low capacity of local NGOs with respect to project and financial management
- v. Poor quality service delivery by local actors/facilitators (assumptions about experience, knowledge)
- vi. Failure to assess differential power relations, and motivations, of actors within local value chains
- vii. Failure to assess appropriateness/desirability of and counter income differentials between existing and proposed alternative or enhanced livelihood activities
- viii. Need for holistic view of livelihood activities, encompassing soft-skills and support to engage in/expand into formal value chains
- ix. Need for longer time frames to build capacity of new institutions (e.g. fisheries cooperatives)
- x. Failure to situate activities within existing regulatory framework (e.g. secure tenure) and assess potential for conflict in open-access resource management environment

unskilled and isolated from avenues to develop and expand an emerging small enterprise. Finally, many projects underestimated the time or resources required for different activities (e.g. capital investments), and to build the capacity of new institutions (e.g. fisheries cooperatives).

4. Discussion

Our review of 20 livelihood intervention projects has identified the diversity of interventions implemented in coastal communities across Indonesia over the last two decades. Overall, we found a lack of thorough evaluation of project activities and their impacts, precluding an assessment of the sustainability of project activities in the longer term. This is important, given the substantial investments made. A similar evaluation by Pomeroy et al. [31] in the Philippines estimated that only 15–20% of livelihood interventions for fishing communities were sustained one year after project conclusion. Further, some projects applied gender reinforcing or accommodating approaches; these have generally been gender blind with the effect of reinforcing existing inequalities between men and women [29]. In this section, we discuss four main thematic areas affecting the design, implementation, and evaluation of interventions: 1. Trade-offs between livelihoods and environmental sustainability goals; 2. Governance; 3. Role of markets; and 4. Cross-sectoral collaboration and institutional bricolage. We see these as flashpoints at which enabling and constraining forces need to be addressed if sustainable livelihood outcomes are to be achieved.

4.1. Trade-offs between livelihoods and environmental sustainability goals

All programs studied sought to improve household livelihoods (measured as increased income) while, implicitly or explicitly, enhancing various aspects of natural resource management (e.g. fisheries) and habitat protection (e.g. coral reefs, mangroves). Linear theories of change involved simplistic assumptions, including that provision of an alternative livelihood would eliminate, or at least reduce, pressure on the target resource [32,33]. However, we found evidence to the contrary, flowing first from the top-down application of conservation and management measures and second from the failure to accommodate or compensate for the delay in purported benefits from these actions. In the first instance, projects were hampered by a lack of effective participatory engagement, taking account of local power relations and institutions, in generating understanding and acceptance of the perceived need to conserve and/or manage the target resource. Ethnographic work in Indonesia by Warren and McCarthy [34], Clifton and Majors [35], Lowe [36]; Steenbergen and Visser [37], and Pauwlessen and Verschoor [38], among others, highlights the differing worldviews of conservation actors and local indigenous communities, and the need for these views to be understood and incorporated into conservation and management approaches. Enabling factors ii-v in Table 5, pertaining to more inclusion, point towards mechanisms that catalyze local alignment and participation. The degree of inclusivity of participatory approaches impacts local awareness [39], while ineffective enforcement can undermine conservation outcomes even when there is a high level of awareness [40]. This can lead to ‘paper parks’, with rhetorical, but little practical value. In the second instance, projects rarely considered how resource users would sustain a livelihood in the period prior to the purported benefits of conservation and/or management measures accruing; for example, capturing the spill-over from a proposed increase in fish biomass in no-take zones. Gillett et al. [41] refer to this, in their review of Pacific Islands’ fisheries livelihood projects, as overcoming the ‘fisheries management hump’. From the studies reviewed, an exception was the *Implementing an Ecosystem Approach to Fisheries* project [#8,] which compensated for restrictions on fishing in protected areas, newly established through the revitalization of customary management, with the simultaneous introduction of fish aggregating devices and squid attractors.

