

A critical review of marine mammal governance and protection in Indonesia

Achmad Sahri^{a,*}, Putu Liza Kusuma Mustika^{b,c}, Hadi Yoga Dewanto^d, Albertinka J. Murk^a

^a Marine Animal Ecology Group, Wageningen University and Research, Droevendaalsesteeg 1, 6708 PB, Wageningen, the Netherlands

^b Cetacean Sirenian Indonesia (CETASI), Jl. Kalibaru II No.31, Jakarta Utara, Indonesia

^c James Cook University, College of Business, Law and Governance, Townsville, Queensland, Australia

^d Ministry of Marine Affairs and Fisheries of The Republic of Indonesia, Jl. Medan Merdeka Timur No. 16, Jakarta Pusat, Indonesia

ARTICLE INFO

Keywords:

Institutional arrangement

Legal framework

Marine governance

Marine mammal

Marine spatial planning

Policy

ABSTRACT

The governance of marine conservation in Indonesia has been the subject of critique for decades. This paper elucidates and analyses the legal framework for marine mammal protection and current institutional arrangements, and reveals gaps and overlaps in the national legal and policy frameworks for marine mammal governance in the Archipelago. We reviewed available policies to assess the current regulation practices in the country's marine mammal protection. In total, five relevant international conventions, 28 Indonesian national regulations, and 16 provincial regulations on marine spatial planning were found. Progress on legal framework regarding marine mammal governance reveals three different phases: 1970s (species-centred approach), 1990s (site-based approach), and current (wider marine management approach). We summarized seven policies based on the following characteristics: species, site and other values. We identified functional overlap and unclear mandates as the main shortcomings of these regulations. Although marine mammal protection in Indonesia enjoys a set of regulations, the practical actions required by these regulations are still unclear. Protection gaps still exist, rendering conservation efforts less effective. The paper argues how an adequate and appropriate legal framework and institutional arrangements will ameliorate and strengthen marine mammal governance in Indonesia. We suggest some urgent-yet-lacking policies that should be added to the current regulations, including regulations on traditional whale hunting, the code of conduct for marine mammal watching tourism, standards for aquaria, and the legal basis for marine mammal stranding network and underwater noise pollution. We endorse the cetacean National Plan of Action for it is designed to enhance ecological and human-dimension research on cetaceans and address the detrimental effects of anthropogenic activities to the cetaceans. We suggest establishing a mechanism for cross-institutional coordination for more effective marine mammal protection in Indonesia. Becoming a full member of the Convention on the Conservation of Migratory Species of Wild Animals and International Whaling Commission will further strengthen the conservation management of marine mammals in Indonesia.

1. Introduction

Cetaceans are important top predators of the marine food chain and play a critical role in maintaining biodiverse and resilient ecosystems. However, several species of cetaceans are threatened. Based on International Union for Conservation of Nature (IUCN) online database [1], the status of more than a fifth of cetacean species that occur in Indonesian waters are listed as threatened species (Table S1). Further, more than three quarter of other cetacean species are listed as 'Least Concern' or 'Data Deficient' making it difficult to assess its population status.

There is a long history of anthropogenic pressures on marine mammals through historical and commercial whaling, habitat degradation, and other anthropogenic activities in the marine environment [2]. The anthropogenic threats include interactions with fisheries (entanglement, bycatch, prey depletion) [3], physical and acoustic disturbance (ship strikes, underwater noise from seismic activities and naval sonar) [4,5], and pollution [6], including oil spill, plastic debris, persistent organic pollutants and heavy metals, and other chemicals.

The Indonesian government has set up measures dedicated to improve the conservation of migratory species, including stipulation of

* Corresponding author.

E-mail address: achmad.sahri@wur.nl (A. Sahri).

<https://doi.org/10.1016/j.marpol.2020.103893>

Received 8 June 2019; Received in revised form 11 February 2020; Accepted 12 February 2020

Available online 27 February 2020

0308-597X/© 2020 The Authors.

Published by Elsevier Ltd.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

several regulations intended to directly protect cetacean species as well as establishment of Marine Protected Areas (MPAs) that indirectly provide benefits to cetacean protection. Via MPAs many other marine species are also protected in their habitat, thus supporting total biodiversity [7,8]. Many policies have been designed and initiatives have been developed by the government in order to maintain and conserve marine resources. In 2006, during the Conference of the Parties to the Convention on Biological Diversity (COP-CBD) in Brazil, the Indonesian government declared its commitment to establish and manage MPAs covering an area of 10 million hectares by 2010. This commitment was strongly asserted again during the World Ocean Conference 2009 in Indonesia and the target size was readjusted to 20 million hectares by 2020 [9]. In addition to this effort, the Indonesian government also decided to formulate extra regulations. To name a few, the Indonesian government has declared all cetacean species as protected biota. This includes a ban on hunting and killing of marine mammals, prohibition of trade of these species or their derivative products with some exceptions. According to the Indonesian regulation, migration paths of marine biota, including cetaceans, now have to be incorporated into Marine Spatial Planning (MSP) [10]. Recently, the 2016–2020 National Action Plan for Cetacean Conservation has also been issued as guidance for cetacean conservation in Indonesia [11,12].

Although officially all cetacean species are protected by international or Indonesian national regulations, in reality they are not. The limited governance quality of some marine conservation initiatives has polarized opinions for decades, resulting in intense debates and serious critique [13], particularly regarding their ability to provide real protection to specifically targeted animals. In addition, the implementation in local policies, and enforcement and effectiveness of the chosen policy measures, remains debated and has been subject of inquiry by many [14]. In addition, the lack of proper implementation in institutional arrangements has contributed to the current problems with marine management effectiveness, see e.g. Ref. [15]. A better understanding of the strengths, weaknesses, gaps and overlaps within the legal framework can help in overcoming the often complex issues arising from the enactment of regulations.

The aim of this study was to elucidate and analyse problems with the legal framework for marine mammal protection and reveal gaps and overlaps in the national legal and policy framework for cetacean governance in Indonesia. This study was conducted to provide a

structured overview of the legal framework, institutional arrangement, and policies related to marine mammal governance and protection in Indonesia. The following three questions will be answered: (i) what are the existing marine mammal protection policies and regulations in Indonesia? (ii) what are the gaps and main shortcomings in the current marine mammal protection regulations? (iii) what are the most important aspects to improve marine mammal governance and protection in Indonesia?

2. Materials and methods

2.1. Data collection

To obtain data on Indonesian regulations regarding cetacean governance and protection, policy documents issued by the central national government, relevant ministries and provincial government (on marine spatial planning) within the period of 1970–2018 were reviewed. Most of the policy documents issued in Indonesia are now available online, although mostly only in Bahasa Indonesia. Online platforms such as *peraturan.go.id* (an online platform to disseminate all the laws and regulations managed by the Directorate General of Legislation of Indonesian Ministry of Law and Human Rights) and *jdih.kkp.go.id* (a legal documentation and information network of Indonesian Ministry of Marine Affairs and Fisheries) were used.

Since the terms ‘governance’ and ‘protection’ are not clearly defined in many regulation documents, specific terms were applied in combination to comprehend the main message of the policy documents. The specific combination of terms such as ‘cetacean protection from trading and hunting’, ‘cetacean habitat protection’ and ‘protection of cetacean migration corridor’ as well as ‘marine conservation’ and ‘marine biota management’ in general were used to determine whether a particular policy can be categorized as a regulation relating to cetacean protection or not.

2.2. Data analysis

To answer the first research question (Fig. 1), an extensive literature review was performed of legal and policy documents issued by the central government and relevant ministries. These include International conventions that were adopted/ratified by the Indonesian government.

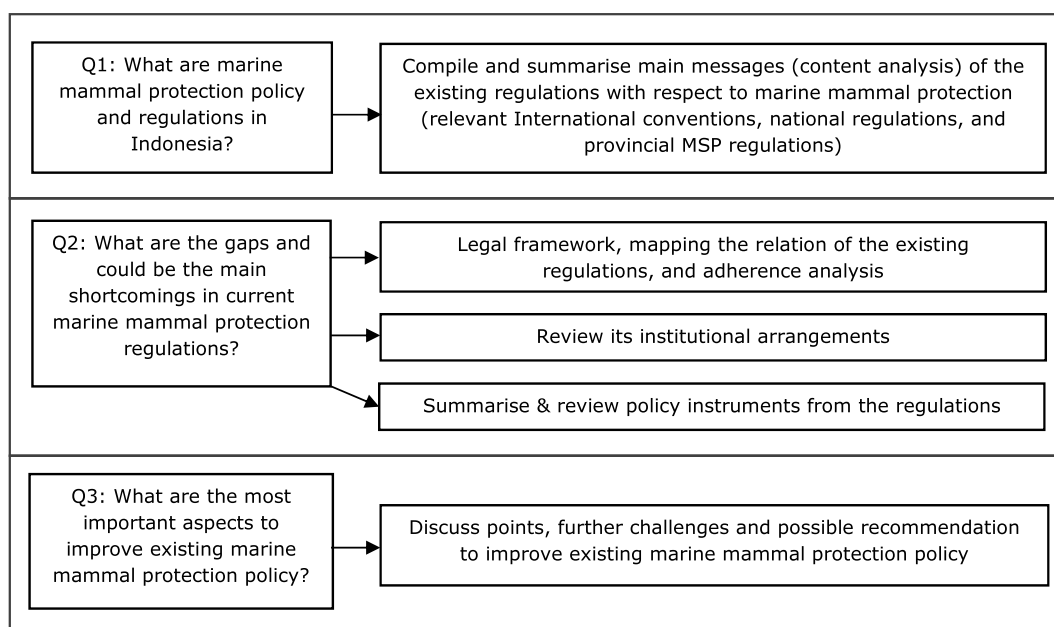


Fig. 1. Schematic overview of the analyses performed in this study.

Provincial regulations on marine spatial planning were also included. The review summarized the core aspects (content analysis) of each regulation and analysed whether it provides incentives to protect cetaceans, and in what form. Subsequently, the findings were compiled and presented in a tabular form allowing for comprehensive interpretation.

The second research question was answered through three steps. First, we mapped the inter-relation among the existing regulations (policy mapping) and subsequently performed adherence analysis [16]. The policies extracted from existing regulations were grouped based on regulation content category. For instance, regulations that directly mention cetacean species as protected biota were grouped together. Second, problems with institutional arrangements such as potential issues related to functional overlap and unclear mandates of regulations in marine mammal governance were identified. Third, the policies (the specific measure regarding marine mammal management) were summarized and reviewed to obtain a comprehensive understanding.

To be able to answer the third question, striking points and findings from the previous parts were discussed. Further challenges and possible options to improve cetacean protection policy were also discussed. The detailed data analysis methodology of this study is presented in Fig. 1.

3. Results

In total, five relevant international conventions (Table 1) and 28 Indonesian national regulations (Table 2) related to marine mammal protection policy, as well as 16 provincial regulations on marine spatial planning were found (Table 3). The presentation of the main gaps and shortcomings of the current regulations is divided into three subsections: legal framework, institutional arrangements and policies.

3.1. Legal framework

Almost a half century preceding this study, from 1972 to 2018, the Indonesian government showed high commitment in marine biota protection and marine management in general. In the first decade starting from 1970s, the general basis for marine biota protection was drawn up, and indicated the main strategic lines of policy areas from a species-centred point of view. The regulations regarding marine mammal management were basically enacted regulations that mentioned several endangered and vulnerable species as protected biota and prohibited of their exploitation. The Indonesian government conforms to global initiatives by adopting several relevant international agreements into its national legal framework, as well as establishing its own legal framework that is needed for national purposes. Later on, the issues were changed in line with the more recent notion of site-based management, such as marine protected areas [17] and marine spatial planning [18,19]. Within the legal framework, we distinguish several international policies that are relevant for marine mammal management, the national legal framework for marine mammal management, and the adherence of Indonesia to international conventions.

3.1.1. Relevant international policies on marine mammal management

Five international conventions and agreements related to marine mammal governance were found (Table 1), of which three were ratified entirely by the Indonesian government, namely the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES 1973), the United Nations Convention on the Law of the Sea (UNCLOS 1982), and the Convention on Biological Diversity of the United Nations (CBD 1992). These three conventions were ratified because of their benefits for and in line with the government goal on marine biota protection and management.

