



Coastal livelihood vulnerability to marine resource degradation: A review of the Indonesian national coastal and marine policy framework

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ABSTRACT

In rapidly developing countries, where large sections of the population are highly dependent on marine resources, coastal livelihoods are vulnerable to sudden shocks and long-term change. National policy can attempt to mitigate this vulnerability within a multi-level framework by addressing the three aspects of vulnerability (exposure, sensitivity, adaptive capacity) through well-documented interventions. This article reviews the Indonesian policy framework for coastal and marine policy interventions that either directly or indirectly address different dimensions of coastal livelihood vulnerability. The findings show that the policy environment for addressing coastal livelihood vulnerability is heavily based on developing adaptive capacity and to a certain extent sensitivity without adequately addressing exposure, the initial cause of vulnerability. In addition, the complexities and inconsistencies within the Indonesian governmental structures, as well as more general issues of funding gaps and poor coordination, mean that policies created at national level rarely filter down to provide the intended benefits to coastal communities. It is recommended that practitioners and policymakers engage in a more cohesive and balanced approach to addressing livelihood vulnerability in coastal management by focusing more on the causes of the disease, exposure, rather than healing just the symptoms.

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1. Introduction

1.1. Marine resources and coastal livelihoods

The majority of the world's population lives in coastal areas and human populations derive a variety of benefits from functions, goods and services marine ecosystems provide. The livelihoods of coastal communities are strongly linked to the health of the coastal and marine ecosystems on which the majority of these communities rely [1]. Globally, the fisheries sector alone provides about 170 million jobs, and more than 1.5 billion people rely on marine resources for their protein intake [2]. Small-scale, or artisanal fisheries employ the

vast majority of the world's fishers [3]. Of the small-scale fishers, over a quarter fish on coral reefs, and half of all coral reef fishers are found in Southeast Asia [4]. Marine ecosystems in many regions of the world, however, show alarming signs of degradation [5]. Increasing demand on coastal and marine resources, especially in the tropics, has led to extensive and sometimes irreversible damage to the marine environment, whilst simultaneously compromising livelihoods [6]. This situation is particularly grave in Southeast Asia, where over 90% of coral reefs are at risk from local threats [7]. The amount of overexploited marine fish stocks has increased steadily over the past three decades to around one third, and less than 15% of fish stocks still hold potential for increased exploitation [8]. In the 2008 report 'The Sunken Billions', the total economic loss caused by the global decline in fish stocks is estimated to be approximately two trillion dollars for the last 3 decades [9]. The loss of functions, goods and services marine ecosystems provide is a significant barrier to the achievement of the Millennium Development Goals to eradicate

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extreme poverty and hunger [10]. The vulnerability of marine resource-dependent sectors of society to degradation of these resources, particularly in developing countries, requires policy responses that address the different factors contributing to this vulnerability [11]. Indonesia is taken as a case study to examine how national marine policy addresses vulnerability arising from marine resource dependency.

1.2. The Indonesian case

Indonesia is the world's largest archipelagic nation consisting of more than 17,000 islands. It is located within the Coral Triangle, the global hotspot of marine biodiversity. The country's coastline of about 81,000 km includes around 4000 ha of mangrove forests and the territory encompasses 5.8 million km² of sea area, of which approximately 51,000 km² are coral reefs [12]. It has been estimated that in 2005, 7.3 million people (or 8% of the working population [13]) were employed directly or indirectly by the fisheries sector, with the marine fisheries sector providing US\$ 5.2 billion to the country's national gross domestic product (GDP) [14].

The condition of Indonesia's marine ecosystems reflects the global trend. In 2011, the Ministry of Marine Affairs and Fisheries passed a decree (Kep. 45/Men/2011) to assess the status of marine fisheries resources in the eleven Indonesian fisheries management areas (*Wilayah Pengelolaan Perikanan*). The results showed clear signs of overexploitation (defined as fishing levels higher than the maximum sustainable yield, with decreasing yield at increasing fishing effort) in all management areas, particularly for small pelagic species [15]. Over the last few decades, unsustainable use of marine resources has dramatically risen in Indonesia, and the degradation of marine ecosystems including coral reefs, seagrass meadows and mangroves pose major threats to the viability of coastal ecosystems [16] from both land- and sea-based human activities [17]. The cumulative impact of the human drivers of change on marine ecosystems causes an ever-increasing concern for the livelihoods of coastal populations, especially the ones living in small coastal communities where marine natural resource dependence is often high. The main coastal pressures arise from population growth, pollution, exploitation of natural resources [7,18] and climate change [11]. In addition, unsustainable practices including coral mining, anchoring in reef areas and destructive fishing methods, such as cyanide fishing, dynamite fishing and the use of fine mesh nets [7], are jeopardizing environmental quality crucial for sustaining vulnerable local livelihoods [19–23]. Nowadays, 93% of Indonesia's coral reefs are at risk from these local threats¹ [7]. This situation is further exacerbated by the predicted impacts of global climate change, which is a key threat to coral reefs and marine fisheries [24,25]. Indonesia is projected to experience the strongest decline in marine fisheries of any nation—total marine fish catches are predicted to decrease by over 20% until 2055 [26]. Particularly for the livelihoods of inhabitants of many small rural coastal villages, marine ecosystems play a fundamental role [22,23,27]. Households in coastal communities thus are particularly vulnerable to the impacts of ongoing marine resource degradation.