The challenge of achieving environmental sustainability at the same time as promoting diversified livelihoods was evident, with inconsistencies and contradictions between stated project objectives and the assistance provided. For example, in both the *Coastal Community Development Project* [#5] and *COREMAP II* [#7] efforts to enhance coastal management were undermined by the provision of assets (engines, fishing gear) which increased capacity and thus pressure on resources, while early success in seaweed mariculture promoted by the *Alternative livelihoods project for fishers* [#1] saw rapid uptake which exacerbated the potential to degrade water quality and increase susceptibility to crop-destroying diseases. Where the links between environmental sustainability and proposed alternative livelihoods are poorly manifested, [41] caution that diversification activities “can be a distraction that deters communities from gaining awareness of the need for, and benefits of, more effective forms of’ conservation and management. There was little evidence of projects assessing the perverse outcomes associated with conservation and management measures, such as intensification or diversion of activities to other sensitive locations, with project evaluations largely reporting simple metrics such as number or area (hectares) of protected areas established.

Intracommunity heterogeneity, intersectional factors and the intrinsic value of traditional livelihood activities are also relevant at this interface of conservation and livelihood-focused interventions but were poorly addressed. Households within a community are characterized by differing asset endowments and capabilities, as well as nested social and economic relationships, which affects their ability to engage with and grasp potential opportunities. For example, an independent evaluation of the *COREMAP II* [#7] program found that “funds to support local capacitation and livelihood mainly provided benefits to an influential minority... [with] resource access and decision-making influence not open to the majority of villagers” ([42], p. 1219). Studies elsewhere have shown that women can be particularly disadvantaged, as they are culturally excluded or lack the recognized voice to contribute to ‘community’ discussions [9], while the poorest of fishers may have limited livelihood mobility due to indebtedness in *punggawa-sawi* (patron-client) relationships [39]. Hanh and Boonstra’s [43] work in Vietnam also highlight generational (youth vs. elderly) differences in the desire and ability of small-scale fishers to capitalize on alternative livelihood opportunities. Inadequate consideration was given to the intrinsic values of traditional livelihood activities. In many projects attempts to diversify fishing activities or introduce alternative livelihoods (e.g. seaweed mariculture) had limited success and the original activities were quickly resumed (e.g. *COREMAP II* [#7]). This is consistent with studies in East Africa and the western Indian Ocean which have highlighted the ties between socio-cultural identity and livelihood activities, especially in specialist fishing communities [44,45]. These ties, together with small economic gains available in new livelihood activities, contribute to minimal uptake [46], and can result in assets (equipment/gear) donated to incentivize alternative activity being repurposed by beneficiaries [41]. The social impacts of integrated conservation and development projects are rarely adequately evaluated, with evaluations undertaken at one point in time, focusing on one or very few outcomes, and lacking the requisite data to assess causal effects [47].

To effectively minimize pressure on natural resources, piloted alternative livelihood activities must demonstrate tangible local benefits and this can be challenging for activities with relatively long production cycles (e.g. aquaculture), as the interest of potential adopters must be maintained and donor reporting targets met [48]. The coastal field schools approach applied in the *Restoring Coastal Livelihoods* project [#13] provides a case in point, collaborating with community groups over an entire production cycle (averaging 13 weeks). From their study in Tanzania, Torell et al. [49] found that alternative occupations that provide for immediate nutrition and cash needs were preferred over those that required longer term investment to realize benefits. Torell et al. [49] contrast alternative livelihood activities that provide a slow and steady income in markets that can accommodate a lot of

entrepreneurs (e.g. seaweed farming) with those that provide a relatively high and steady income for only a few entrepreneurs per village (e.g. bread baking, solar multi-chargers). They reflect that the options pursued depend upon whether a project seeks to diversify the livelihoods and strengthen resilience of many households through livelihood activities that provide a small and steady income, or to bring people out of a poverty trap by concentrating supporting resources but reaching a smaller number of households. The former approach was evident across many of the large-scale projects included in our review. For example, the *Sustainable Aquaculture for Development Project* [#6] aimed to work with nearly 15,000 households, and *COREMAP II* [#7] was implemented in 357 communities. Program design, and their associated theories of change, need to consider more explicitly how scales of intervention relate to intended objectives (e.g. locally-targeted change versus sectoral/institutional change). Aligning scope, resources and impact evaluations to reflect program objectives may allow better judgement on the value of investment.