The ratified conventions have a significant bearing on marine mammal governance and protection for Indonesia. CITES reflects a marine mammal protection approach through strictly managing international commercial trade of all threatened and endangered species. UNCLOS provides a comprehensive international legal regime for

oceans and seas worldwide; regarding marine mammal management, this convention explicitly encourages international cooperation on marine mammal conservation among ratifying countries. Marine mammals are specifically mentioned as a conservation target. CBD is the parent multilateral treaty on conservation of biodiversity and the sustainable use of its components. Under this convention, marine mammal governance and protection are embraced through several policy items, such as recognition of the dependence of traditional communities on biodiversity, protected area systems, international cooperation, and considering biodiversity conservation within national policy-making.

The two conventions that are not (yet) ratified by Indonesia are the International Convention for the Regulation of Whaling (ICRW 1946) and the Convention on the Conservation of Migratory Species of Wild Animals (CMS 1979). Although ICRW and its commission, IWC (International Whaling Commission), were established earlier than the other conventions regarding marine mammal management, Indonesia still is not a member of IWC. However, the convention is included in this study, since it is heavily related to the IWC issues on traditional hunting practiced by Indonesian locals. Towards CMS, Indonesia has only signed the MoU (Memorandum of Understanding) for marine turtles but has not yet done so for dugongs and cetaceans, migratory species that occur in Indonesia. The degree of adherence of the Indonesian regulatory framework to principles mentioned in International conventions with respect to marine mammal governance showed in Table 4.

3.1.2. National legal framework on marine mammal protection and management

Twenty eight regulations were found in the national legal framework related to marine mammal protection and management. These regulations cover many aspects of their management including determination of protected species and appropriate uses of the species, establishment of protected area systems, measures to deal with bycatch, marine pollution management, promotion of international cooperation, and development of action plans intended for marine mammal management (Table 2).

In the policy mapping (Fig. 2), the legislative framework for marine mammal governance falls into three categories: species-specific, site-specific, and other measures (Fig. 2). All these regulations are also interrelated as several regulations reflected more than one measure category (Fig. 2). For instance, the Government Regulation No.60/2007 that is initially enacted to provide conservation of fish resources (marine mammals are considered as 'fish' under this regulation) through stipulation of aquatic conservation areas (site-specific measures), at the same time manages the utilization of fish resources in trading and aquaria (species-specific measures). The mentioned protected fish refer to CITES Appendices species, hence all marine mammals that occur in Indonesia are categorized as protected species (species-specific measures).

The history of marine mammal protection in Indonesia started with the issuance of the Minister of Agriculture's decree No. 327/1972. This regulation became the first legal basis for the protection of the dugong, one of the marine mammals in Indonesia. Progress on legal frameworks regarding marine mammal governance reveals three different phases (Fig. 3, top panel). In the first phase, from 1972 to 1980s, regulations were mainly produced to protect individual species. In the second phase from 1990 onward, the regulations reflected site-specific management dominated by stipulation of regulations for marine protected areas or other similar systems, as well as marine pollution management. The last phase, from 2010 onward, is characterised by a wider marine management approach that is applied in national policy including marine spatial planning and bycatch fishing management.

The Indonesian government extended the protection and management of marine mammals when Law No.1/2014 was issued. According to the regulation, migration paths of marine biota have to be incorporated in Marine Spatial Planning (MSP) through a zoning plan for the coastal areas and small islands (Indonesian: *Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil*, abbreviated as RZWP3K). The zoning plan needs to provide protection of habitat and other important areas for

Table 1
International conventions that are relevant for marine mammal governance in Indonesia.

No	Name of Conventions	Main messages with respect to marine mammals	Remarks
1	International Convention for the Regulation of Whaling (ICRW) 1946	The ICRW is the legal basis for the International Whaling Commission (IWC). ICRW aims to protect all whale species from overhunting and to ensure proper conservation and development of the global whale stocks. <u>Almost all whale species are protected from commercial killing</u> , although it is still debated whether or not to include small cetaceans. ICRW regulates any activity that may threaten the whale stocks. IWC asked its members to adopt regulation specifically dedicated for conservation and utilization of whale resources, including the development of sanctuary areas where whaling activities are strictly prohibited. IWC manages whaling activities, including a moratorium on commercial whaling, catch limits for aboriginal subsistence whaling, <u>management of scientific whaling</u> , and it handles objections to IWC whaling bans.	Indonesia is currently not a member of IWC. However, IWC's competences have been expanded beyond whaling (see Ref. [20]), therefore it is worthwhile for Indonesia to further explore the benefits from joining the IWC.
2	Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) 1973	All threatened species (including their recognizable parts or derivatives) which are trafficked all over the world are subject to strict regulation and only allowed in highly exceptional conditions. CITES issued appendices I, II, and III lists. Appendix I: the most endangered species that are threatened with extinction and prohibited for trading except for non-commercial purposes (e.g. scientific research). Appendix II: species that are not necessarily now threatened with extinction but that may become so, unless trade is strictly controlled. Appendix III: species that are not necessarily threatened with extinction globally and are listed after one member state has asked other parties for assistance in controlling trade in a species. All marine mammals which occur in Indonesian waters are listed in <u>Appendices I (12 species) and II (23 species) of the convention</u> .	Indonesia joined CITES as an accession member and ratified the convention through Presidential Decree No. 43/1978 in December 1978.
3	Convention on the Conservation of Migratory Species of Wild Animals, CMS (Bonn Convention) 1979	The CMS provides the <u>legal foundation for internationally coordinated conservation measures</u> throughout a migratory range. CMS parties should immediately protect the migratory species of its Appendix I (endangered migratory species), and encourage states (particularly range states) to conclude an agreement for conservation and management of migratory species in Appendix II (migratory species to be the subject of agreement). CMS requires the parties that are range states to have <u>scientific knowledge</u> on identification of migratory species, description on the range, and migration route of the species; to conserve and restore their habitat as well as <u>control adverse factors</u> for the species. Most of the marine mammals that occur in Indonesian waters are listed in its Appendices I (6 species) and II (18 species). CMS prohibits taking, hunting, fishing, capturing, harassing, or deliberate killing of these migratory species. By 2011, seven resolutions focusing on cetacean conservation have been issued by CMS, including future actions for several whales and reduction of adverse human-induced impacts (e.g. ocean noise) on cetaceans.	Indonesia is non-party of CMS. Indonesia is an MoU Signatory for marine turtles (by May 2005). However, Indonesia is not an MoU Signatory for dugong and cetaceans, although Indonesia is a range state of these migratory species.
4	United Nations Convention on the Law of the Sea (UNCLOS) 1982	Part V (Economic Exclusive Zones, EEZ) of UNCLOS specifically mentions highly migratory species (Article 64), and marine mammals (Article 65). On Part VII (High Seas) Section 2, UNCLOS explicitly stresses the importance of and encourages international cooperation for living resources of the high seas for all ratifying countries. Article 120 specifically mentions marine mammals as a conservation target.	Ratified by Indonesia in 1985 through Law No. 17/1985. Indonesia is a party to this convention.
5	Convention on Biological Diversity (CBD) of the United Nations 1992	The CBD recognises the traditional dependence of humans on biological resources, and encourages the parties to manage the traditional use of biological resources sustainably. CBD calls on parties to establish a system of protected areas to conserve biological diversity, to actively participate in any aspect of conservation effort and to control risks associated with the use of biological diversity. CBD suggests incorporating consideration of biodiversity conservation within national policy-making and encourages <u>cooperation among parties</u> in all activities regarding biological resources. CBD was later followed by the enactment of the Jakarta Mandate in 1995 that directed all member states to <u>develop an action plan</u> for implementing CBD for marine and coastal biodiversity and to ensure that coastal and marine living resources will be used sustainably. The mandate includes establishment of an <u>integrated marine-coastal area management</u> and <u>marine protected areas</u> .	Ratified by Indonesia through Law No.5/1994. Indonesia is a party to this convention.

Table 2
National regulations for marine mammal protection and governance in Indonesia (*Indonesian words in Italics*).

No	Name of Regulations	Main messages with respect to marine mammals
1	Minister of Agriculture (MoA) Decree No.327/1972 on Protection of wild animals	The <u>Dugong</u> is listed as a <u>protected wild animal</u> in the regulation.
2	MoA Decree No.35/1975 on Protection of wild animals	The protected wild animals listed in the regulation include <u>freshwater- and marine dolphins</u> .
3	MoA Decree No.327/1978 on Protection of wild animals	Addendum of <u>Blue, Fin, and Humpback whales</u> to the protected wild animal list.
4	Presidential Decree No.43/1978 on Ratification of Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	All marine mammals which occur in Indonesian waters are listed in Appendix I (12 species) and Appendix II (23 species) of the convention.
5	MoA Decree No.716/1980 on Protection of wild animals	Addition of all whales to the protected wild animal list.
6	Law No.17/1985 on Ratification of the United Nations Convention on the Law of the Sea (UNCLOS)	Explicitly stresses the importance of and encourages international cooperation for marine mammal conservation for all ratifying countries. As a highly migratory species, marine mammals are a <u>conservation target</u> .
7	Law No.5/1990 on Conservation of living natural resources and their ecosystems	Regulates all aspects related to conservation, both space and natural resources, and aims to regulate the protection of life buffer systems, preservation of the diversity of plant and animal species and their ecosystems, and the sustainable use of biological natural resources and their ecosystems. The law also mentions types of <u>nature reserves</u> . This law divides animals into protected and unprotected species.
8	Presidential Decree No.32/1990 on Management of protected areas	Indicates the necessity to establish protected areas and guidelines for management of protected areas. The regulation also describes types of nature reserves and the criteria for establishment of each type. It specifically mentions marine nature reserves.
9	Law No.5/1994 on Ratification on the United Nations Convention on Biological Diversity (CBD)	CBD suggests establishing a system of protected areas, controlling risks associated with the use of biological diversity, incorporating consideration of biodiversity conservation within national policy-making, collaborating among contracting states in all activities regarding biological resources, and developing action plans for implementing CBD in terms of marine and coastal biodiversity through integrated coastal area management and marine protected areas. The CBD recognises the <u>traditional whale hunting</u> in Indonesia and as a CBD member Indonesia is expected to manage the whale hunting sustainably.
10	Government Regulation No.68/1998 on Nature reserves and nature protected areas	Describes in-situ conservation, establishment criteria, utilization, and management plans. The in-situ conservation is categorized into nature reserves and nature protected areas. The nature reserves consist of nature preservation areas (<i>Kawasan Cagar Alam</i>) and wildlife sanctuaries (<i>Kawasan Suaka Margasawa</i>). Nature protected areas consist of national park areas (<i>Kawasan Taman Nasional</i>), great forest park areas (<i>Kawasan Taman Hutan Raya</i>), and nature park areas (<i>Kawasan Taman Wisata Alam</i>). Derivative regulation of Law No.5/1990.
11	Government Regulation No.7/1999 on Preservation of flora and fauna	Flora and fauna are divided into protected and unprotected species. Flora and fauna preservation could be done in-situ or ex-situ. All marine mammals in Indonesia are protected from deliberate killing and trading. Derivative regulation of Law No.5/1990.
12	Government Regulation No.8/1999 on Exploitation of wild flora and fauna	Strict regulation for protected and unprotected plants and wildlife from being captured, hunted, traded, exchanged or raised for pleasure. Derivative regulation of Law No.5/1990.
13	Government Regulation No.19/1999 on Marine pollution and/or destruction control	Prohibits and regulates activities that will cause <u>marine pollution</u> and destruction. Mandates assigning sea water quality standards and marine ecosystem destruction standards.
14	Law No. 31/2004 on Fisheries (Amended by Law No. 45/2009) ⁸	Marine mammals are considered as 'fish' under this law (Article 1 clause 4). The law addresses fishery conservation (Article 1 clause 8). In order to support the fishery resources management policy, protected fish species and aquatic conservation areas need to be stipulated (Article 7 clause 1). Since marine mammals are considered as fish, the fishery conservation and stipulation of aquatic conservation areas benefit marine mammals as well.
15	Law No. 27/2007 on Management of coastal area and small islands (Amended by Law No. 1/2014) ⁸	Coastal and small island conservation is organised to protect migration corridors and habitats of fish and other marine biota (Article 28). This law also explains about zoning plans for marine, coastal and small island areas (Indonesian: <i>Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil</i> , abbreviated as RZWP3K). Although it doesn't explicitly state the protection of marine mammals, it highlights the importance of migration corridors and habitat protection.
16	Government Regulation No. 60/2007 on Conservation of fish resources	Conservation and sustainable use of fish resources, including their habitat. Marine mammals are considered as 'fish' under this regulation (Article 1 clause 6). Stipulation of aquatic conservation areas shall take into account ecological aspects: biodiversity, spawning area, nursery area, migration corridor, etc. Four forms of aquatic conservation areas are defined: aquatic national parks, aquatic tourism parks, aquatic nature reserves, and fishery sanctuaries. The utilization of fish resources includes use for research, aquaculture, trading, aquaria, exchange or raising for pleasure. The regulation divides fish into protected and unprotected fish. Derivative regulation of Law No. 31/2004 (amended by Law No. 45/2009). Protected fish refer to CITES Appendices species; hence all marine mammals which occur in Indonesia belong to protected species.
17	MMAF Regulation No. 16/2008 on Management planning of coastal area and small islands (amended by MMAF Regulation No. 34/2014) ⁹	Marine biota migration paths are considered to be sea lanes (Article 15 clause 6) that must be included in the establishment of a zoning plan for coastal and small island areas (RZWP3K).
18	Ministry of Marine Affairs and Fisheries (MMAF) Regulation No. 17/2008 on Conservation area in the coastal area and small islands	Four forms of coastal and small islands conservation areas are defined: coastal sanctuaries, small islands sanctuaries, coastal parks, and small island parks. Core zones must be determined in each type of conservation area. The core zone is part of the conservation area which serves, among other things, as a spawning area, nursery area, and migratory corridor of marine biota (Article 32 clause 1). Derivative regulation of Law No. 27/2007 (amended by Law No. 1/2014). Although it doesn't explicitly state the protection of marine mammals, it provides the opportunity to protect them by stipulation of the conservation areas.
19	MMAF Regulation No. 2/2009 on Procedures for stipulation of aquatic conservation areas	Stipulation of the four forms of aquatic conservation areas have to take into account ecological aspects including the existence of habitat, spawning area, nursery area, and migration corridor for certain types of fish that have values and conservation interests (Article 4 clause 2).