1.3. Vulnerability in coastal and marine social-ecological systems

The concept of *vulnerability* is multi-faceted and has undergone several changes over time [28]. For this article, vulnerability is

understood as “the degree to which a system is susceptible to and is unable to cope with adverse effects” [28] of resource degradation. Vulnerability is frequently understood as comprising the three key dimensions *exposure* (E), *sensitivity* (S) and *adaptive capacity* (AC) [11,25,28–31]. In the context of marine resources, exposure relates to the extent to which a system is subject to various environmental and anthropogenic factors such as climatic events, fishing impacts, nutrient inputs or habitat modification [11,30,32]. For example, it may describe the frequency and duration with which a coral reef experiences a thermal anomaly, or the amount of trawling that a particular benthic area is subject to. With regard to fishing communities, Cinner et al. [33] argue that socioeconomic exposure to marine resource degradation is a result of ecological vulnerability of those marine resources (which is caused by both environmental and socio-economic drivers). Sensitivity is the degree to which a system is affected or modified by perturbations or stressors [11,32,34]. There are both ecological and socio-economic components of sensitivity. For example, the stock of a species that grows and reproduces slowly is more sensitive to the removal of large individuals than that of an early-reproducing, fast-growing species, and a community of heat-tolerant coral species is less sensitive to a warming event than one comprising highly heat-sensitive species. Similarly, a coastal community with low dependence on marine resources is not overly sensitive to degradation of these resources. Adaptive capacity refers to the ability of a system to adapt and respond to change and to minimize, cope with, and recover from the consequences of change [11,30,35]. The socio-economic constituents of adaptive capacity can be broadly grouped into four key clusters: flexibility, capacity to learn, capacity to organize, and assets [36]. Adaptive capacity is related to, and sometimes equated with, *resilience* [29,30,32]. While the latter has conceptual origins in ecology, it is increasingly applied to linked social-ecological systems [37]. Resilient social-ecological systems are capable of absorbing larger shocks and long-term changes and contain the components needed for system survival [38]. Resilience is usually associated with adaptivity and diversity, including the diversity of species, of human capacities and of economic options [38]. In line with this requirement, marine resource conservation attempts call for adaptive approaches and the provision of alternative livelihood options in order to decrease the pressure on marine ecosystems and increase the resilience of small rural coastal communities [39,40].

2. Methods

2.1. Research approach

The continuing decline of marine resource abundance and the degradation of marine ecosystems result to a large extent from policies that are still structured around unsustainable approaches to marine resource use [2]. With respect to livelihoods based in coastal and marine social-ecological systems (CM-SES), national level law, policy and actions play a critical role in reducing vulnerability of resource dependent coastal communities [11,41]. Particularly in decentralized countries, such as Indonesia, fragmented legal systems are a common problem for an integrated policy framework [42]. Yet, clear directions need to be set by a consistent policy framework that addresses coastal vulnerability by building adaptive capacity [38,43]. This includes enabling flexible multi-level, multi-sector governance [23,38] and generating a diverse livelihood portfolio to increase resilience of coastal communities [19,44–46].

This article aims to provide feedback about the Indonesian policy framework for coastal and marine livelihoods to policy makers in

¹ Note that while these threats are localized in their impact (as opposed e.g. to large-scale eutrophication from terrestrial run-off or changes in ocean temperature and chemistry), they are often driven by dynamics at higher levels. An example is the use of cyanide, which is driven to a large extent by the demand for live reef fish on Asian markets (particularly Hong Kong and Singapore) and the international trade in marine ornamentals.

order to improve the regulatory framework towards reducing the livelihood vulnerability of coastal communities. Based on the state of the marine environment and the problems coastal communities face, the analysis centers on the question of whether the measures set by the Indonesian policy framework are appropriate and cohesive enough to address the different scales and components of vulnerability and thus reduce vulnerability in the face of marine resource degradation. Data was collected through a desk-based study using sources from the legislative database FAOLEX, the Indonesian Ministry of Marine Affairs and Fisheries (KKP) and the International Union for the Conservation of Nature (IUCN). Legal documents, policy plans, and secondary literature related to CM-SES in Indonesia were evaluated at the national level.

In order for policy to adequately address vulnerability, the different dimensions and underlying causes of vulnerability need to be understood [3,11]. The starting point of this analysis was thus a review of the concept of vulnerability to resource degradation in the context of CM-SES. This provided the basis for an identification of a number of policy interventions that address different sources of livelihood vulnerability which are described in Section 2.2 and Table 1. Subsequently, the overall Indonesian umbrella framework of fisheries and marine conservation policy is analyzed in the light of its political context in order to illuminate the opportunities and challenges for reducing vulnerability of coastal communities in Indonesia. Finally, the relevant legal documents were examined as to whether or not the identified interventions are enclosed in the respective documents to gain an understanding of which aspects of livelihood vulnerability received a relatively high or low attention and analyze if livelihood vulnerability, based on the three dimensions of vulnerability, is adequately addressed by Indonesian policy. Legislation that focused on commercial-scale fisheries was disregarded from the analysis as the focus of this paper is on small-scale fishing livelihoods in coastal communities.

2.2. Coastal and marine policy interventions that address vulnerability

Indonesian coastal and marine policies were reviewed for 11 well-documented coastal and marine policy interventions that either directly or indirectly address different dimensions of coastal livelihood vulnerability. The listed references further describe each of the types of interventions. Interventions are categorized according to the dimensions of vulnerability they address. While habitat degradation can be caused by both local impacts (e.g. from the use of destructive fishing gears) and larger-scale factors (such as climate change), this study focuses on policy interventions aimed

at local ecosystem users, as these are most intimately linked to coastal ecosystems.

Focusing on coastal communities and associated ecosystems, livelihood exposure to marine habitat degradation (i.e. ecological vulnerability) can be reduced by measures that decrease degradation, such as restrictions and ban of gear types or limitation of catches (e.g. [7,47]), together with measures that improve management effectiveness, or strengthen or restore ecosystem health (e.g. [48–50]). Interventions that reduce livelihood sensitivity include provisions for alternative livelihoods (although these can have counterproductive outcomes if inadequately planned and implemented [11,51]), subsidies, assistance in fishing diversification and intensification, improved market access (all of which can both decrease and increase sensitivity, depending on which species are targeted and how measures are distributed within a community [11,33]), and investment in improved health and nutrition [47]. The majority of policy interventions identified and recommended to address coastal livelihood vulnerability are aimed at enhancing the adaptive capacity of coastal households and communities [11]. Measures that support diversification within or outside of fisheries, or that strengthen health and environmental awareness, not only reduce sensitivity to resource degradation but also enhance adaptive capacity. Again, if not carefully planned, such interventions can backfire and increase, rather than reduce, livelihood vulnerability [33,51]. Improved management measures, such as gear-based-, participatory- and co-management [11,52], and policies that enhance social and cultural capital or aim for capacity building, are frequently recommended to enhance adaptive capacity, as they enable communities to better anticipate and organize to cope with change [53]. A further measure that enhances households' and communities' adaptive capacity is the provision of credit systems [30]. In the Indonesian context, this aspect is of particular importance as it addresses the prevalent dependence on patrons for credit which has negative implications for the sustainable use of marine resources and the adaptive capacity of the dependent fishers [23].