4.2. Governance

Livelihood-focused interventions are implemented within and across different scales of governance. In Indonesia, the process of decentralizing government functions from national to district/regency and village levels, with provinces as supporting intermediaries, began in 1999. While decentralization is regarded as valuable for unlocking the development potential of regions, “principally by intensifying pressure on local governments to work more effectively and respond to the needs and demands of local communities” ([50]: 11), in Indonesia decentralization has “contributed to political tensions between levels, governance fragmentation and conflicting government policies” ([51]: 2), with many regional governments – especially in resource-poor (no oil and gas) regions – remaining heavily dependent on intergovernmental transfers for routine expenditures, let alone investment in community infrastructure [52]. The central government retains an overarching policy and management role, with many of the large-scale projects coordinated through the Ministry of Marine Affairs and Fisheries. As the decentralization process unfolded, several of the projects reviewed were hampered by a lack of engagement with newly established regional agencies, and their capacity, interest and readiness to implement various planned project components. For example, infrastructure for a vessel registration scheme and fish landing and market information website were prepared by the *RFLP* [#9], but not implemented or maintained after the project concluded. Another project, the *Coastal Community Development Project* [#10], was stymied by sudden changes in Ministerial policy on external loan assistance, with potential reputational risk given prior socialization of project activities ([53], #10). Effective governance is also affected by the potential for corruption and local elite capture of decision-making and rents [50]. The positive and negative roles of *punggawa* trader-creditors in Indonesian SSF value chains as patrons and informal leaders are well documented in the literature [27, 54, 55], but were rarely referenced in project proposals or evaluation materials.

Secure access rights are a fundamental starting point for management of common resources, however Indonesia’s decentralized bureaucracy contributes to a complex marine tenure framework [56, 57]. Evolution in the development of coastal and marine management frameworks over the last three decades was evident in project components seeking to embed conservation and marine management approaches within Indonesia’s regulatory framework. However, the development of these institutions at the national level, and then replication and implementation at district level in appropriate form proved time consuming, leaving a patchwork of ‘community-based natural resource management plans’ and village ‘marine protected areas’ with uncertain legal status. Berdej and Armitage [51]’s example from the province of Bali highlights the challenges of retrospectively ‘fitting conservation’ across multiple scales of governance.

At the same time, this formal legal framework overlaps with long-standing customary ‘adat’ institutions (e.g. *awiq-awiq*, *sasi*). These customary institutions were seen as an important enabling factor (v in Table 5) for building community consensus and acceptance of conservation and fisheries management measures in numerous projects (e.g. *I-LMMA project* [#14]). However, they were overlooked by the top-down prescriptive approach pursued in other projects, despite ‘participatory’ implementation (e.g. *COREMAP II* [#7]) [42]. In some cases, the creation of exclusive zones of use contributed to the potential for conflict between ‘local’ and ‘outside’ user groups, with evidence of discriminatory application of sanctions against both ‘outsiders’ and marginalized community members vis-à-vis well-networked locals. Efforts to navigate this complexity were evident in only one project, namely the *I-LMMA project* [#14], where support was obtained from local academic law experts to ensure that the management framework was legally grounded (reflecting enabling factors i & ii Table 5). Despite the importance of ensuring tenure security, it is unclear how these issues were navigated in other projects.