(continued on next page)

Table 2 (continued)

No	Name of Regulations	Main messages with respect to marine mammals
20	Law No.32/2009 on Environmental protection and management	Environmentally sustainable development must be done through planning policies, rational exploitation, development, restoration, supervision, and control. In terms of marine mammal management, this law supports protection of natural habitats and regulation of pollution that can negatively impact the marine ecosystem.
21	MMAF Regulation No. 30/2010 on Management and zoning plan of aquatic conservation areas	Protection of migration corridors of marine biota is included in the stipulation of sustainable fishing zones of the aquatic conservation areas (Article 19 and 26).
22	Government Regulation No.62/2010 on Utilization of small outlying islands	Utilization of small outlying islands for environmental sustainability can be implemented by assigning outlying islands as conservation areas (Article 8 and 9). Derivative regulation of Law No. 27/2007 (amended by Law No. 1/2014).
23	MMAF Regulation No. 12/2012 on Open seas fisheries	Any vessel fishing on the open seas that catches marine mammals unintentionally while catching tuna or other pelagic species has to make sure the animals are released alive (Article 39) and the bycatch species must be reported to the port authority (Article 42).
24	MMAF Regulation No. 30/2012 on Capture fishery in fishing territory of Indonesia (amended twice by MMAF Regulation No. 26/2013 and MMAF Regulation No. 57/2014) ^a	Any fishing vessel which obtained a fishing permit (Indonesian: <i>SIP</i>) has to apply conservation measures to protect certain species ecologically related to tuna from bycatch, including marine mammals (Article 73 clause 1 and 2). The bycatch species must be released alive and must be reported to the port authority (Article 73 clause 4).
25	Law No. 32/2014 on Marine	The government must undertake effort to protect the marine environment through marine environment conservation, including for migratory species, particularly marine mammals (Article 50 and its Explanation). Marine conservation could also be applicable to high seas (Article 11). International cooperation on marine resources conservation and management is stimulated (Chapter VII).
26	MMAF Decree No.6/2014 on Management planning and zoning of Savu Sea Aquatic National Park and adjacent waters 2014–2034	Corridors for marine protected animals have been set up in Savu Sea National Park. Cetacean population management developed through regulating fishing gears, considering migration seasons, bycatch management, regulating shipping routes, and mining activities including seismic within the park.
27	MMAF Decree No.79/2018 on National action plans for marine mammals conservation 2018–2022	The stipulation of national action plans for conservation of dugongs and cetaceans (includes all whales and marine dolphins) for the period of 2018–2022.
28	Presidential Decree No. 83/2018 on Tackling marine waste	The stipulation of national action plans for accelerating marine waste reduction management. This document describes the detailed strategy, program, activities, and institutions that are responsible to reduce marine waste including plastics for period of 2018–2025.

^a The parts of these regulations that are relevant to marine mammal governance remain the same after the amendment.

marine life and migratory species such as marine mammals. Until 2018, of the 34 provinces in Indonesia, 16 have finalised their MSPs and complemented them with provincial regulations (Table 3, Fig. 4). The national guidance on incorporation of migratory paths in an MSP, however, is implemented quite differently in the provincial regulations. Among 16 provincial regulations, 14 regulations provide migration corridors (areas or zones) or migration paths (indicative lines) for marine biota of which 12 regulations specifically mention marine mammal biota (Table 3).

3.1.3. Adherence of Indonesia to international conventions

An examination of the Indonesian legislative framework for marine mammal governance and protection shows that the national management approach mostly reflects the required principles laid down in the main international conventions used in this study (summarized in Table 4). They include regulations on determination of protected species, sustainable use of species, global commercial trades on endangered species, protected area establishment, controlling anthropogenic and adverse factors, encouraging global cooperation, and development of an action plan for marine mammal management. The only part of the international legislation that has not yet been integrated in Indonesian legislation relates to whaling activities, particularly traditional subsistence whaling in Indonesia. There is no specific regulation intended to manage this practice.

3.2. Institutional arrangements

The development of legal frameworks regarding marine mammal governance was consequently followed by changes in institutional arrangements (Fig. 3, bottom panel). This effort has especially involved the creation of new institutions required to handle specific tasks that previously were not well delivered. Although the institutions discussed here are mostly responsible for broader marine management, they also are eligible for marine mammal management.

In 1972, the Department¹ of Agriculture (DoA) of Indonesia issued Ministerial Decree No. 327/1972, the first regulation in Indonesia to protect marine mammals. At that time, the DoA was authorized by law to protect endangered animals in Indonesia since a specific department was not established yet. The DoA had two subordinate agencies named the Directorate General (DG) of Forestry and the Directorate General (DG) of Fisheries, which were appointed to be the implementer of wildlife conservation in Indonesia. The main task of these two Directorate Generals related to marine mammal conservation is to maintain the diversity of protected species so that they are prevented from extinction. In 1983, DG of Forestry became a stand-alone department; the Department of Forestry (DoF). Since 1978, regency and provincial agencies for natural resources conservation (Indonesian: *Balai Konservasi Sumber Daya Alam*, abbreviated as BKSDA) have also been established gradually in order to implement the regulations on wildlife conservation more locally.

In 1990, the Indonesian government issued Law No. 5/1990 concerning conservation of living resources and their ecosystems and appointed the DoF to be the implementer of the law. Through this law, the government introduced the concept of nature reserve areas, including the stipulation of marine conservation areas. The Directorate General of Forest Conservation and Nature Preservation (now called DG of Natural Resource Conservation and Ecosystems) is an institution under the DoF which is appointed to implement regulations relating to the protection of wildlife in general and management of conservation areas. Marine National Park (MNP) Authorities (Indonesian: *Balai Taman Nasional*) under the DoF are mandated to manage the MNPs, including marine mammal conservation. Seven MNPs were then

¹ Before 2009, the Indonesian government used word 'Department' to name its ministries.

Table 3
The provincial regulations on marine spatial planning (*Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil*, or RZWP3K) in Indonesia that take into account marine mammal governance.

No	Name of regulations	Main messages with respect to marine mammals
1	Provincial Regulation of North Sulawesi No. 1/2017 on a zoning plan for the coastal areas and small islands for 2017–2037	In determining sea lanes, the migration corridors ^a of marine biota must be included (Article 12). The marine biota mentioned in this regulations, however, are only turtles and fish (Appendix II of the regulation). No marine mammal species mentioned.
2	Provincial Regulation of West Sulawesi No.6/2017 on a zoning plan for the coastal areas and small islands for 2017–2037	In determining sea lanes and conservation areas, the migration paths ^b of marine biota must be included (Article 13). Specifically mentions the migration paths of turtles (for landing and laying eggs), aquatic protected fish, and marine mammals (Appendix of the regulation). Vessels must lower their speed when passing the migration paths (Article 58 clause 1). Fishing activities are prohibited in the migration paths (Article 58 clause 2). Mandates research on the identification of <u>marine mammals</u> species and their migration patterns, and development of a surveillance and monitoring system for the migration paths.
3	Provincial Regulation of West Nusa Tenggara No.12/2017 on a zoning plan for the coastal areas and small islands for 2017–2037	The migration paths of marine biota must be stipulated and protected (Article 47). The migration paths must be synchronised with other marine spatial uses. Specifically mentions the migration paths of turtles, sharks, whales, and dugongs (Article 48). Regulates the type of fishing gear that can be used in conservation areas, migration paths, spawning and nursery areas (Article 61). Mandates research on the identification of types of migratory species and their migration patterns, development of a surveillance and monitoring system for the migration paths, and deployment of special signs for the migration paths.
4	Provincial Regulation of East Nusa Tenggara No.4/2017 on a zoning plan for the coastal areas and small islands for 2017–2037	This province has the largest migration corridors of cetaceans and these are stipulated as cetacean protected zones within the zoning plan (Article 21). The corridors, however, are integrated into the use zones that allow fishing activities by only applying cetacean-friendly fishing gear (Article 19, Explanation section). Mandates research on identification of the types of migration paths and patterns, and behaviour of marine mammals and other large biota, development of a migration path monitoring system, and synchronisation of the migration paths with other marine spatial uses.
5	Provincial Regulation of Central Sulawesi No.10/2017 on a zoning plan for the coastal areas and small islands for 2017–2037	The migration paths of marine biota must be synchronised with other marine spatial uses (Article 31). The migration paths must be protected in determining conservation areas. Regulates a passing vessel on a migration corridor or conservation area to lower the vessel speed and commission a crew member to watch out for migratory biota (Article 59). Specifically mentions migration corridors of turtles, <u>marine mammals</u> (whales, dolphins, dugongs), and several fish species (marine eels, skipjack tuna) (Article 34). Prohibits fixed fishing gear in the migration paths (Article 45). Mandates research on identification of migratory species and their migration patterns, and behaviour of marine mammals and other large biota, development of a migration path monitoring system, and synchronisation of the migration paths with other marine spatial uses.
6	Provincial Regulation of Lampung No.1/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	In determining sea lanes, migration paths of marine biota must be considered (Article 10). The migration paths need to be protected or strictly regulated. Specifically mentions migration corridors of turtles and marine mammals (Article 28). Vessels must lower their speed when passing the migration paths (Article 53). Mandates research on identification of the lane types, migration patterns, and behaviour of marine mammals and other large biota, development of a migration path monitoring system, and synchronisation of the migration paths with other marine spatial uses.
7	Provincial Regulation of East Java No.1/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	In determining sea lanes and conservation areas, migration corridors and migration paths of marine biota must be considered. The migration paths together with spawning and nursery grounds must be protected within the conservation areas (Article 10 clause 3). The migration paths must be synchronised with other marine spatial uses (Article 12 clause 4). The marine biota mentions in this regulation, however, are only turtles and certain fish (pelagic and demersal fish) (Article 47 and 48). No marine mammal species mentioned. Restricts human activities that potentially affect the migratory species. Mandates research on identification of the lane types, migration patterns, and behaviour of marine biota, deployment of special signs for the migration paths, monitoring and evaluation of human activities around the migration paths.
8	Provincial Regulation of West Sumatera No. 2/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	This regulation does not state the migration paths of marine biota in sea-lanes designation. However, this regulation prohibits catching protected marine biota (Article 43, 46, and 60). Since the absence of migration paths within current regulation and zoning plan, research on identification of migration paths of turtles, marine mammals, and certain fish is needed as a basis for future migration path stipulation within future marine spatial planning (Appendix VII of the regulation).
9	Provincial Regulation of South Kalimantan No. 13/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	The migration paths must be synchronised with other marine spatial uses (Article 9). The migration paths include spawning and nursery grounds for endangered species. The marine biota mentioned in this regulation includes turtles, dugongs, whale sharks, freshwater- and marine dolphins (Article 28 and 41). The migration paths must be protected in establishment of an conservation area. Regulates human activities around the migration paths.
10	Provincial Regulation of Maluku No. 1/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	Vessels passing a migration corridor must lower the vessel speed and commission a crew to watch out for migratory biota (Article 41 clause 10). Mandates research on identification of the lane types, migration patterns, and behaviour of turtles, dolphins, dugongs and other <u>marine mammals</u> , development of a migration path monitoring system, and synchronisation of the migration paths with other marine spatial uses.
11	Provincial Regulation of Kalimantan Utara No. 4/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	In determining conservation areas, migration paths, spawning and nursery ground must be considered and protected (Article 28). The migration paths are for protected marine biota (Article 14 clause 6). The migration paths must be synchronised with other marine spatial uses (Article 13 clause 1 and Article 37 clause 2). Specifically mentions the migration paths of cetaceans including dugongs and dolphins (Article 39). Prohibits fixed fishing gears in the migration paths and prohibits the captivity of megafauna including turtles, dugongs, dolphins, and whales (Article 39). Vessels must lower their speed when passing the migration paths (Article 60).
12	Provincial Regulation of Maluku Utara No. 2/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	The migration paths must be synchronised with other marine spatial uses (Article 26 clause 2). The migration paths are for protected marine biota (Article 46 clause 1). The marine biota mentioned in this regulation, however, are only turtles and pelagic fish (Article 26 clause 5). No marine mammal species mentioned. The migration paths must be stipulated both in use zones and conservation areas. Vessels must lower their speed when passing the migration paths (Article 46 clause 2). Mandates research on spatio-temporal monitoring of migratory biota, identification of migratory biota density, and mapping the migration paths of turtles and pelagic fish.
		In determining conservation areas, migration paths must be included and protected. Specifically mentions the migration paths of <u>marine mammals</u> (dolphins, whales), and turtles (Article 32). This regulation prohibits protected marine biota catching (Article 38 clause 2). Regulates a passing vessel on a migration corridor or conservation area to lower the vessel speed and commission a crew to observe migratory biota (Article 49 clause 1).