3. Results and discussion

3.1. Indonesian umbrella framework of fisheries and marine conservation policy

Indonesia's national Decentralization Law 22/1999, in conjunction with Law 32/2004, the Fisheries Law (31/2004) and Coastal Zone Management Law (27/2007, revised by Law 1/2014), acts as

Table 1
Descriptions of marine and coastal policy interventions addressing livelihood vulnerability. (E-exposure/S-sensitivity/A-adaptive capacity).

Intervention	Description	Vulnerability dimensions addressed	References
Ban destructive practices	Cyanide, explosives, mesh sizes, drag nets, purse seines	E	[20,61,72,73]
Strengthening ecosystem health	Conservation measure, restoration or maintenance of ecosystem function or services	E	[72,74–77]
Strategies for coastal and/or fisheries management	Gear restrictions, total allowable catch, closed seasons, size/weight restrictions, licensing, reporting, monitoring	E, A	[12,16,78]
Legal procedures for lack of compliance	Enforcement measures, penalties	E, A	[39,61,79–81]
Provisions for conducting aquaculture	Provision of equipment, species allocations	S, A	[8,47,69,82]
Improving health or education	Clinics, health programmes, health and/or environmental education	S, A	[28,47,83–85]
Assistance with intensification, capitalization of existing fishing practices	Distribution of nets, fuel subsidization, increased market access	S, A	[10,86,87]
Consider/enhance social and/or cultural capital	<i>Sasi laut</i> , local management schemes, local social/religious customs	A	[79,88–90]
Call for capacity building	Enhancement of organizational, institutional, human, physical or resource assets	A	[20,91–93]
Community participation in management	Stakeholder consultation, active roles in decision-making, local enforcement	A	[20,42,58]
Provision of credit systems	Micro-finance, subsidies, loans	A	[94,95]

Table 2
Hierarchy of Indonesian national-level legislation.

Indonesian	English
Undang-Undang	Law
Peraturan Pemerintah	Government Regulation
Peraturan Presiden	Presidential Regulation
Keputusan Presiden	Presidential Decree
Peraturan Menteri	Ministerial Regulation
Keputusan Menteri	Ministerial Decree
Instruksi Presiden	Presidential Instruction
Peraturan Dirjen	General Director Regulations

an umbrella framework for fisheries and marine conservation policy. It provides direction for national, regional and local policies on coastal and marine management and livelihoods but leaves ample scope for specification and interpretation on how to implement the regulations [42]. A typology of the Indonesian legislation hierarchy is outlined in Table 2.

Law 22/1999, which was revised and amended by Law 32/2004, provides for the decentralization of administration to provincial, district and municipal governments (Articles 3 and 9). Provincial governments (referred to in the amendment as “local” governments) obtained jurisdiction over the marine and coastal zone and its natural resources up to 12 nautical miles from the coastline. District and city governments (*Kabupaten/Kota*) are authorized to autonomously manage one third of this area (i.e. up to 4 miles from the shore) [54]. As a result, these branches are now required to adopt, specify and enforce the national regulations related to marine and coastal issues within their jurisdictional territory [55].

The present overall framework in fisheries management was launched in 2004 by national Law No. 31/2004 on Fisheries (also called *Fisheries Act*). It guides fisheries management in coastal areas and Indonesia’s Exclusive Economic Zone [12]. The Ministry of Marine Affairs and Fisheries (*Kementerian Kelautan dan Perikanan/KKP*) was created in 1999 to integrate different sectoral policies [56]. The *Fisheries Act* gave KKP authority to implement measures to prevent illegal and destructive fishing, incorporating the definition and prohibition of destructive fishing methods. It grants KKP the right to determine protected fish species and marine protected areas and defines the Minister’s responsibility for planning fisheries management, determining fish stocks and setting allowable catch rates. The law also contains a variety of provisions regarding fish cultivation, food additives, fishing enterprises and fish processing which remain to be further specified [17].

The Coastal Zone and Small Islands Management Act was enacted in 2007 (Law 27/2007) and revised by Law No. 1, 2014. It offers a framework for planning, coordination and integration of coastal management by specifying decentralization in the coastal marine realm and encourages community-based management schemes [16]. General provisions regulate administration and implementation, monitoring and evaluation as well as conflict resolution and funding. The law also promotes voluntary, incentive-based programs for local integrated coastal management initiatives [57] and emphasizes the importance of public consultation [42]. The revision of the Coastal Zone and Small Islands Management Act (Law 1/2014) includes the replacement of a controversial measure known as Coastal Waters Use Right (*Hak Pengusahaan Perairan Pesisir*, or HP-3) with a permit system, introduces provisions for local governments to assist local and traditional communities to obtain these permits, and places restrictions on the utilization of small islands and coastal waters by foreign enterprises. It furthermore contains provisions to strengthen the role of local and traditional communities in coastal

management and to provide financial and material assistance and capacity building to coastal communities.

3.2. Shortcomings in policy implementation

The Indonesian national policy framework encompasses various means of addressing sensitivity and adaptive capacity of coastal communities to marine resource degradation. Many provisions exist for management, monitoring and reporting. Yet, it appears that coastal community vulnerability remains high, resilience low and therefore, policy ineffective. Few concrete strategies were found concerning implementation or financial support for the projects outlined in the various policies. As stated in Law 12/2010, it is simply assumed that finances will be covered by the State Budget without further consideration of whether and/or how this will be possible. This, along with the low priority given to community participation in coastal management and decision-making, may contribute to the failure of small-scale fishery development programs [30,58,59]. The increased provisions for communities’ role in management introduced in Law 1/2014 are a positive signal in this respect, but it remains to be seen how these intentions will play out in reality.