4.3. Role of markets

The development of markets, and market access, were considered key to improve livelihood opportunities in most of the projects reviewed. Although enhancing and diversifying livelihood activities were centered on men’s fishing at the production node, other activities were designed to develop and enhance the value of activities in downstream nodes. Many programs reached women through post-harvest processing enterprise groups for example. However, as observed by Adhuri et al. [54], small-scale fishers’ access to market and pricing information is governed (in fact, limited) by their relationship with *punggawa* patrons, with many fishers having no knowledge of the ‘real’ price of the fish harvested. Fishers have little bargaining power to enable them to capture a larger, or fairer, share of value from markets; Cripps and Harris [58], for example, report that fishers capture only 30% of the value of the small-scale octopus fishery in Indonesia. Several of the projects sought to enhance the price of fish received by fishers through international fair trade and sustainable harvesting or production certification schemes and, partnering with higher-level value chain actors (particularly exporters / international buyers), with benefits (premiums) delivered to and distributed by community-level institutions (e.g. *Fair-trade seafood project* [#17]). However, there is limited evidence elsewhere of the impact of sustainability certification schemes on production for, or demand in, domestic markets in low- and middle-income developing countries [59]. Opportunities for replicating these schemes are also limited in more remote regions. Nevertheless, some programs have sought to develop the infrastructure and institutions for entire value chains through private or joint-venture arrangements ([53], #10). Establishing collaborative linkages with private sector actors (enabling factor vi in Table 5) offers opportunity to integrate (market) networks which otherwise do not sufficiently engage in governance matters, thus compromising enforcement of rules.

If market-based approaches offer potential for enhancing existing livelihoods or introducing new livelihood activities, questions of under what circumstances, and who should be involved and how, are raised. Numerous alternative livelihood activities promoted by projects offered limited potential; for example, ecotourism and handicraft activities in communities either distant from large markets or on the periphery of small but well-served exclusive markets (e.g. dive tourism). Poorly developed and regulated ecotourism activities can also have negative impacts on animal welfare, as seen in two cases studied (*Dolphin watching* [#19] and *Sea turtle conservation* [#20]). Reflecting on similar approaches in the Pacific Islands, Gillett et al. [41] suggest that fisheries agencies and NGOs lack the capacity to identify, develop, and provide on-going support, especially in marketing, but may be well-placed to act as ‘honest brokers’ between communities and commercial businesses. In parallel, recognizing the heterogeneity within communities, Torell et al.

[48] suggest working with motivated entrepreneurial individuals and households, rather than large numbers of households, to gain greatest local benefits (echoing enabling factor ii in Table 5).

4.4. Cross-sectoral collaboration and institutional bricolage

The livelihood-focused interventions included in this study were largely sector-specific, seeking to enhance and broaden the value-chain of fisheries products. Evidence of cross-sectoral collaboration was limited; some projects provided grants to address broader community well-being considerations such as water/sanitation infrastructure (e.g. *Coastal Community Development project* [#10], *Coastal Field Schools* [#13]). Interestingly, even when communities could choose how to spend 'village grants', these were not necessarily directed to projects addressing basic needs. In other cases, opportunities for building cross-sectoral linkages appeared to have been missed, especially with respect to improved 'food security' as compared to 'nutritional security'. The uni-sectoral focus of many projects contrasts with a 'territory-based approach' advocated by [50] in which interventions address "the specific needs and opportunities present in rural areas by strengthening local capacities, fostering synergies, enhancing local governance competencies, promoting social inclusion and developing sustainable comparative advantages in employment inclusive sectors". This nested cross-sectoral and integrated approach, also suggested by Allison and Horemans [23], seeks to develop opportunities across natural resource and non-resource-based sectors. This approach is somewhat evident, although still sector-focused, in the scaling-up of IFAD's *Coastal Community Development Projects* ([53], #10).

Many of the projects reviewed sought to use participatory, adaptive co-management approaches, to develop and build the capacity of institutional actors across different scales of governance. In these projects, the supportive role of local customary and village leaders, competent local or locally-embedded project facilitators, non-governmental organisations, and universities were highlighted as favorably influencing project outcomes (see enabling factors i, ii, iii and v in Table 5). Attention to the 'bricolage' perspective advocated by Cleaver [60], which focuses on process, interpersonal and institutional engagement, human and social capacity building, and incremental improvement, is relevant. We have highlighted the importance of understanding the dynamic and complex social and economic power relationships that characterize different communities and value chain actors. Participatory approaches, encompassing activities that document and increase awareness of these relationships (e.g. gender awareness activities), such as the field school methodology applied in the *Restoring Coastal Livelihoods* project [#13], learning centers used in the *I-LMMA* [#14] project, and village information centers used in the *Coastal Community Development and Fisheries Resources Management Project* [#5] are consistent with Cleaver's bricolage perspective.