(continued on next page)

Table 3 (continued)

No	Name of regulations	Main messages with respect to marine mammals
13	Provincial Regulation of Yogyakarta No. 9/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	This regulation does not mention the migration paths of marine biota in sea-lanes designation. However, this regulation requires surveillance and protection of protected biota (Article 7 clause 2). Since the absence of migration paths within this regulation and zoning plan, future research on identification of migration paths of migratory biota is needed (Appendix IV of the regulation).
14	Provincial Regulation of Gorontalo No. 4/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	In determining sea lanes and conservation areas, the migration paths of marine biota must be included. Prohibits the captivity of endangered species (Article 45 clause 3 and Article 46 clause 2) (refers to the CITES term, Article 7 and 8). Prohibits fixed fishing gear in the migration paths (Article 45 clause 3). The migration paths must be synchronised with other marine spatial uses (Article 31 clause 1). Specifically mentions the migration paths of turtles, marine mammals (dolphins, whales, dugongs), and certain fish (marine eels, skipjack tuna) (Article 31 clause 4 and Article 34). Vessels must lower their speed when passing the migration paths (Article 58 clause 8). Mandates research on identification of migratory species and their migration patterns, and behaviour of marine mammals and other large biota, and development of a migration path monitoring system.
15	Provincial Regulation of Central Java No. 13/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	The protected species and their migration paths must be protected (Article 13 clause 2). The protected species mentioned in this regulation, however, are only marine eels and turtles (Article 34). No marine mammal species mentioned. Shipping traffic in the migration paths is allowed with lowered vessel speed or by applying ship routing system (Appendix III of the regulation).
16	Provincial Regulation of SE Sulawesi No. 9/2018 on a zoning plan for the coastal areas and small islands for 2018–2038	The protected species and their migration paths must be protected (Article 7 and 9). Specifically mentions the migration paths of whale sharks, dolphins, and turtles (Article 23 clause 4). In determining conservation areas, migration paths of marine biota must be included (Article 39 clause 3). Vessels must lower their speed when passing the migration paths (Article 45 clause 4). Mandates research on identification of the lane types, migration patterns, and behaviour of marine mammals, turtles, whale sharks, development of surveillance and monitoring system for the migration paths, and synchronisation of the migration paths with other marine spatial uses.

^a Migration corridors: special areas or zones on a map intentionally designed for migration routes of marine biota.

^b Migration paths: lines only indicating the presence of migration routes of marine biota.

established gradually from the 1980s onwards. The DoF was renamed the Ministry of Forestry (MoF) in 2010.

The Department of Marine Exploration was established in 1999, then renamed the Department of Marine Exploration and Fisheries. It once again changed its name to the Department of Marine Affairs and Fisheries in 2000, and got its current name, the Ministry of Marine Affairs and Fisheries (MMAF), in 2009. This change in ministerial nomenclature does not only concern the name but also denotes the process and the consequences for the tasks and responsibilities, thus showing the changing priorities of the government. The conservation of marine biota is managed by the Directorate of Conservation and Marine Biodiversity under the MMAF. Since 1999, marine and fisheries offices of the MMAF have gradually been established in all regencies and provinces to implement the regulations. Since then, conflicts between the MoF and the MMAF began to emerge mainly on authority dualism on aquatic conservation area management. Based on Presidential Decree No. 102/2001, the MMAF claimed that it was responsible for the marine life conservation program, including marine mammals, and for managing marine conservation areas. The MMAF requested the MoF to hand over the management of seven marine national parks, namely: Kepulauan Seribu, Karimun Jawa, Taka Bonerate, Wakatobi, Togean, Bunaken, and Teluk Cendrawasih. The MoF, however, did not agree with this.

In 2014, the MoF was merged with the Ministry of Environment to become the Ministry of Environment and Forestry (MEF). The debated management of seven MNPs were then managed under this ministry; the MEF refused the request from MMAF and argued that their mandate to manage marine conservation areas had never been cancelled. A new Coordinating Ministry of Maritime Affairs and Natural Resources was established in the same year mainly to coordinate ministries' roles, and is expected to resolve those of the MEF and MMAF. According to Law No.1/2014, the management and authority of the seven MNPs should be transferred from MEF to MMAF, but the transfer process has stalled. The overlapping jurisdiction between MMAF and MEF on MNP management is still unresolved up to now, which hampers good management. Since October 2019, the name of the Coordinating Ministry changed again and now is Coordinating Ministry of Maritime Affairs and Investment. The name change suggests a change in priority.

Another overlap among the responsibilities of the MMAF and the MEF with respect to marine conservation issues regards marine pollution management. The MEF aims to preserve the marine environment, including issues of pollution and contamination, but so does the MMAF. The overlaps should be disentangled to be able to improve the efficiency of marine mammal management in Indonesia. Collaboration between two ministries is necessary, as the MEF ministry focuses on pollution (including hazardous materials and plastics) and environmental impact assessments, optimising the MMAF task on marine management.

The Indonesian government also issued Law No. 23/2014 concerning regional government, which together with Law No.1/2014, mandates the provincial government to stipulate a zoning plan for the coastal areas and small islands (RZWP3K) in their areas. A zoning plan aims to protect marine habitats and specific important areas (for instance migratory paths, as well as spawning and feeding areas) for marine life and migratory species such as marine mammals. RZWP3Ks are mainly managed by two provincial offices: the agency for regional development planning (Indonesian: *Badan Perencanaan Pembangunan Daerah*, BAPPEDA Provinsi) and the regional agency for marine affairs and fisheries (Indonesian: *Dinas Kelautan dan Perikanan*, DKP Provinsi) together with other institutions at provincial level.

3.3. Policies

The government policy for marine mammal protection can be extracted from existing regulations and categorized into three principal groups: species-specific policies (three policies), site-specific policies (two policies), and other policies (two policies). In total, there are seven policies (Fig. 5), elaborated as follows.

Table 4

The adherence of the Indonesian regulatory framework to principles mentioned in International conventions with respect to marine mammal governance.

Management principles	Legislation Item ^a
<u>International Convention for the Regulation of Whaling (ICRW) by IWC^b</u>	
- Almost all whale species are <u>protected</u> from <u>commercial killing</u> purposes	3,4,5,11,12,16
- <u>Regulates</u> any kind of (<u>human</u>) <u>activities</u> that may threaten the whale species and its stocks	9,13,20,23,24,27,28
- Encourages development of <u>sanctuary areas</u> where whaling activities are strictly prohibited	7- 10,14–16,18,19,21,22,25
- Manages whaling activities, including setting a moratorium on commercial whaling, catch limits for <u>aboriginal subsistence whaling</u> , and managing scientific whaling	N/A
<u>Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)</u>	
- Strict regulation of global <u>trafficking</u> of all threatened and endangered species	1-5,11,12,16
<u>Convention on the Conservation of Migratory Species of Wild Animals (CMS)^c</u>	
- <u>Prohibits</u> taking, hunting, fishing, capturing, harassing, or deliberate killing of migratory species	1-5,11,12,16
- Immediately <u>protects</u> the migratory species of its Appendix I	7- 10,14–16,18,19,21,22,25
- <u>Conserves, restores and ensures sustainable use</u> of migratory animals and their <u>habitats</u>	9,13,20,23,24,27,28
- Controls <u>adverse factors</u> for migratory species	27
- <u>Study on identification</u> of migratory species, their range and migration routes	6,9,25
- Creates an <u>international cooperation</u> towards the conservation of migratory species	
<u>United Nations Convention on the Law of the Sea (UNCLOS)</u>	
- Stresses the importance of and encourages <u>international cooperation</u> for living resources	6,9,25
- As highly migratory species, marine mammals are a <u>conservation target</u>	1-5,11,12,16
<u>Convention on Biological Diversity (CBD) of the United Nations</u>	
- <u>Recognises</u> the <u>traditional dependence</u> of humans on biological resources	7,9,14
- Manages the <u>traditional use of biological resources</u> sustainably	7,9,10,12,15,16
- Establishes a system of <u>protected area-like</u> regions to conserve biological diversity	7- 10,14–16,18,19,21,22,25
- <u>Controls risks</u> associated with the use of biological diversity	9,13,20,23,24,27,28
- Incorporates considerations of biodiversity conservation within <u>national policy-making</u>	All
- Encourages <u>cooperation among parties</u> in all activities regarding biological resources	6,9,25
- Develops <u>action plans</u> for implementing CBD in terms of marine and coastal biodiversity through integrated coastal area management and marine protected areas (Jakarta Mandate)	9,27

^a See the number of regulation in Table 2.

^b Indonesia is not a member of the International Whaling Commission (IWC).

^c Indonesia is not a full member of CMS, only as an Agreement-MoU Signatory for marine turtles.

3.3.1. Designation of marine mammals as protected animals

The Indonesian government started to apply policy for marine mammal protection by direct stipulation of endangered and vulnerable species as protected biota through enactment of several regulations. Its origin goes back to 1972 when the dugong was assigned the status of a protected wild animal. Freshwater- and marine dolphins were also declared as protected biota in 1975, followed by several whale species in 1978.

A large number of marine mammal species became protected after the Indonesian government ratified CITES in 1978. Protected species, including all marine mammals which occur in Indonesian waters, are listed in Appendix I and Appendix II of the convention. All whales that were later found in Indonesian waters are also listed as protected wild animals in the addendum in 1980. The protected animal averment occurred in 2007, when Government Regulation No.60/2007 was issued. The regulation protects fish as referred to in the CITES Appendices, and these include all marine mammals which occur in Indonesia. So in total 35 marine mammal species are protected, 12 species referred to the Appendix I and 23 species in the Appendix II.

3.3.2. Ensuring the sustainable use of marine mammal to maintain biological diversity

Indonesia ratified the United Nations Convention on the Law of the Sea (UNCLOS) of 1982 through enactment of Law No.17/1985 originally to strengthen its position as an archipelago state. However, since the convention was fully ratified, all contents of the convention became a legal basis for Indonesia, including the sustainable use of biodiversity. It mentions that as a ratifying state, Indonesia has the sovereign right to explore, exploit, and manage biodiversity in its territorial sea, exclusive economic zone, and high seas. The law also explicitly stresses the importance of marine mammal conservation. Therefore the right to exploit their biodiversity can only be done in a sustainable manner.