The two main legal provisions Law No. 31/2004 on fisheries and Law No. 27/2007 on the Management of Coastal Areas and Small Islands can be seen as seedlings of an ecosystem-based management approach for fisheries and coastal marine areas [17] in a garden continually overgrown with policies driving intensified exploitation of coastal marine resources [23,60]. The ideas are progressive, if limited to the sensitivity and adaptive capacity arenas. There are signs that ecosystem-based management is gaining stronger traction in Indonesian marine policy: KKP has established a national task force for the adoption of ecosystem-based fisheries management (EAFM), and trials for testing indicators of coastal ecosystem status and pilot projects of EAFM implementation have been carried out. Nonetheless, Law 27/2007 and its revision (Law 1/2014) still contain at least two weaknesses. First, this law defines coastal waters as up to 12 mile from the coastline. However, for terrestrial areas, there is no clear definition. It states that the terrestrial part of a coastal area expands along the length of the coastal sub-district (Indonesian: *kecamatan*) area, which varies from place to place. It does not outline measures for managing the terrestrial part of the coastal zone, an important consideration when managing pollution, aquaculture and non-fisheries-based alternative livelihoods. Second, even though the controversial HP-3 has been revoked for using a blanket-approach to marine resource ownership that placed local communities into one arena with businesses and government without accounting for differences in relative power and resources (predictably to the relative disadvantage of the communities), the revision does not completely eliminate this flaw. After Law 27/2007 went through a judicial review by the constitutional court in 2011, the HP-3 articles were considered as having no binding power due to their inconsistency with the Indonesian Constitution. The Indonesian government reacted by amending the law within three years (Constitutional Court of Indonesia 2010). The new law (Law 01/2014) acknowledges indigenous communities and their customary laws, which legalizes local marine area management. However, the new law still opens up the possibility of using the marine coastal zone to any business entity, including foreign investors, and for non-fisheries/aquaculture use through the provision of territorial and management licences (*izin lokasi dan izin pengelolaan*). Although indigenous communities are exempt from the process, other communities still need to provide licences. This means that, until communities acquire such licences, current activities of community in coastal and small islands such as salt mining or aquaculture are

Table 3

Total mentions of interventions aimed at mitigating coastal livelihood vulnerability in Indonesian national policies (this list is may not be exhaustive).

Level	Year	Legislation no.	English name	Ban destructive practises	Strengthen ecosystem health	Strategies for coastal and/or fisheries management	Legal procedures for lack of compliance	Provisions for conducting aquaculture	Improved health or education	Assistance with intensification, capitalization of existing fishing practises	Consider/ enhance social and/or cultural assets	Call for capacity building	Community participation in management	Provision of credit systems	
Law	2004	31	Fisheries Act	x		x			x					x	
	2007	27	Coastal and Small Island Management Act	x		x	x		x		x	x			
	2009	45	Amendment to Fisheries Law			x	x	x							
Government Regulation	2014	1	Revision of Coastal and Small Island Management Act	x		x	x		x	x	x	x	x	x	
	2005	78	Managment of Outermost Small Islands		x							x			
	2007	60	Fishery Resource Conservation	x	x	x	x	x	x			x			
Ministerial Regulation	2008	16	Coastal and Small Island Management Planning		x				x		x	x	x		
		20	Use of Small Islands and Surrounding Waters		x										
	2009	01	Fisheries Management Areas of the Republic of Indonesia												
Ministerial Decree		05	Scale of Business in Aquaculture					x		x					
		08	Empowerment and Participation in Coastal Areas and Small Islands						x		x	x	x		
	2010	12	Minapolitan			x			x	x		x		x	
	2011	22	Guidelines for Distribution of Direct Aid in Marine Affairs and Fishery to Communities							x	x	x		x	
	2012	18	Guidelines for Developing Master Plan of Minapolitan							x		x		x	
	2013	02	Guidelines for National Programme on Community Empowerment in Marine Affairs and Fisheries						x	x	x	x		x	
		04	Guidelines for Business Development in Fishing Communities					x		x		x			
		12	Management and control of the coastal area and small islands		x		x							x	
	2001	33	Technical Directives for Utilization of Food Credits in the Marine and Fishery Sector						x	x					x
	2010	06	Fishing Gear in the Fisheries Management Areas of the Republic of Indonesia			x									
	22	Implementation Guidelines for Fisheries Credit System												x	
2011	18	Minapolitan Guidelines							x		x				
	56, 58, 83, 84, 85	Direct Beneficiaries of the National Programme on Self-Empowerment in the Marine and Fisheries Rural Business Development Framework of 2011												x	
	2012	50				x	x								

Table 3 (continued)

Level	Year	Legislation no.	English name	Ban destructive practises	Strengthen ecosystem health	Strategies for coastal and/or fisheries management	Legal procedures for lack of compliance	Provisions for conducting aquaculture	Improved health or education	Assistance with intensification, capitalization of existing fishing practises	Consider/enhance social and/or cultural assets	Call for capacity building in management	Community participation in management	Provision of credit systems
	2013	37	National Action Plan for Prevention and Control of Illegal, Unreported and Unregulated Fishing Determination of protection status of Napoleon Fish (Cheilinus undulatus)	x	x	x								
Total mentions				4	6	9	6	4	9	9	6	12	4	9

considered illegal. The new law tries to avoid marginalizing these communities by stating that the government shall facilitate the provision of such licences, especially in the case of subsistence activities. Furthermore, the law acknowledges 'traditional rights' of fishing and other related activities within the area. Yet the meaning of "traditional rights" remains open to interpretation. The case of the MoU Box around the Indonesian and Australian borders shows how the ambiguity in the term "traditional" can undermine the effectiveness of marine natural resource management [96]. In regard to Law 1/2014, the term 'traditional right' has to be defined in order to avoid adding more pressure to marine ecosystems for the sake of facilitating provision of the licences for coastal communities.

Considering current business practices in Indonesia, the second weakness might pose particular threats in the form of marginalization of poor fishers and coastal communities, as well as for sustainable and equitable fish production. Furthermore, the complex and sometimes overlapping formal legal regulations [42], the long process of drafting legislation, the adaptation of government bodies to new responsibilities [16] and ineffective law enforcement [61] make it unlikely that the official governance system, even though decentralized, is able to respond quickly and adequately to marginalization of coastal communities by business activities, and to coastal community vulnerability to marine resource degradation more generally.