4.5. Recommendations

We recommend attention to the following critical principles underpinning a systematic sustainable livelihood approach for evaluating empirical outcomes of project interventions. These recommendations apply to Indonesia, but resonate with studies elsewhere and thus are applicable more broadly to the Southeast Asian region.

4.5.1. Recommendation 1 – Long term project evaluations to assess trade-offs between livelihoods and sustainability

Given the absence of adequate post-project assessments in Indonesia, a thorough review of long-term project impacts needs to be conducted, using the Sustainable Livelihood Approach Framework. In so doing long-term best-practice policy and benchmark outcomes for both environmental sustainability and social equity can be established. Outcomes balancing dimensions of livelihood and environmental sustainability require extended post-project monitoring and ongoing engagement.

Policy changes and the visibility of outcomes also require attention if a virtuous cycle between existing policy, project outcome analysis and policy and programming revision is to emerge.

4.5.2. Recommendation 2 – Improving governance for equitable participation

Establishing meaningful processes to ensure local participation and the congruence of policy goals and principles across spatial scales and levels of government is an urgent governance concern. To this end, attention to local customary and state legal regimes, as these relate to property and resource rights-in particular for marginalised social groups requires comprehensive consideration. Ensuring the articulation of government policy and local practice in all stages of project interventions – from design through monitoring and enforcement – is essential for effective programs, as is establishing best-practice mechanisms for local participation in planning, data gathering, decision-making, implementation and monitoring [31].

4.5.3. Recommendation 3 – Mitigating the conflicted role of markets

Future research and assistance programs must integrate marketing development with regulatory regimes if genuinely sustainable livelihood improvements are to be achieved through product enhancement, diversification, knowledge and infrastructure upgrading [61]. With respect to SSF access to certification schemes that attempt to connect resource governance to livelihood benefits, interventions are required to deal with the heavy transaction costs involved to achieve and maintain certification. The effectiveness of certification schemes is also heavily reliant upon upscaling promotional and regulatory regimes on the international trade agenda to move from a marginal to mainstream role in articulating markets with good governance.

4.5.4. Recommendation 4 – Promote cross-sectoral collaboration and institutional bricolage

These recommendations converge on the core principle that participatory and adaptive co-management approaches must be introduced from the outset to engage communities, build trust and adapt project objectives to sustainable coastal development and community based natural resource management goals (see also [31]). Projects need to establish an effective 'bricolage' approach to relations between levels of government and other sources of influence on fisheries and communities. This includes, for example, collaborative engagements of community facilitators who have ongoing commitment to communities and experience in dispute management, capacity building, product development, marketing and data collection, alongside researchers with long-term action research agendas. The ability to collaborate across government, NGO, academic and local community sectors deserves attention in policy agenda setting and resourcing.

4.5.5. Recommendation 5 – Applied research capacity building for impact studies

Improving applied research capacity for livelihood development through developing Indonesian-specific bilingual training and resource tools to test and apply in Indonesian SSF case studies would allow for feasibility assessments in the early stages of community engagement and lead to more targeted impact pathways. Given that social change (e.g. behaviour and/or adoption of livelihood practices) happens slowly, longitudinal, applied research studies offer better means to assess livelihood intervention impacts and generate empirical evidence for success factors leading to reduced pressures on marine resources. To enable this, funding structures need to accommodate longer program time frames. Where funding initiatives beyond 5 years may entail too much risk for donors, project design may instead be approached in a multi-phased programmatic way that allows opportunity for continuity while including opportunity periodic review and adjustments.

5. Conclusions

We applied the SLF and a categorization of gender approaches to assess and evaluate the immediate and longer-term outcomes of sustainable coastal livelihood projects in Indonesia, and factors contributing to or hindering their intended outcomes. We identified four main themes arising from the review of these interventions underpinned by policies, institutions and processes of the SLF which mediate sustainable resource and livelihood intervention outcomes.