Sustainable use of biodiversity is regulated in Law No.5/1990. Marine mammal utilization is included within this regulation, since it regulates the sustainable use of biological natural resources and their ecosystems. The uses of the species that are forbidden by this law include those explained below (*in the italic subsection*). Fines and penalties are set for violating this law.

The most comprehensive regulation on conservation and sustainable use of biological diversity is Law No.5/1994 on Ratification of the CBD. Indonesia ratified the CBD, because it would recognise traditional whale hunting in Indonesia. As a CBD member, Indonesia should manage whale hunting sustainably. The CBD also suggests that country members control risks for biodiversity associated with its use.

The ban or strict regulation on marine mammal hunting, killing, or trafficking

Strict regulation on commercial trading on endangered species was set by the Indonesian government when the Presidential Decree No.43/1978 on Ratification of CITES was enacted. As all marine mammal species which occur in Indonesian waters are listed in the CITES Appendices I and II, they became subject of this regulation.

Two derivative regulations of Law No.5/1990 underlined the direction towards a ban on the hunting, killing, or trafficking of protected species. The first regulation is Government Regulation No.7/1999 that prohibits the killing and trading of protected animals, including all marine mammals in Indonesia. The second one is Government Regulation No.8/1999 that applied strict regulation for protected wildlife from being captured, hunted, traded, exchanged or raised for pleasure.

Under Government Regulation No. 60/2007, marine mammals are considered as 'fish'. The regulation divided fish into protected and unprotected fish. Since protected fish mentioned in this regulation refer to CITES Appendices species, all marine mammals occurring in Indonesia belong to protected 'fish'. Strict regulations are applied in utilization of fish resources, including those for trading, aquaria, and exchange.

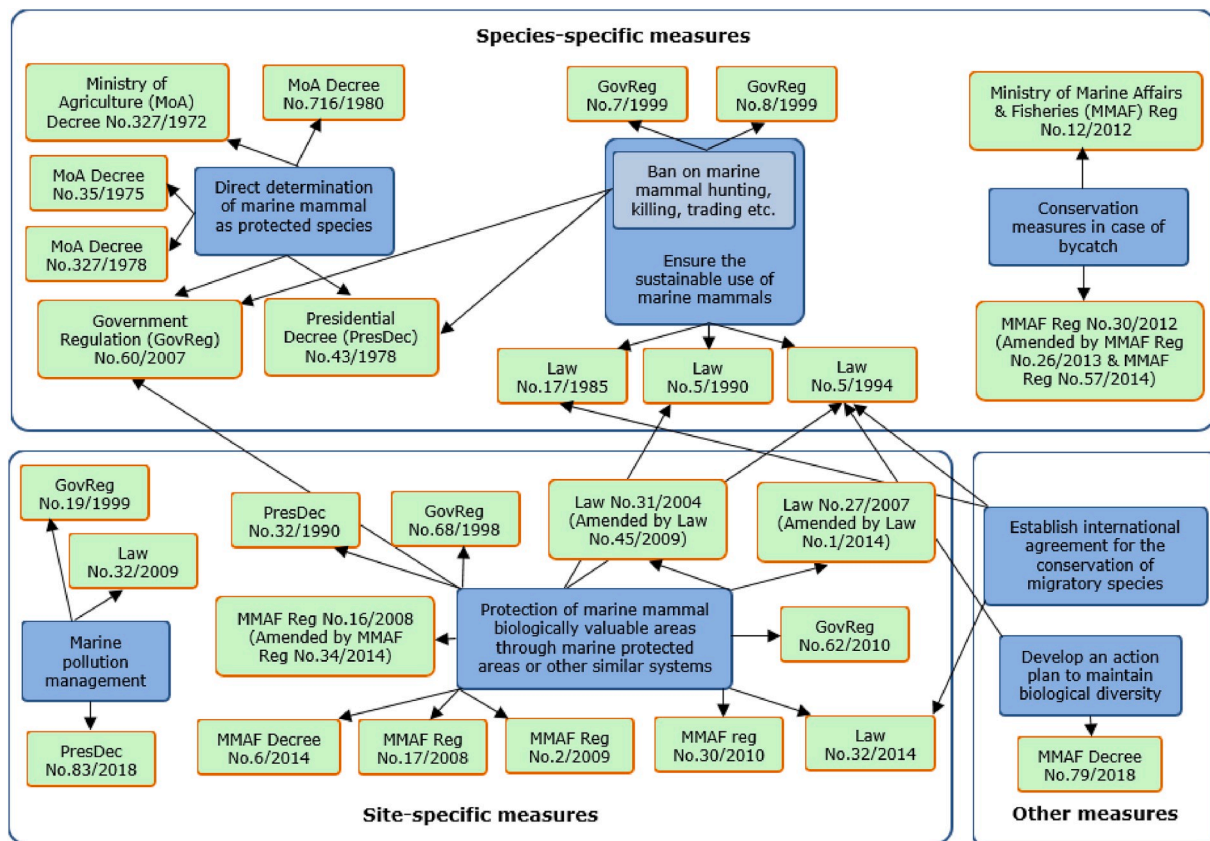


Fig. 2. Policy mapping: the interrelation among Indonesian regulations included in this work. Three categories of measures within the regulations are distinguished: species-specific measures, site-specific measures, and other legal options for protecting marine mammals. The content of each regulation is summarized in Table 2.

3.3.3. Conservation measures for marine mammal bycatch

Marine mammals easily get entangled in fishing nets. Therefore, the Indonesia government, through the MMAF, has set two regulations to minimize marine mammal bycatch. The first regulation is MMAF Regulation No. 12/2012 on Open seas fisheries. The second regulation is MMAF Regulation No. 30/2012 on Capture fisheries in fishing territory of Indonesia, that has since been amended twice through MMAF Regulation No. 26/2013 and MMAF Regulation No. 57/2014. Both regulations demand any fishing vessel that make unintentional bycatch of marine mammals in tuna or other pelagic fishing has to release the animals alive. The mammalian bycatch should also be reported to the port authority for documentation purposes.

3.3.4. Protection of areas of high value to marine mammals

This is the most important policy for marine mammal protection management in Indonesia. A large number of regulations fall in this policy category. Although all these regulations don't explicitly state the protection of marine mammals, it highlights the importance of migration corridors and habitat protection during establishment of marine conservation areas, hence offering protection to marine mammals.

As a response to contemporary issues on site-specific management for biodiversity in the early 1990s, the Indonesian government enacted Presidential Decree No.32/1990 that asserts the necessity of the establishment of protected areas. Implementation of conservation of marine and coastal biological diversity through marine protected areas or other protected area-like systems was mentioned in Law No.5/1994. Law No.5/1990 and its derivative regulation, Government Regulation No.68/1998, already stated the important of in-situ conservation of biodiversity through establishment of nature reserves and nature protected areas.

Two regulations were issued by the government to support the fishery resources management led by the MMAF: Law No. 31/2004

(later amended by Law No. 45/2009) and Government Regulation No. 60/2007. Under these regulations, marine mammals are grouped as 'fish', which contradicts the scientific definition and the definition used by the MEF (e.g. Government Regulation No. 7/1999). As a derivative regulation of Law 31/2004, Government Regulation No. 60/2007 categorized four forms of aquatic² conservation areas: aquatic national park, aquatic tourism park, aquatic nature reserve, and fishery sanctuary. Stipulation of aquatic conservation areas have to take ecological aspects into account including migration corridors of marine biota.

Law No. 27/2007, later amended by Law No. 1/2014, stands out in coastal and small island conservation by protecting migration corridors and habitats of marine biota in developing a zoning plan for the coastal areas and small islands (RZWP3K). Its derivative regulation, MMAF Regulation No. 16/2008 (later amended by MMAF Regulation No. 34/2014) mentions that marine biota migration pathways are one of the sea lanes that should be included in RZWP3K.

Through MMAF Regulation No. 17/2008, four types of coastal and small island conservation areas are defined: coastal sanctuary, small islands sanctuary, coastal park, and small island park. The core zone must be defined in the design of each area, and include a migratory corridor for marine biota. Two other regulations, MMAF Regulation No. 2/2009 and MMAF Regulation No. 30/2010, also emphasize the importance of migratory corridors in the stipulation of aquatic conservation areas.

The marine conservation areas also need to be established in other types of seas, including small outlying island waters and high seas.

² Three different terms are used in this study: aquatic conservation area, marine conservation area, and marine protected area (MPA). 'Aquatic' includes freshwater and marine, but here mainly refers to marine. MPA is an umbrella term, under which all conservation areas fall.

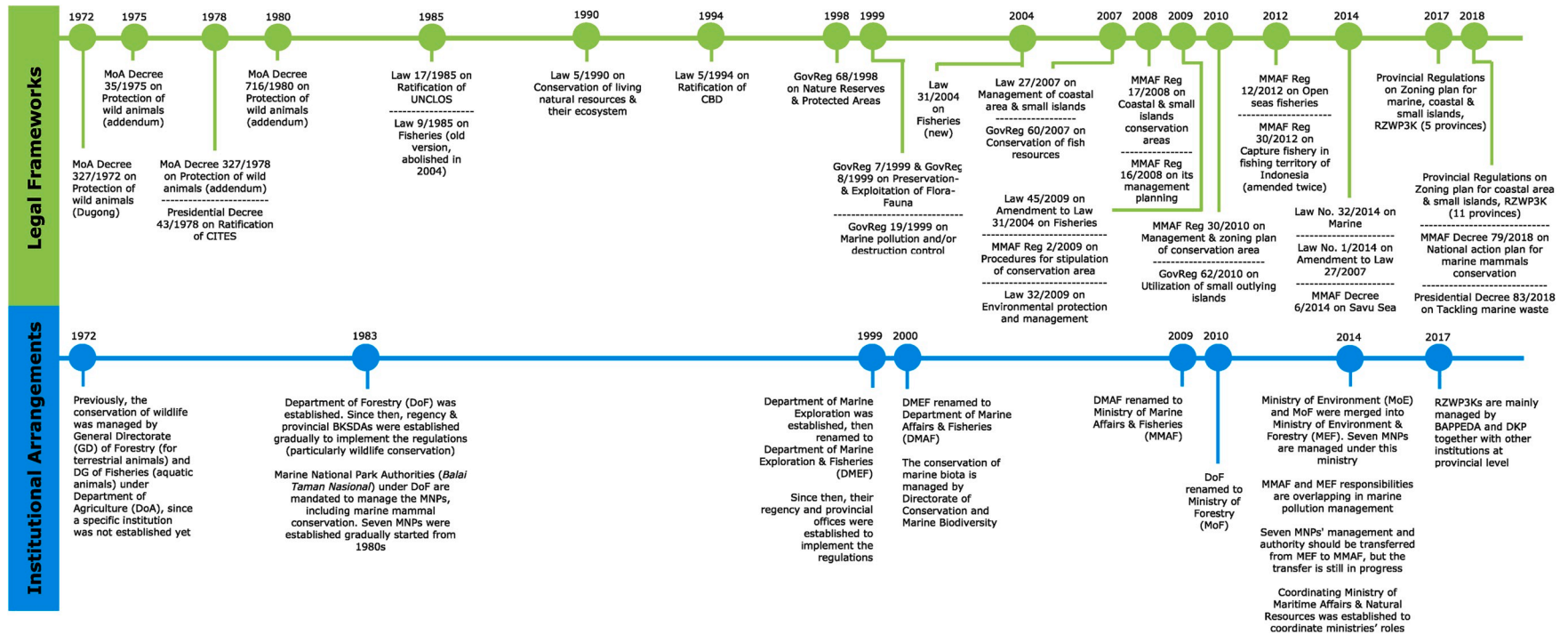


Fig. 3. Timeline of instalment of legal frameworks and institutional arrangements regarding marine mammal governance in Indonesia. MoA, Minister of Agriculture; GovReg, Government Regulation; RZWP3K, *Rencana Zonasi Wilayah Pesisir dan Pulau-Pulau Kecil* (A zoning plan for the coastal areas & small islands); BKSDA, *Balai Konservasi Sumber Daya Alam* (Agency for natural resources conservation); BAPPEDA, *Badan Perencanaan Pembangunan Daerah* (Agency for regional development planning), DKP, *Dinas Kelautan dan Perikanan* (Office for marine affairs and fisheries).