To date, the good intentions at the national policy level remain intangible to local government and local coastal communities and seem to have had little effect on the resilience of Indonesia's CM-SES. Low capacity, inadequate funding and/ or coordination between institutions has led to a lack of systematic, logical implementation of these policy interventions on the ground [17,62]. There appears to be no consistent or coordinated plan to help coastal communities to exit the CM-SES poverty trap [63] and become more resilient. Local institutions (such as patrons and community leaders) may be better positioned to implement contextually relevant strategies to address coastal community vulnerability [20,64]. Furthermore, corruption on many government and local levels undermines government effectiveness and delivery of important services to marginalized members of society, and weakens marine management efforts, impairing adaptive capacity and exacerbating vulnerability [11,34,65]. Efforts that aim to improve governance by making the political processes more transparent and accountable, improving participation of civil society, and making law enforcement more equitable and reliable usually originate from outside the fisheries sector (i.e. NGOs) but contribute to improved management of small-scale fisheries [3].

3.3. Vulnerability concept in the Indonesian national policy framework

This section examines the relevant legal documents as to which interventions are enclosed in the policy and discusses if livelihood vulnerability in terms of exposure, sensitivity and adaptive capacity [11,32] is adequately addressed by Indonesian policy. In total, 28 legislative documents in the national policy framework were found that relate to various interventions intended to mitigate coastal livelihood vulnerability in Indonesia since 2001. The distribution of the different interventions across the spectrum of Indonesian policy on coastal vulnerability is shown in Table 3.

A 'call for capacity building' was found in 12 documents, making it the most common item in coastal livelihood vulnerability-related policy. This was followed by 'strategies for coastal/fisheries management', 'provisions of credit systems', 'improved health/education' and 'assistance with intensification/capitalization' with 9 mentions each.

There were few 'provisions for conducting aquaculture', which together with 'community participation in management' and 'ban

destructive practices' received the lowest number of references at 4 mentions each. Few policies stated specific 'legal procedures for lack of compliance' or highlighted a 'concern for ecosystem health' (6 mentions each).

The analysis shows that the framework aims to, if not explicitly, address all three components of vulnerability. However, Table 3 shows an imbalance in policy interventions addressing these three pillars individually. The largest number of mentions across all policy interventions was for measures aimed at building adaptive capacity of coastal communities, followed by measures to address their sensitivity to change. Little reference is made to dealing with coastal communities' initial exposure to marine resource degradation. Strengthening ecosystem health, banning destructive fishing practices and outlining legal procedures for lack of compliance do not appear to carry the same weight as development through capacity building, improving human health and education and providing economic means to continue fishing, even fishing more intensively. This is perhaps not surprising given that adaptive capacity is the aspect of vulnerability most amenable to influence through policy interventions [33]. Furthermore, reducing exposure to resource degradation may require action at the international level (e.g. by reducing greenhouse gas emissions) or thinking outside the conventional-policy box by supporting livelihoods that do not depend on marine resources. Although these measures provide opportunities for reducing sensitivity and increasing the adaptive capacity of coastal communities to marine resource degradation, there are two consequences of pushing 'exposure' further down the agenda of the policy framework.

First, moving forward with measures to build adaptive capacity and reduce sensitivity without addressing exposure is tantamount to treating ill-health by healing symptoms, not the underlying disease. The cracks in the CM-SES dam that lead to exposure risk are not simply cured by filling with cement. Instead, policy-makers and interventionists need to address the underlying pressures on CM-SES, origins of vulnerability emanating from multiple sources [66].

Second, by concentrating on intensification of marine resource exploitation, development and economic progress [19,23,60], the policy framework, much like patron-client systems [64], furthers the dependence on coastal and marine resources [67] and drives the decline of marine ecosystems to greater depths. The focus remains on increasing productivity in order to meet the production goals. Rather than using integrated, participatory approaches to reduce coastal and marine resource dependence [68,69], the policy framework pushes its coastal communities towards new avenues of exploitation and opportunity—all within an already-stressed CM-SES. This leads to an imbalance in interventions that can effectively tackle the issue of coastal community vulnerability.

Livelihood diversification as an adaptive capacity measure has been identified as a key approach to reduce vulnerability [70], but is not explicitly addressed in any of the policies found, apart from expansion into aquaculture. In no legislation was there any mention of strategies to find opportunities for livelihood diversification outside of the CM-SES. Assisted migration away from small islands and coastal areas particularly dependent on marine resources, which has been identified as a key policy action to address all three aspects of vulnerability [11] and recommended in the Indonesian context by Ferse et al. [19], was not found to be considered in the policies examined. The current general development strategy and legal system hamper cross-sectoral and integrated approaches. Although jargon such as 'sustainable development' and 'integrated coastal management' has been adopted for decades in Indonesian policy, the focus remains on economic growth and development, rather than on integrated coastal zone management and true, long-term sustainability and resilience. In terms of the legal system, even in the Coastal and Small Islands Management Act, regulations deal more with the marine system

rather than striving for a balance between aquatic and terrestrial parts of the coast. Policies, although employing terms such as integrated management and 'intersectoral' (in the case of Law 1/2014), remain sector-based, e.g. fisheries policy is focused on capture and aquaculture. Given these shortcomings, comprehensive, integrated management and alternative livelihoods development (outside of aquatic resource use) remain elusive.

4. Limitations

There are limitations to this research: a lack of access to the grey literature meant that the analysis was restricted to what was available in the public domain. The focus of this review on the national level says little about the local realities. The aim was to highlight the gaps in addressing vulnerability for policy- and decision-makers and to help practitioners identify legal sources of strength in their interventions. The assumption of deducting priority from the number of legislative measures making use of particular types of interventions is a crude approximation meant to provide an orientation on what kind of approaches prevail. Differences in effectiveness and depth very likely exist between the various legislative measures considered here. It was not possible to discuss in detail the true depth or scope with which each piece of legislation deals with coastal issues relating to vulnerability. As a result, this paper does not draw conclusions on the relative effectiveness of each piece of legislation individually. Finally, the legal realm in Indonesia, despite being hindered by bureaucracy and complexity [42], changes constantly. What holds true today may not be the case tomorrow. The data set and analysis presented here is therefore not exhaustive, nor are the conclusions reached permanent.