The majority of projects pursued an externally-derived, top-down 'blue-print' aiming to protect and/or enhance coastal and coral reef ecosystems by shifting perceived pressure away from targeted resources. For the most part they focused on introducing alternative livelihood activities, in preference to enhancing existing strategies that were more likely to threaten sustainability. From the cases reviewed, it was impossible to identify unqualified successes. Analytical comparisons were made difficult due to short project time-frames, the absence of baseline data, lack of consistent monitoring and evaluation measures, pressure for satisfactory reports to donors, and limited post-project evaluation, together with the invisibility of women's work and non-commercial exchanges in SSF.

Projects' failure to thoroughly assess the viability of proposed alternative livelihood activities (e.g. with gender and value-chain analyses), to monitor and evaluate the 'success' of activities, and to share learnings (including failures), leaves communities reluctant to engage with future livelihood programs and creates a reputational risk for institutional 'bricoleurs' like extension agencies and local universities [26]. Diverse socio-political, spatial and ecological contexts mean that careful adaptation is required for programs to be successful [62], particularly within a sprawling and diverse archipelagic nation such as Indonesia.

The limited but growing assessments of best practice approaches [79, 80,81] need to be supported by empirical research and evaluation on impacts of changed marine management and conservation regimes on livelihoods. Longitudinal case studies of the sustainability of livelihood enhancement and diversification interventions implemented in Indonesia are needed to complement greater investment in pro-poor marine and fisheries resource management and governance [4,31, 63–65]. Greater integration between livelihood interventions and protection of the natural resource base will reduce mutually destructive outcomes from livelihood improvement built on unsustainable resource exploitation. We concur with Torell et al. [48] that more long-term research is required to fully understand how various factors and enabling conditions impact livelihoods in different community and country contexts in order to address the limited literature and mixed successes. Keppel et al. [66] conclude that medium- to long-term investments of at least 10–15 years are required to achieve reliable assessment of outcomes. Such strategies would go a long way to avoiding investment in ill-fated livelihood interventions in the first place, particularly given the high global significance of Indonesia's marine biodiversity and the large number of resource dependent communities they support.

There are significant opportunities to strengthen the integration of gender into all aspects of coastal livelihood and development project design, implementation and evaluation in Indonesia, drawing from developments elsewhere in the international agricultural research for development sector (e.g. [67,68]) and policy (e.g. [69,70]). Such action would facilitate a move towards gender equitable natural resource governance and management [71].

Programs should be integrated into holistic cross-sectoral activities that incorporate initiatives to improve health, education, and general well-being [72]. This is supported by others who highlight the need for interventions to focus on addressing factors that contribute to or inhibit livelihood improvement (e.g. education, health, social norms, human rights etc.) [25]. Further adaptation of the SLF for analyzing and evaluating livelihood interventions in order to better measure, monitor and

evaluate interventions, their viability and risks in short, medium and long terms should form part of an expanded evaluation agenda.

The analysis of coastal community interventions using a framework such as the SLF is all the more relevant given evidence that the livelihoods of the poor are becoming more, not less precarious, and that climate change will impact most severely on these communities and groups [19,73–76].

A narrow focus on poverty reduction targets in Indonesia may mask slower progress or growing inequality at the subnational level and among specific populations (e.g. traditional fishing communities, women) [50]. In the face of Blue Economy future ocean agenda's [77], comprehensive and systematic evaluation of approaches and outcomes in coastal livelihood focused interventions is urgently needed to provide protection and security for SSF livelihoods. Accelerating vulnerability and widening income inequality, despite apparent improvements measured by economic growth metrics prior to COVID-19, make this an urgent task.

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CRediT authorship contribution statement

Natasha Stacey: Conceptualization, Methodology, Formal Analysis, Writing. **Emily Gibson:** Conceptualization, Methodology, Analysis, Writing. **Neil R. Loneragan:** Conceptualization, Methodology, Analysis, Writing. **Carol Warren:** Conceptualization, Methodology, Analysis, Writing. **Budy Wiryanan:** Analysis, Resources, Reviewing. **Dedi S. Adhuri:** Analysis, Reviewing, Resources. **Dirk J. Steenbergen:** Methodology, Analysis, Resources, Writing. **Ria Fitriana:** Methodology, Analysis, Resources.

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