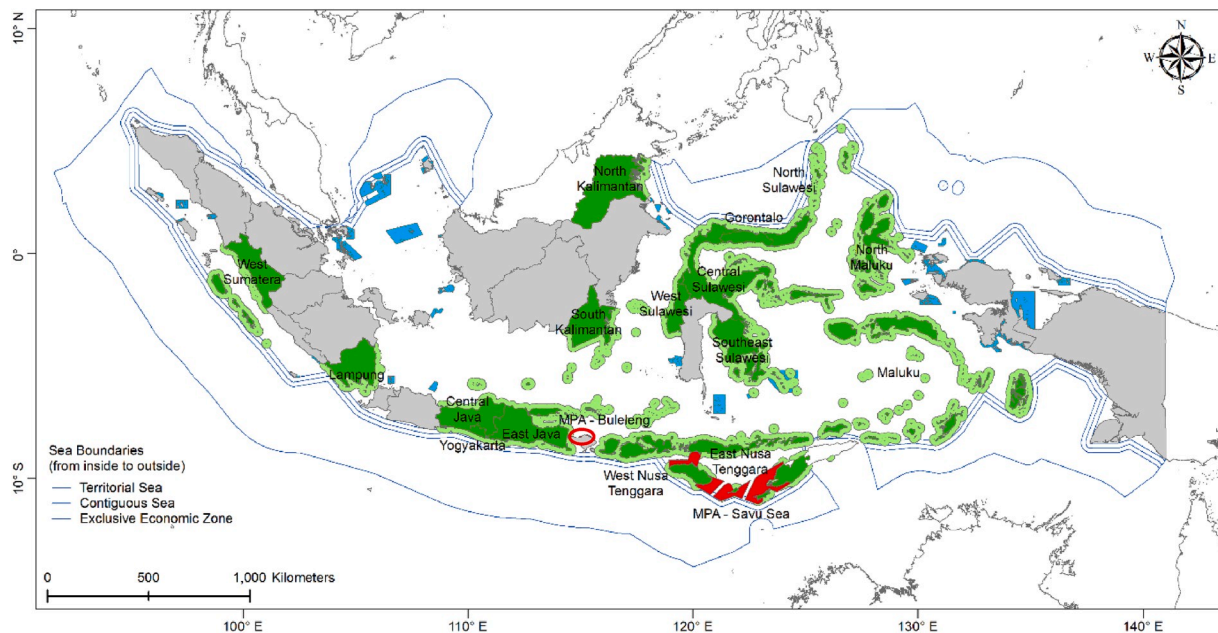


Fig. 4. Spatial gaps in jurisdiction: Until 2018, among 34 provinces (grey) in Indonesia, 16 provinces (green) already have their own marine spatial planning (RZWP3K, light green) that provide different benefits for marine mammals (see Table 3). Of 177 MPAs (blue), only two MPAs (red) are specifically designed for marine mammals. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Government Regulation No.62/2010 is the base for assigning outlying islands as conservation areas, while Law No. 32/2014 mandates the government to protect the marine environment and migratory species through marine conservation in high seas.

To date, more than 20 million hectares of marine conservation areas or MPAs have been established by the Indonesian government [21]. This achievement is the fulfilment of the government commitment as declared during COP-CBD in Brazil in 2006 to establish and manage 10 million hectares of MPAs by 2010, that then was readjusted to be 20 million hectares by 2020 during the World Ocean Conference 2009 [9]. Among 177 MPAs in Indonesia [21], only two MPAs are intentionally designed for marine mammals, namely Buleleng and Savu Sea (Fig. 4). MMAF Decree No.6/2014 is a legal basis for the management plan and zoning of Savu Sea Marine National Park that manages marine mammal populations through regulation of fishing practices, shipping and mining activities. Migration seasons and corridors are also considered.

3.3.5. Marine pollution management

To control marine pollution and contamination, Government Regulation No. 19/1999 has been set up to regulate activities that cause marine pollution and destruction. Law No.32/2009 on Environmental Protection and Management (replacing the old version, Law No.23/1997) contributes to marine mammal management by protecting natural habitats and regulating pollution that can negatively impact the marine ecosystem.

Recently, marine pollution with waste plastics has become a major threat for marine biota, including marine mammals. To resolve the marine waste problem, particularly related to plastics, Presidential Decree No. 83/2018 has been issued. This document describes the detailed strategy, program, activities, and institutions that are responsible for reducing marine waste, including plastics, for the period 2018–2025. Noise pollution resulted from e.g. seismic activities in ocean, however, is not mentioned in any Indonesian regulation.

3.3.6. Establishment of regional/international agreements for the conservation of migratory species

Important for successful management of marine migratory species is regional and international agreement and cooperation. This is

stimulated in the national legal framework and there are three regulations that underline this. Law No.17/1985 on Ratification of UNCLOS encourages international cooperation for marine mammal conservation for all ratifying countries. Collaboration among states in all activities regarding biological resources is also mentioned as being important in Law No.5/1994 on Ratification of the CBD. Lastly, the enactment of Law No. 32/2014 also benefits marine mammal management and promotes international cooperation in the field of marine resource conservation and management.

3.3.7. Develop an action plan to maintain biological diversity

The opportunity to develop a specific action plan to protect biodiversity is included at a national level policy through enactment of Law No.5/1994 that ratified the CBD. The CBD followed up with the Jakarta Mandate [22], which suggests developing action plans intended to implement the CBD principles on protection of marine and coastal biodiversity through integrated coastal area management and marine protected areas.

A purposeful action plan to conserve marine mammals has recently been launched by the Indonesian government through enactment of MMAF Decree No.79/2018 on a National Action Plan for marine mammal conservation for the period of 2018–2022. The marine mammals mentioned in this decree are dugongs, whales and dolphins. This action plan is a comprehensive, structured, and detailed guidance that includes all aspects needed for conserving marine mammals, including a comprehensive strategy and implementation and enforcement mechanisms. The action plan highlights seven main points for cetacean conservation i.e. (i) research on ecological and socio-economic-cultural aspects of cetaceans, (ii) building of a cetacean database and information system, (iii) reduction of the mortality rates from fishing and ship strikes, (iv) identification and protection of critical cetacean habitat (e.g. migration corridors) as conservation areas, (v) regulation and modelling the potential economic value of cetaceans, (vi) capacity building and strategic partnership for registration of cetacean stranding, and (vii) regulation of the negative effects of noise and coastal development on cetaceans.

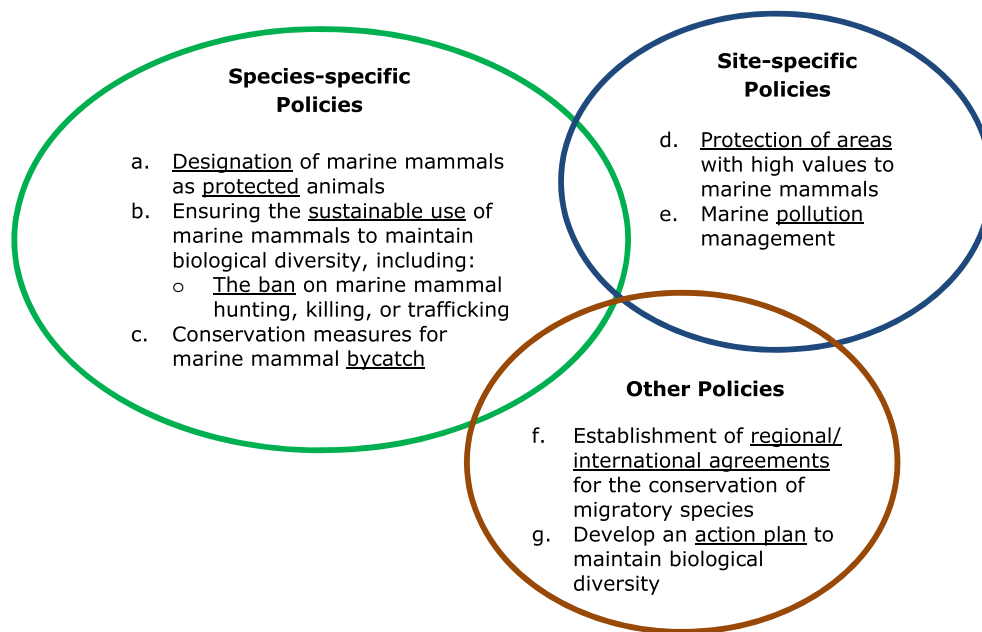


Fig. 5. Policies for marine mammal governance and protection condensed from the existing national legal framework.

4. Discussion

Strong regulatory capacity is required in performing environmental governance in general [23], as well as in effective management of marine mammal biodiversity. Within the current Indonesian legislative framework, several items of legislation already are in place as important cornerstones for marine mammal protection and management. The extensive marine mammal protection approach covers two aspects. Firstly, a species-centred management approach designating marine mammals as protected biota including measures for strictly sustainable use of these species and development of action plans for marine mammal management. Secondly, wider marine management, including marine protected areas, measures to tackle bycatch, and significant international cooperation. Although the legal basis currently exists for marine mammal protection in Indonesia, the practical actions derived from these regulations are still unclear. Implementation and consequent enforcement of the regulations are also still underdeveloped.

Until now, more than 20 million hectares of marine conservation areas or MPAs have been established by the Indonesian government. However, among these 177 MPAs, only two MPAs have been formally designated for marine mammals, i.e. Buleleng [24] and Savu Sea Marine National Park [11]. This demonstrates the urgency for increased real protection of areas for marine mammals. Site-based conservation such as via MPAs can be effective in addressing threats to marine mammals from e.g. fisheries or tourism. It is, however, difficult to design an MPA of a large enough functional scale or a smart network of smaller MPAs [17]. MPA alone is not always sufficient to guarantee protection for the marine mammal species because of range expansion of the animals [25] or inadequate management [26]. The zoning systems set within an MPA are not always intentionally dedicated for marine mammal protection.

To reduce fisheries impact on marine mammals, Indonesian regulations demand fishing vessels operating in Indonesian waters take proper conservation measures to reduce the number and effect of bycatch of marine mammals. A recent study showed that marine mammals are mostly acquired alive in Indonesian tuna longline fisheries bycatch and the hook rate for dolphin and whale bycatch was relatively low, around 0.002 per thousand hooks [27], although other scientists predicted much higher numbers [28]. Still, in the Mahakam River, Kalimantan, bycatch appears to be the major human cause of dolphin mortality, since use of bycatch-sensitive fishing gear is highly prevalent (85%) [29].

Marine waste, especially lost fishing gear, is a major threat to marine species, including marine mammals [30–33]. Marine plastics are often found in the stomachs of marine animals including cetaceans [30,34]. The government of Indonesia recognises this threat and intended to reduce it by enacting regulations focusing on marine pollution management (Government Regulation No. 19/1999 and Law No.32/2009). The effect, unfortunately, is still limited and given the extent of the problem in Indonesia, Presidential Decree No. 83/2018 has been issued to accelerate the implementation and enforcement of a marine waste reduction program. This program is followed by many local governments, to name a few: Bali province [35], Padang city in Sumatera [36], and Samarinda city in Kalimantan [37]. These local regulations for instance in Bali, however, were questioned by some plastic industries and they pushed the government to cancel the regulation [38]. However, there was also civic movement to retain the regulation [39] and the demand has been approved by the government. Other type of pollution that negatively affects marine mammal life is underwater noise resulted from e.g. seismic activities [40,41] during offshore mining, oil and gas exploration. However, until now there is no dedicated regulation in Indonesia to regulate this issue.

The growing human population puts increased pressure on natural resources and coastal marine waters which as a consequence are becoming increasingly degraded. Unregulated anthropogenic modifications and environmental degradation cause dramatic declines in habitat quality and food availability for these marine biota [42] which is aggravated by domestic and foreign (over)fishing. Although the Indonesian government has also set regulations governing foreign fishing activities, there is still illegal, unregulated and unreported (IUU) fishing going on [43]. The effects of these activities for marine mammal protection are still unknown.

So far, Indonesia has not yet introduced codes of practice for whale and dolphin watching. The codes of practice should regulate the minimum approach distance to the animals, the maximum number of boats around the cetaceans, the maximum time allowed around the animals, and the speed and angle of approaching the animals. Such guidelines are urgently needed to support sustainability of marine mammal watching tourism [44]. The improvement of regulation on qualification standards of ex-situ conservation for marine mammals (such as aquaria) is also needed. Both should be part of specific action plan within the current legal framework for marine mammal protection management.