5. Conclusion

In answer to the question of whether the policy framework provides an enabling context for addressing vulnerability of coastal communities in Indonesia: there is a definite lack of cohesion and balance in strategies to address the three pillars of vulnerability. So far it seems that the national policy framework has focused on addressing the symptoms (by outlining measures for dealing with sensitivity and adaptive capacity) without adequate consideration of one of the underlying causes of vulnerability (exposure). A more holistic and balanced approach needs to be taken if the Indonesian policy framework is to be appropriate and effective in addressing vulnerability of its coastal communities to marine resource degradation.

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References

- [1] Salafsky N, Wollenberg E. Linking livelihoods and conservation: a conceptual framework and scale for assessing the integration of human needs and biodiversity. *World Dev* 2000;28:1421–38.
- [2] United Nations. Secretary-General's High-Level Panel on Global Sustainability. Resilient people, resilient planet: a future worth choosing. New York: United Nations; 2012.

- [3] Andrew NL, Béné C, Hall SJ, Allison EH, Heck S, Ratner BD. Diagnosis and management of small-scale fisheries in developing countries. *Fish Fish* 2007;8:227–40.
- [4] Teh LSL, Teh LCL, Sumaila UR. A global estimate of the number of coral reef fishers. *PLoS One* 2013;8:e65397.
- [5] World Bank. Scaling-up marine management: the role of marine protected areas. Report no. 36635-CLB. Washington, DC; 2006.
- [6] Tundi A, Alder J, Dayton P, Curran S, Kitchingman A, Wilson M, et al. Coastal systems. In: Hassan R, Scholes R, Ash N, editors. Millennium ecosystem assessment current state and trends, vol 1. London: Island Press; 2005. p. 515–49.
- [7] Burke L, Reyntar K, Spalding M, Perry A. Reefs at risk revisited. Washington, DC: World Resources Institute (WRI); 2011.
- [8] Food and Agriculture Organization (FAO). The state of world fisheries and aquaculture 2012. Rome 2012.
- [9] World Bank. Food and Agriculture Organization (FAO). The Sunken Billions, the economic justification for fisheries reform. Washington, DC: World Bank; 2008.
- [10] Allison EH, Ellis F. The livelihoods approach and management of small-scale fisheries. *Mar Policy* 2001;25:377–88.
- [11] Cinner JE, McClanahan TR, Graham NAJ, Daw TM, Maina J, Stead SM, et al. Vulnerability of coastal communities to key impacts of climate change on coral reef fisheries. *Global Environ Change* 2012;22:12–20.
- [12] Syarif LM. Promotion and management of marine fisheries in Indonesia. In: Winter G, editor. Towards sustainable fisheries law. A comparative analysis. Gland, Switzerland: International Union for Conservation of Nature (IUCN); 2009. p. 29–82.
- [13] (BPS) Badan Pusat Statistik. Survei Angkatan Kerja Nasional (Sakernas); 2005.
- [14] Hoegh-Guldberg O, Veron JEN, Green A. The coral triangle and climate change: ecosystems, people and societies at risk. Brisbane: WWF Australia; 2009.
- [15] Keputusan Menteri Kelautan dan Perikanan. Tentang Estimasi Potensi Sumber Daya Ikan di Wilayah Pengelolaan Perikanan Negara Republik Indonesia. Republik Indonesia; 2011.
- [16] Siry HY. In search of appropriate approaches to coastal zone management in Indonesia. *Ocean Coast Manage* 2011;54:469–77.
- [17] Waddell S. Rising to the challenge of providing legal protection for the Indonesian coastal and marine environment. In: Cribb R, Ford M, editors. Indonesia beyond the Water's Edge: Managing an Archipelagic State. Singapore: Institute of Southeast Asian Studies; 2009. p. 172–94.
- [18] Kusuma-Atmadja M, Purwaka TH. Legal and institutional aspects of coastal zone management in Indonesia. *Mar Policy* 1996;20:63–86.
- [19] Ferse SCA, Knittweis L, Krause G, Maddusila A, Glaser M. Livelihoods of ornamental coral fishermen in South Sulawesi, Indonesia: implications for management. *Coast Manage* 2012;40(5):525–55.
- [20] Glaser M, Baitoningsih W, Ferse SCA, Neil M, Deswandi R. Whose sustainability? Top-down participation and emergent rules in marine protected area management in Indonesia *Mar Policy* 2010;34:1215–25.
- [21] Wilkinson C. Status of coral reefs of the world: 2008. Townsville, Australia: Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre; 2008.
- [22] Satria A, Matsuda Y, Sano M. Questioning community-based coral reef management systems: case study of Awig-Awig in Gili Indah, Indonesia. *Environ Dev Sustainability* 2006;8:99–118.
- [23] Ferse SCA, Glaser M, Neil M, Schwerdtner M, Mafiez K. To cope or to sustain? Eroding long-term sustainability in an Indonesian coral reef fishery *Reg Environ Change* 2014;14:2053–65.
- [24] Hughes TP, Baird AH, Bellwood DR, Card M, Connolly SR, Folke C, et al. Climate change, human impacts, and the resilience of coral reefs. *Science* 2003;301:929–33.
- [25] Allison EH, Perry AL, Badjeck M-C, Adger NW, Brown K, Conway D, et al. Vulnerability of national economies to the impacts of climate change on fisheries. *Fish Fish* 2009;10:173–96.
- [26] Cheung WWL, Lam VWY, Sarmiento JL, Kearney K, Watson R, Zeller D, et al. Large-scale redistribution of maximum fisheries catch potential in the global ocean under climate change. *Global Change Biol* 2010;16:24–35.
- [27] Dahuri R, Dutton IM. Integrated coastal and marine management enters a new era in Indonesia. *Oceanol Int* 1999;1–12.
- [28] Adger NW. Vulnerability. *Global Environ Change* 2006;16:268–81.
- [29] Turner BL, Kasperson RE, Matson PA, McCarthy JJ, Corell RW, Christensen L, et al. A framework for vulnerability analysis in sustainability science. *Proc Natl Acad Sci USA* 2003;100:8074–9.
- [30] Smit B, Wandel J. Adaptation, adaptive capacity and vulnerability. *Global Environ Change* 2006;16:282–92.
- [31] McCarthy JJ, Canziani OF, Leary NA, Dokken DJ, White KS, editors. Climate change 2001: impacts, adaptation and vulnerability. Cambridge: Cambridge University Press; 2001.
- [32] Gallopín GC. Linkages between vulnerability, resilience, and adaptive capacity. *Global Environ Change* 2006;16:293–303.
- [33] Cinner JE, Huchery C, Darling ES, Humphries AT, Graham NAJ, Hicks CC, et al. Evaluating social and ecological vulnerability of coral reef fisheries to climate change. *PLoS One* 2013;8:e74321.
- [34] McClanahan TR, Cinner JE. Vulnerability of coastal communities. In: McClanahan TR, Cinner JE, editors. Adapting to a changing environment: confronting the consequences of climate change. New York, NY: Oxford University Press; 2012. p. 67–83.
- [35] Adger WN, Vincent K. Uncertainty in adaptive capacity. *CR Geosci* 2005;337:399–410.
- [36] Cinner J, MMPB Fuentes, Randriamahazo H. Exploring social resilience in Madagascar's marine protected areas. *Ecol Soc* 2009;14:41.
- [37] Folke C. Resilience: the emergence of a perspective for social-ecological systems analyses. *Global Environ Change* 2006;16:253–67.
- [38] Folke C, Carpenter S, Elmqvist T, Gunderson L, Holling CS, Walker B. Resilience and sustainable development: building adaptive capacity in a world of transformations. *AMBIO: J Hum Environ* 2002;31:437–40.
- [39] Christie P. Marine protected areas as biological successes and social failures in Southeast Asia. American Fisheries Society Symposium; 2004; 155–64.
- [40] Christie P, White AT. Best practices for improved governance of coral reef marine protected areas. *Coral Reefs* 2007;26:1047–56.
- [41] Garmestani AS, Allen CR, Benson MH. Can law foster social-ecological resilience? *Ecol Soc* 2013;18:37.
- [42] Wever L, Glaser M, Gorris P, Ferrol-Schulte D. Decentralization and participation in integrated coastal management: policy lessons from Brazil and Indonesia. *Ocean Coast Manage* 2012;66:63–72.
- [43] Smith T, Thomsen D, Gould S, Schmitt K, Schlegel B. Cumulative pressures on sustainable livelihoods: coastal adaptation in the Mekong Delta. *Sustainability* 2013;5:e11999.
- [44] Cinner JE, Bodin O. Livelihood diversification in tropical coastal communities: a network-based approach to analyzing livelihood landscapes. *PLoS One* 2010;5:e11999.
- [45] Glaeser B, Glaser M. People, fish and coral reefs in Indonesia. *Gaia Ecol Perspect Sci Soc* 2011;2:139–41.
- [46] Von Essen L, Ferse SCA, Glaser M, Kunzmann A. Attitudes and perceptions of villagers toward community-based mariculture in Minahasa, North Sulawesi, Indonesia. *Ocean Coast Manage* 2013;73:101–12.
- [47] Bell J, Kronen M, Vunisea A, Nash W, Keeble G, Demmke A, et al. Planning the use of fish for food security in the Pacific. *Mar Policy* 2009;33:64–76.
- [48] Wade AA, Beechie TJ, Fleishman E, Mantua NJ, Wu H, Kimball JS, et al. Steelhead vulnerability to climate change in the Pacific Northwest. *J Appl Ecol* 2013;50:1093–104.
- [49] Bellwood DR, Hughes TP, Folke C, Nyström M. Confronting the coral reef crisis. *Nature* 2004;429:827–33.
- [50] World Bank. Convenient solutions to an inconvenient truth: ecosystem-based approaches to climate change. Washington, DC: World Bank; 2009.
- [51] Cinner J. Coral reef livelihoods. *Curr Opin Environ Sustainability* 2014;7:65–71.
- [52] Cinner JE, McClanahan TR, Graham NAJ, Pratchett MS, Wilson SK, Raina J-B. Gear-based fisheries management as a potential adaptive response to climate change and coral mortality. *J Appl Ecol* 2009;46:724–32.
- [53] Berkes F, Seixas CS. Building resilience in lagoon social-ecological systems: a local-level perspective. *Ecosystems* 2005;8:967–74.
- [54] Satria A, Matsuda Y. Decentralization of fisheries management in Indonesia. *Mar Policy* 2004;28:437–50.
- [55] Patlis JM, Dahuri R, Knight M, Tulungen J. Integrated coastal management in a decentralized Indonesia: how it can work. *Integr Coast Manage* 2001;4:24–39.
- [56] Tiwi DA. Improving environmental impact assessment for better integrated coastal zone management. Wageningen: Taylor and Francis; 2004.
- [57] Siry HY. Decentralized coastal zone management in Malaysia and Indonesia: a comparative perspective. *Coast Manage* 2006;34:267–85.
- [58] Glaser M, Radjawali I, Ferse SCA, Glaeser B. Nested participation in hierarchical societies? Lessons for social-ecological research and management *Int J Soc Sci* 2010;2:390–414.
- [59] Nasuchon N, Charles A. Community involvement in fisheries management: experiences in the Gulf of Thailand countries. *Mar Policy* 2010;34:163–9.
- [60] Sievanen L, Crawford B, Pollnac R, Lowe C. Weeding through assumptions of livelihood approaches in ICM: seaweed farming in the Philippines and Indonesia. *Ocean Coast Manage* 2005;48:297–313.
- [61] Chozin M. Illegal but Common: life of blast fishermen in the Spermonde Archipelago. South Sulawesi, Indonesia: Ohio University; 2008.
- [62] Winter G. Towards sustainable fisheries law: a comparative analysis. Switzerland: Gland; 2009.
- [63] Cinner JE. Social-ecological traps in reef fisheries. *Global Environ Change* 2011;21:835–9.
- [64] Ferrol-Schulte D, Ferse SCA, Glaser M. Patron-client relationships, livelihoods and natural resource management in tropical coastal communities. *Ocean Coast Manage* 2014;100:63–73.
- [65] Adger NW. Social vulnerability to climate change and extremes in coastal Vietnam. *World Dev* 1999;27:249–69.
- [66] Glaser M, Christie P, Diele K, Dsikowitzky L, Ferse SCA, Nordhaus I, et al. Measuring and understanding sustainability-enhancing processes in tropical coastal and marine social-ecological systems. *Curr Opin Environ Sustainability* 2012;4:300–8.
- [67] Idrus MR. Hard habits to break: investigating coastal resource utilisations and management systems in Sulawesi, Indonesia. University of Canterbury; 2009.
- [68] Cullen LC. Marine resource dependence, resource use patterns and identification of economic performance criteria within a small island community. Kaledupa, Indonesia: University of Essex; 2007.
- [69] Salayo ND, Perez ML, Garces LR, Pido MD. Mariculture development and livelihood diversification in the Philippines. *Mar Policy* 2012;36:867–81.
- [70] Ellis F. Household strategies and rural livelihood diversification. *J Dev Econ* 1998;35:37–41.
- [72] Edinger EN, Jompa J, Limmon GV, Widjatmoko W, Risk M. Reef degradation and coral biodiversity in Indonesia: effects of land-based pollution, destructive fishing practices and changes over time. *Mar Poll Bull* 1998;36:617–30.