Some regulations that are counter-productive to marine mammal conservation are identified. For instance, according to the Fisheries Law 31/2004 (Amended by Law 45/2009), marine mammals are considered 'fish' (Article 1 clause 4, and Explanation section of Article 7 clause 5). Labelling marine mammals as 'fish' may lead to the misconception that those species are available for harvesting. However Government Regulation No. 7/1999 clearly states in its appendix that all marine mammals are protected species, and thus should not be caught, killed or traded. Article 7 clause 1 of the Law 31/2004 also mentions that in order to support the fishery resources management policy, protected fish species and aquatic conservation areas need to be stipulated. Since marine mammals are considered as fish, the fishery conservation and stipulation of aquatic conservation areas would on the other hand benefit marine mammals as well.

The Indonesian government shows a high commitment for marine biota protection and marine management in general. The government, hitherto, is open to global initiatives by adopting relevant international conventions into its national legal framework. Among five global conventions, three have been fully ratified by Indonesia to fill the gaps in its national legal framework. The examination of the current legal framework shows that the national management approach mostly reflects the required principles agreed in the international conventions. Only the ICRW is not ratified by Indonesia because in the past it was believed that this would pose problems for the traditional hunting still practiced by Lamalera locals in the Savu Sea. However, the traditional whaling conducted at Lamalera would probably fit within the definition of 'aboriginal subsistence whaling' as permitted and managed by the IWC, a matter that deserves to be fully explored. The Indonesian government has no formal written position with respect to traditional whale hunting which is a deficiency of the current legal framework that needs to be repaired by providing dedicated regulation to address this problem. However, several national regulations acknowledge and respect the rights of traditional communalities e.g. on environmental protection and management (Law No. 23/2014 on Local Government, Article 15 clause 1 and Appendix I.K) and capture fisheries management (Law No. 45/2009 on Fisheries, Article 6 clause 2). The uncertainty about the sustainability of this hunting, however, is still questioned and possibly leads to international concerns. In another whaling village nearby Lamalera, i. e. the village of Lamakera in Solor Island (west of Lembata Island where Lamalera is located) whaling is also rooted in tradition [43]. Its practice, however, has shifted from subsistence to commercial whaling. Such shifting from small scale subsistence to larger scale commercial whaling with much greater potential impact on whale populations, requires differentiated conservation management.

The whaling prohibition in the Savu Sea would introduce problems for the traditional whale hunters, including eroding their food security [43]. For Lamalera people, whale hunting is an integral part of their socio-cultural system. The prohibition of whale hunting would bring about serious socio-cultural consequences to the community not only internally but also in relation to neighbouring communities which the Lamalera people barter their whale meat with other commodities. The Indonesian government needs to conduct a comprehensive study of the marine mammal populations in the Savu Sea, and the sustainability of the traditional whaling practices.

Joining the IWC would provide more benefits for Indonesia since IWC can support the assessment of traditional whale hunting sustainability and other benefits beyond whaling, including management of whale watching, ship strikes, marine noise, chemical pollution, marine debris, cetacean conservation, and climate change issues [20]. International as well as regional cooperation is needed to strengthen the marine mammal protection effort. The framework of multilateral environmental agreements such as CBD and CMS, as well as a potential agreement through UNCLOS is very promising. Indonesia is a full member of the CBD and UNCLOS, but signed the MoU of the CMS only for sea turtles. Although dugong and cetaceans widely occur in Indonesian water, Indonesia did not sign the CMS MoU for these migratory species. It

would be strategic for Indonesia to become a full member of the CMS, as the CMS can assist Indonesia in management of and research into marine mammals. Joining the CMS would facilitate regional collaboration with Australia and other countries that have been conducting extensive studies on marine mammals, including the species targeted by whale hunters [43].

Although regional collaborations that can strengthen research on marine mammals in Southeast Asia and adjacent regions have existed for more than a decade, those initiatives are not yet optimized. Indonesia has been actively involved in the establishment and management of the Coral Triangle Initiative (CTI) along with Malaysia, the Philippines, Timor Leste, Papua New Guinea and Solomon Islands. The CTI aims to, among others, improve the status of threatened species, including marine mammals [45]. However, there is insufficient evidence to date that the CTI has dedicated optimum efforts in addressing issues related to marine mammals. Another regional initiative worth mentioning is ASEAN (The Association of Southeast Asian Nations). More than a decade ago, the Southeast Asian Fisheries Development Centre (SEAFDEC) has reviewed cetacean studies in SE Asian Waters [46]. In early 2019, the ASEAN Science, Technology and Innovation Fund (ASTIF) provided some funding to conduct a workshop in Malaysia to assess the conservation of marine mammals and other endangered marine organisms. This workshop suggested the creation of a marine mammal (or marine megafauna) working group within ASEAN to address issues related to these taxa.

An important additional aspect of marine mammal protection was issued by the Indonesian government by designating a marine mammal migration corridor or path as a lane in a provincial marine spatial planning (RZWP3K) establishment [10]. It is, however, not yet clear how to determine the lane correctly in the zoning plan. Our review of 16 provincial regulations regarding the RZWP3K shows that 14 provide migration corridors or migration paths for marine biota of which 12 specifically mention marine mammal species. There are some additional aspects mentioned in each regulation such as regulate vessel speed when passing the migration paths, regulate type of fishing gears or restrict human activities in the migration paths, and synchronise the migration paths with other marine spatial uses (Table 3). This was the case where national general guidance on incorporation of migratory paths in an MSP was implemented. Support from the national level government including a clear standard on how to incorporate these aspects into the provincial zoning planning development is needed to optimise its implementation.

The recent national action plan for marine mammal conservation that has been issued by the Indonesian government [12] is very comprehensive, structured, and detailed, and provides a general strategy as well as a step by step implementation mechanism to conserve dugongs, whales and dolphins in Indonesia. The main aspects include research capacity building, database development, anthropogenic threat reduction on marine mammals, stranding network corroboration, and marine mammal conservation integration into marine spatial planning. The action plan also mentioned the importance of networking and management of marine mammal stranding [28,47]. Such a network has already been established by volunteers; the network has contributed to resolving many stranding events in Indonesia since 2002. Recently, the DG of Marine Spatial Management of the MMAF is assigned responsibility for coordinating marine mammal stranding events, however, the legal basis for the stranding network involving communities is not available. The role of this voluntary network in doing so is relevant to what Ref. [48] reported that community-based organizations play critical assisting roles in a governance system, even if they have not been stipulated public roles in an official way.

The implementation of such regulation is unfortunately still constrained by institutional arrangements that are characterised by a lack of sufficient sectoral coordination, resulting in uncertainty and inconsistency in law enforcement, authority dualism as well as institutional conflicts. The jurisdictional overlaps and unclear mandates in current

wildlife conservation and broader marine protected area management between MEF and MMAF still is unresolved. The MMAF claims that its duties and responsibilities pertain to the marine life conservation program and marine conservation area management. Therefore the MMAF requested that the MEF hand over the management of seven marine national parks. Conversely, the MEF refuses the request from MMAF and argues that their mandate to manage marine conservation areas had not been abolished [15]. A successful marine mammal protection requires effective coordination and full cooperation of all involved government agencies in marine life and marine conservation area management as well as national-provincial levels [49,50]. Such an effort to resolve the overlap in mandates could be led by the Coordinating Ministry of Maritime Affairs and Investment, since its main task is to coordinate the ministries' roles. Another responsibility overlap between the MMAF and the MEF regards marine pollution management could be solved by encouraging a collaboration between both ministries to optimise marine management. The presence of different institutions working on the same domain is pivotal in natural resource governance [51].

This paper does not analyse the effectiveness of the existing provisions due to limited data availability. For example, no information is available on how many prosecutions have been made from violating any of the provisions or the degree of cetacean population declines or recoveries or the impact of the threats on cetacean populations (e.g. degree of bycatch), as well as the extend of enforcement of the regulations. Such data need to be gathered in the future to be able to assess the effectiveness of the provisions. Examining the systems' effectiveness is outside of the scope of the current study, and we strongly support that this should be addressed in the near future. The problems with cetacean conservation are not only the legal gaps but also the discrepancy between the formal legal construction and the reality of enforcement on the ground. This is, one among many factors, because the legal formal construction is driven more by biological-ecological and legal considerations than by human dimension considerations (e.g., community perspective, interests and participation that are often neglected).

5. Conclusions and recommended steps

The current Indonesian legislation provides a good legal basis to protect and manage its marine mammals. However, the practical actions derived from the regulations as well as problems with implementation and enforcement of the regulations are not yet well enough developed to provide true protection of the animals in their natural habitats.

Considering the lack of information on the sustainability of Indonesian whale hunting, which is considered important to the local people, it is urgent to provide the science that can underpin the sustainability of traditional whale hunting and resolve the complex IWC-related issue. Continuing research on occurrence and population status, migration corridors, critical habitats of marine mammals as well as anthropogenic threats in Indonesia is also needed. Research on the socio-cultural importance of such traditions is important, because governance should be based on biological and ecological factors and also socio-cultural considerations.

Becoming a full member of the CMS and the IWC will further strengthen the conservation management of marine mammals in Indonesia, a country that is widely known as a range state of the migratory species and still practices subsistence whale hunting. Joining the CMS would facilitate regional collaborations on marine mammal research. The IWC can support the assessment of the traditional whaling sustainability and other benefits beyond whaling (e.g. best practices in cetacean watching tourism and bycatch reduction).

Our review has revealed some urgent-yet-lacking policies in the current legal framework for marine mammal protection effort in Indonesia, such as regulations intended to govern traditional whale hunting that takes socio-cultural issues into account, the introduction of a code of conduct for marine mammal watching tourism, standards for aquaria, and the legal basis for marine mammal stranding network as

well as for regulating underwater noise pollution. Establishing a mechanism for cross-institutional coordination is also needed to resolve lacking and/or overlapping jurisdiction among institutions and levels of governance. An adequate and appropriate legal framework and sufficient institutional arrangements and enforcement at the appropriate governance levels will ameliorate and strengthen marine mammal governance and protection in Indonesia.

Conflicts of interest

The authors declare no conflict of interest regarding the results presented in this paper.

Acknowledgements

This work was financially supported by Indonesia Endowment Fund for Education (LPDP) Scholarship from Ministry of Finance of The Republic of Indonesia for the first author [contract number: PRJ-482/LPDP.3/2017]. The authors would like to thank Yitno Suprpto for the preliminary study, Abigail Muscat for proof reading and the anonymous reviewers who helped to improve the quality of this manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.marpol.2020.103893>.