- [73] Silva P. Exploring the linkages between poverty, marine protected area management, and the use of destructive fishing gear in Tanzania. Washington, DC: World Bank; 2006; 43.
- [74] Moberg F, Rönnbäck P. Ecosystem services of the tropical seascape: interactions, substitutions and restoration. *Ocean Coast Manage* 2003;46:27–46.
- [75] Rhoe V, Catenazzi A, Chen M, Reid W, Sengupta D, Ximing C. Ecosystem conditions and human well-being. In: Hassan R, Scholes R, Ash N, editors. Millennium ecosystem assessment current state and trends, 1. London: Island Press; 2005. p. 125–64.
- [76] Souter D, Wilhelmsson D, Obura D. Coral Reef Degradation in the Indian Ocean. Stockholm: CORDIO & SAREC, Stockholm University; 2002.
- [77] Hughes TP, Bellwood DR, Folke C, Steneck RS, Wilson J. New paradigms for supporting the resilience of marine ecosystems. *Trends Ecol Evol* 2005;20:380–6.
- [78] Christie P, Fluharty D, White A, Eismaosorio L, Jatulan W. Assessing the feasibility of ecosystem-based fisheries management in tropical contexts. *Mar Policy* 2007;31:239–50.
- [79] Fox HE, Mascia MB, Basurto X, Costa A, Glew L, Heinemann D, et al. Reexamining the science of marine protected areas: linking knowledge to action. *Conserv Letters* 2012;5:1–10.
- [80] Haisfield KM, Fox HE, Yen S, Mangubhai S, Mous PJ. An ounce of prevention: cost-effectiveness of coral reef rehabilitation relative to enforcement. *Conserv Letters* 2010;3:243–50.
- [81] Lowe C. Global markets, local injustice in Southeast Asian seas: the live fish trade and local fishers in the Togeian Islands of Sulawesi. In: Zerner C, editor. People, plants, and justice: the politics of nature conservation. Columbia University Press; 2000. p. 235–58.
- [82] Fröcklin S, de la Torre-Castro M, Lindström L, Jiddawi NS, Msuya FE. Seaweed mariculture as a development project in Zanzibar. *East Africa: a price too high to pay? Aquaculture* 2012;356–357:30–9.
- [83] Mascia MB, Claus CA. A property rights approach to understanding human displacement from protected areas: the case of marine protected areas. *Conserv Biol* 2009;23:16–23.
- [84] Ban NC, Adams V, Pressey RL, Hicks J. Promise and problems for estimating management costs of marine protected areas. *Conserv Letters* 2011;4:241–52.
- [85] Hardin G. The tragedy of the commons. *Science* 1968;162:1243–8.
- [86] Béné C. Small-scale fisheries: assessing their contribution to rural livelihoods in developing countries. *FAO Fish Circular* 2006;1008:46.
- [87] Armitage D, Tam C. A political ecology of sustainable livelihoods in coastal Sulawesi, Indonesia. *Canad J Dev Stud* 2007;28:39–57.
- [88] Bodin O, Crona B. Management of natural resources at the community level: exploring the role of social capital and leadership in a rural fishing community. *World Dev* 2008;36:2763–79.
- [89] Campbell J. Systematic approaches to livelihoods enhancement and diversification: a review of global experiences. Gland, Switzerland and Colombo, Sri Lanka: IUCN; Kalmar, Sweden: CORDIO; Cambridge, UK: ICRAN; 2008.
- [90] Kumar KG, editor. Workshop on customary institutions in Indonesia: do they have a role in fisheries and coastal area management? Chennai, India: International Collective in Support of Fishworkers (ICSF); 2010.
- [91] Wood G, Newton J. From welfare to well-being regimes: engaging new approaches. Arusha Conference on New Frontiers of Social Policy 2005; 1–41.
- [92] Aldon MET, Fermin AC, Agbayani RF. Socio-cultural context of fishers' participation in coastal resources management in Anini-y, Antique in west central Philippines. *Fish Res* 2011;107:112–21.
- [93] Fisher R, Radford BT, Knowlton N, Brainard RE, Michaelis FB, Caley MJ. Global mismatch between research effort and conservation needs of tropical coral reefs. *Cons Letters* 2011;4:64–72.
- [94] Crona B, Nyström M, Folke C, Jiddawi N. Middlemen, a critical social-ecological link in coastal communities of Kenya and Zanzibar. *Mar Policy* 2010;34:761–71.
- [95] Jones P, Qiu W, de Santo E. Governing marine protected areas: getting the balance right. Nairobi, Kenya: United Nations Environment Programme (UNEP); 2011.
- [96] Adhuri DS, Visser L. Fishing in, fishing out: transboundary issues and the territorialization of blue space. *Asia Pacific Forum* 2007;36:112–45.