References

- [1] International Union for Conservation of Nature (IUCN), The IUCN Red List of Threatened Species, 2019. <https://www.iucnredlist.org/>. (Accessed 17 May 2019).
- [2] C.R. Weir, G.J. Pierce, A review of the human activities impacting cetaceans in the eastern tropical Atlantic, *Mamm Rev.* 43 (2012) 258–274, <https://doi.org/10.1111/j.1365-2907.2012.00222.x>.
- [3] A.J. Read, The looming crisis: interactions between marine mammals and fisheries, *J. Mammal.* 89 (2008) 541–548, <https://doi.org/10.1644/07-mamm-s-315r1.1>.
- [4] M.G. Pennino, A. Arcangeli, V.P. Fonseca, I. Campana, G.J. Pierce, A. Rotta, J. M. Bellido, A spatially explicit risk assessment approach: cetaceans and marine traffic in the Pelagos Sanctuary (Mediterranean Sea), *PLoS One* 12 (2017) 1–15, <https://doi.org/10.1371/journal.pone.0179686>.
- [5] C. Erbe, S.A. Marley, R.P. Schoeman, J.N. Smith, L.E. Trigg, C.B. Embling, The effects of ship noise on marine mammals—a review, *Front. Mar. Sci.* 6 (2019) 1–21. <https://www.frontiersin.org/article/10.3389/fmars.2019.00606>.
- [6] S. Tanabe, Contamination and toxic effects of persistent endocrine disruptors in marine mammals and birds, *Mar. Pollut. Bull.* 45 (2002) 69–77, [https://doi.org/10.1016/S0025-326X\(02\)00175-3](https://doi.org/10.1016/S0025-326X(02)00175-3).
- [7] S.K. Hooker, L.R. Gerber, Marine reserves as a tool for ecosystem-based management: the potential importance of megafauna, *Bioscience* 54 (2004) 27–39, [https://doi.org/10.1641/0006-3568\(2004\)054\[0027:MRAATF\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2004)054[0027:MRAATF]2.0.CO;2).
- [8] F. Sergio, T. Caro, D. Brown, B. Clucas, J. Hunter, J. Ketchum, K. McHugh, F. Hiraldo, Top predators as conservation tools: ecological rationale, assumptions, and efficacy, *Annu. Rev. Ecol. Syst.* 39 (2008) 1–19, <https://doi.org/10.1146/annurev.ecolsys.39.110707.173545>.
- [9] Ministry of Marine Affairs and Fisheries, Establishing Target 20 Million ha of MPA, MMAF Launches E-KKP3K Award Program (E-MPA Awards), 2013. <http://kkji.kp3k.kkp.go.id/index.php/en/beritabarur/156-establishing-target-20-million-ha-of-mpa-mmfa-launches-e-kkp3k-award-program-e-mpa-awards>. (Accessed 17 October 2018).
- [10] Ministry of Marine Affairs and Fisheries, Ministerial Decree No.16/2008 Concerning Planning for Management of Coastal Areas and Small Islands, MMAF, Jakarta, 2008.
- [11] P.L.K. Mustika, D. Sadili, A. Sunuddin, D. Krebs, Sarmintohadi, I. Ramli, D. Suprapti, J. Ratha, E. Lazuardi, H. Rasdiana, Y. Mastro, R.P. Sari, S. Annisa, N. Terry, M.M.P. Monintja, Rencana Aksi Nasional Konservasi Cetacea Indonesia Periode I: 2016-2020, MMAF, Jakarta, 2015.
- [12] Ministry of Marine Affairs and Fisheries, Ministerial Decree No.79/2018 Concerning National Action Plan for Marine Mammals Conservation 2018-2022, MMAF, Jakarta, 2018.
- [13] N.J. Bennett, L. Teh, Y. Ota, P. Christie, A. Ayers, J.C. Day, P. Franks, D. Gill, R. L. Gruby, J.N. Kittinger, J.Z. Koehn, N. Lewis, J. Parks, M. Vierros, T.S. Whitty, A. Wilhelm, K. Wright, J.A. Aburto, E.M. Finkbeiner, C.F. Gaymer, H. Govan, N. Gray, R.M. Jarvis, M. Kaplan-Hallam, T. Satterfield, An appeal for a code of conduct for marine conservation, *Mar. Pol.* 81 (2017) 411–418, <https://doi.org/10.1016/J.MARPOL.2017.03.035>.
- [14] J. Gysen, K. Bachus, H. Bruyninckx, Evaluating the effectiveness of environmental policy: an analysis of conceptual and methodological issues, in: *European Evaluation Society Seville Conference, 2002. Seville, Spain*.

- [15] Dirhamsyah, Setbacks in the development of marine protected areas in Indonesia, *Aust. J. Marit. Ocean Aff.* 8 (2016) 87–100, <https://doi.org/10.1080/18366503.2016.1187781>.
- [16] T. Trop, An overview of the management policy for marine sand mining in Israeli Mediterranean shallow waters, *Ocean Coast Manag.* 146 (2017) 77–88, <https://doi.org/10.1016/j.ocecoaman.2017.06.013>.
- [17] G.N. di Sciarra, E. Hoyt, R. Reeves, J. Ardron, H. Marsh, D. Vongraven, B. Barr, Place-based approaches to marine mammal conservation, *Aquat. Conserv. Mar. Freshw. Ecosyst.* 26 (2016) 85–100, <https://doi.org/10.1002/aqc.2642>.
- [18] F. Maes, The international legal framework for marine spatial planning, *Mar. Pol.* 32 (2008) 797–810, <https://doi.org/10.1016/j.marpol.2008.03.013>.
- [19] S.B. Olsen, E. Olsen, N. Schaefer, Governance baselines as a basis for adaptive marine spatial planning, *J. Coast Conserv.* 15 (2011) 313–322, <https://doi.org/10.1007/s11852-011-0151-6>.
- [20] A.J. Wright, M.P. Simmonds, B.G. Vernazzani, The international whaling commission-beyond whaling, *Front. Mar. Sci.* 3 (2016) 1–7, <https://doi.org/10.3389/fmars.2016.00158>.
- [21] Ministry of Marine Affairs and Fisheries, Report on Performance of Ministry of Marine Affairs and Fisheries - Year 2018, MMAF, Jakarta, 2018.
- [22] CBD-UNEP, The Jakarta Mandate - from Global Consensus to Global Work, 2000. <https://www.cbd.int/doc/publications/jm-brochure-en.pdf>. (Accessed 2 April 2019).
- [23] F. van der Molen, How knowledge enables governance: the coproduction of environmental governance capacity, *Environ. Sci. Pol.* 87 (2018) 18–25, <https://doi.org/10.1016/j.envsci.2018.05.016>.
- [24] The Government of Buleleng, Keputusan Bupati Buleleng No. 523/630/HK/2011 tentang Pencadangan Kawasan Konservasi Perairan di Kabupaten Buleleng, 2011. Buleleng.
- [25] B. Wilson, R.J. Reid, K. Grellier, P.M. Thompson, P.S. Hammond, Considering the temporal when managing the spatial: a population range expansion impacts protected areas-based management for bottlenose dolphins, *Anim. Conserv.* 7 (2004) 331–338, <https://doi.org/10.1017/S1367943004001581>.
- [26] L. Howes, C. Scarpaci, E.C.M. Parsons, Ineffectiveness of a marine sanctuary zone to protect burrunan dolphins (*Tursiops australis* sp.nov.) from commercial tourism in Port Phillip Bay, Australia, *J. Ecotourism* 11 (2012) 188–201, <https://doi.org/10.1080/14724049.2012.713362>.
- [27] I.M. Zainudin, M.P. Patria, P. Rahardjo, Yasman, D.A. Gautama, W.T. Prawira, Bycatch of sharks, marine mammals and seabirds in Indonesian Tuna Longline Fishery, *Biodiversitas, J. Biol. Divers.* 18 (2017) 1179–1189, <https://doi.org/10.13057/biodiv/d180341>.
- [28] P.L. Mustika, F.S. Purnomo, S. Northridge, A Pilot Study to Identify the Extent of Small Cetacean Bycatch in Indonesia Using Fisher Interview and Stranding Data as Proxies: Updated Report to the International Whaling Commission, Denpasar, 2014.
- [29] T.S. Whitty, Governance potential for cetacean bycatch mitigation in small-scale fisheries: a comparative assessment of four sites in Southeast Asia, *Appl. Geogr.* 59 (2015) 131–141, <https://doi.org/10.1016/j.apgeog.2015.01.003>.
- [30] R. de Stephanis, J. Giménez, E. Carpinelli, C. Gutierrez-Exposito, A. Cañadas, As main meal for sperm whales: plastics debris, *Mar. Pollut. Bull.* 69 (2013) 206–214, <https://doi.org/10.1016/J.MARPOLBUL.2013.01.033>.
- [31] M. Allsopp, A. Walters, D. Santillo, P. Johnston, *Plastic Debris in the World's Oceans*, Greenpeace, Amsterdam, 2006.
- [32] I. Kiessling, Finding Solutions: Derelict Fishing Gear and Other Marine Debris in Northern Australia, National Oceans Office; Department of the Environment and Heritage, Hobart - Tasmania, 2003. www.wildlife.ntu.edu.au.
- [33] F. Thevenon, C. Carroll, J. Sousa, Plastic Debris in the Ocean: the Characterization of Marine Plastics and Their Environmental Impacts, Situation Analysis Report, IUCN, Gland, Switzerland, 2015, <https://doi.org/10.2305/IUCN.CH.2014.03.en>.
- [34] T. Jauniaux, L. Brosens, E. Jacquinet, D. Lambrigts, M. Addink, C. Smeenk, F. Coignoul, Postmortem investigations on winter stranded sperm whales from the coasts of Belgium and The Netherlands, *J. Wildl. Dis.* 34 (1998) 99–109, <https://doi.org/10.7589/0090-3558-34.1.99>.
- [35] The Government of Bali, Peraturan Gubernur Bali No.97/2018 Tentang Pembatasan Timbulan Sampah Plastik Sekali Pakai, 2018. Bali.
- [36] The Government of Padang, Peraturan Walikota Padang No. 36/2018 Tentang Pengendalian Penggunaan Kantong Belanja Plastik, 2018. Padang.
- [37] The Government of Samarinda, Peraturan Walikota Samarinda No.1/2019 Tentang Pengurangan Penggunaan Kantong Plastik, 2019. Samarinda.
- [38] L. De Suriyani (Mongabay, Asosiasi daur ulang ajukan uji materiil pergub larangan plastik sekali pakai. <https://www.mongabay.co.id/2019/04/23/asosiasi-daur-ulang-ajukan-uji-materiil-pergub-larangan-plastik-sekali-pakai/>, 2019. (Accessed 29 May 2019).
- [39] L. De Suriyani (Mongabay, Tolak uji materi ADUPI, warga mendukung pelarangan plastik sekali pakai. Ada apa?. <https://www.mongabay.co.id/2019/05/01/tolak-uji-materi-adupi-warga-mendukung-pelarangan-plastik-sekali-pakai-ada-apa/>, 2019. (Accessed 29 May 2019).
- [40] M. Castellote, C. Llorens, Review of the effects of offshore seismic surveys in cetaceans: are mass strandings a possibility? in: A.N. Popper, A.A. Hawkins (Eds.), *Eff. Noise Aquat. Life II, Adv. Exp. Med. Biol.* Springer Science+Business Media, New York, 2016, pp. 133–143, https://doi.org/10.1007/978-1-4939-2981-8_16.
- [41] J.J. Finneran, C.E. Schlundt, B.K. Branstetter, J.S. Trickey, V. Bowman, K. Jenkins, Effects of multiple impulses from a seismic air gun on bottlenose dolphin hearing and behavior, *J. Acoust. Soc. Am.* 137 (2015) 1634–1646, <https://doi.org/10.1121/1.4916591>.
- [42] D. Krieb, Facultative River Dolphins: Conservation and Social Ecology of Freshwater and Coastal Irrawaddy Dolphins in Indonesia, Universiteit van Amsterdam, 2004. <https://dare.uva.nl/search?identifier=091e9f80-69fe-4ee9-a8d5-682268a54502>.
- [43] P.L.K. Mustika, Marine Mammals in the Savu Sea (Indonesia): Indigenous Knowledge, Threat Analysis and Management Options, James Cook University, 2006.
- [44] P.L.K. Mustika, Towards Sustainable Dolphin Watching Tourism in Lovina, Bali, Indonesia, James Cook University, 2011.
- [45] CTI-CFF, Coral Triangle Initiative Regional Plan of Action, 2009. https://www.mpaaction.org/sites/default/files/CTI_2009_RegionalPlanofAction.pdf. (Accessed 22 February 2019).
- [46] SEAFDEC, Cetacean research, in: Southeast Asian Waters: Cetacean Sighting Program, 2010. <http://map.seafdec.org/project/cetacean/pub-report-ws-23-251102010.php>. (Accessed 22 February 2019).
- [47] P.L.K. Mustika, C.C. Madusari, F.S. Purnomo, A. Setiawan, K. Tjandra, W. E. Prabowo, Whale strandings in Indonesia, including the first record of a humpback whale (*Megaptera novaeangliae*) in the Archipelago, *Raffles Bull. Zool.* 57 (2009) 199–206.
- [48] M.D. McGinnis, E. Ostrom, Reflections on Vincent Ostrom, public administration, and polycentricity, *Publ. Adm. Rev.* 72 (2011) 15–25, <https://doi.org/10.1111/j.1540-6210.2011.02488.x>.
- [49] L. Sharma-Wallace, S.J. Velarde, A. Wreford, Adaptive governance good practice: show me the evidence!, *J. Environ. Manag.* 222 (2018) 174–184, <https://doi.org/10.1016/j.jenvman.2018.05.067>.
- [50] J.M. Mojica Vélez, S. Barrasa García, A. Espinoza Tenorio, Policies in coastal wetlands: key challenges, *Environ. Sci. Pol.* 88 (2018) 72–82, <https://doi.org/10.1016/j.envsci.2018.06.016>.
- [51] G. Capano, J.J. Woo, Designing policy robustness: outputs and processes, *Polic. Soc.* 37 (2018) 422–440, <https://doi.org/10.1080/14494035.2018.1504494>.