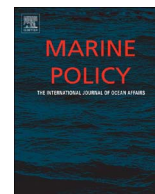




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Assessing the implementation of marine ecosystem based management into national policies: Insights from agenda setting and policy responses

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ABSTRACT

During the past decade, global environmental policy discussions have encouraged countries to engage in an ecosystem approach to managing the oceans. An ecosystem approach involves the integrated management of species, other natural services, and the multiple uses of the coast. Improving ecosystem based management efforts requires a better understanding of how it is included within national level policies that influence marine resource management. Chile has committed to implement international recommendations to include ecosystem based management. This study operationalizes an approach to assess the extent to which ecosystem based management is being implemented at national scales through the synthesis of agenda setting documents and national level policy/regulatory responses. The study specifically searches for ecosystem based management principles, as defined by the Convention of Biological Diversity in State of the Nation presidential speeches, national sectorial policies, national decrees and national programs issued between 1990 and 2014 (n = 1335 documents). Results show that although national level policies in Chile increasingly share common grounds with ecosystem based management principles, the overall approach is poorly mainstreamed into agenda setting speeches and reports. Working with existing institutional settings and institutional capacity are key features to maintain trajectories for the implementation of ecosystem based management in national policies. The approach presented complements research on marine policy implementation by effectively informing how national level policies can be analyzed under the lens of ecosystem based management.

1. Introduction

Humans increasing use of the oceans poses a number of challenges, including the formulation of equitable and sound governance mechanisms for the sustainable use of multiple marine resources [1–4]. In addition, the need to address competing uses has prompted numerous international efforts to consider options for managing multiple ecosystem services. Foremost among these is the concept of ecosystem based management (EBM, sensu [5]). The United Nations Convention on Biological Diversity (CBD) integrates ecological, social and governance objectives and describes EBM as: “a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way” [6]. While there is no single definition for EBM [see [7] for different definitions], most definitions stress that EBM is an integrated approach that considers links among living and non-living resources, involving the management of species,

other natural commodities/services, and humans as components of the ecosystem [8]. Despite variability on the terminology and specific emphasis used (i.e. Ecosystem based management, Ecosystem approach to fisheries, Ecosystem management, Ecosystem based ocean planning) the general merit of EBM approaches is that they include the interactions among ecosystem components, humans and the cumulative impacts of multiple activities, promoting conservation and sustainable use of resources [9].

During the past decade, environmental policy discussions around the world have increasingly encouraged an ecosystem approach to managing the oceans. EBM is currently dominating policy debates, global organizations such as the United Nations and FAO have established a series of recommendations which has made EBM an internationally recognized best practice for ocean governance [10,11]. The Convention on Biological Diversity developed 12 key guiding principles for EBM implementation which are considered critical to define

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Table 1
EBM principles developed by the Convention of Biological Diversity (CBD).

CBD Principle	Short Hand	Definition	Example of studies which use the principle ^a
1	Social choices	The objectives of management of land, water and living resources are a matter of societal choices	1,2,3,5
2	Decentralization	Management should be decentralized to the lowest appropriate level	1,2,3,4,5
3	Adjacent effects	Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems	1,2,3,4,5
4	Economic context	Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context	1,2,5
5	Conservation of functioning	Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach	1,2,3,4,5
6	Appropriate limits	Ecosystem must be managed within the limits of their functioning	1,2,3,4,5
7	Appropriate scale	The ecosystem approach should be undertaken at the appropriate spatial and temporal scales	1,2,3,4,5
8	Long term	Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term	1,2,3,4,5
9	Inevitable change	Management must recognize the change is inevitable	1,2,3,4,5
10	Balance use/ conservation	The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity	1,2,3,4,5
11	All relevant information	The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices	1,2,3,4,5
12	Multidisciplinary	The ecosystem approach should involve all relevant sectors of society and scientific disciplines	1,2,3,4,5

^a Numbers represent other studies where these principles have been considered as EBM elements: 1) [36] Grumble 1994; 2) [7] Arkema et al. 2006; 3) [37] Ruckelshaus et al. 2008; 4) [38] Ward et al. 2002; 5) Studies within a review performed by [39] Curtin & Prelezo 2010.

different elements that should be included in an EBM approach [12] [Table 1]. Concomitantly, EBM has become part of international conventions, has been supported by scientific consensus statements [13] and is becoming target of many national level policies [14]. In addition, EBM guiding principles are present in the majority of the 20 Aichi biodiversity targets subscribed by the CBD conference of the parties. In fact, target 6 explicitly states that “by 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided” [15] (<https://www.cbd.int/sp/targets/default.shtm>). Thus, EBM is internationally recognized as a best practice for ocean governance, acknowledged by multiple stakeholders, and to which 198 countries have formally committed.

Public policies and programs play an essential role in human–environmental interaction by providing guidance on priorities and practices of a country [16]. Therefore to be successful, EBM needs to be translated into concrete policies and actions at a country level [17]. Indeed, global policy discussions aimed at reducing marine impacts emphasize on the need to downscale international guidelines into national-level approaches [18]. In essence, there can be no EBM without partnership, ownership and inclusion of the concept in national policies [18,19].

A significant body of scholarship highlights the vital importance of examining consistency between international conventions guiding principles and national sectorial policies to draw lessons to support the implementation of emerging management strategies [20–23]. While much of this research relates to biodiversity, forestry and land use, there has been little research focusing on understanding consistency between international marine EBM guiding principles and policy implementation at a national scale [17,24,25]. This is unfortunate, as it is critical to synthesize the advances and ways in which EBM principles are being included into national agendas and the regulatory/policy response, in order to aid the effective implementation of the EBM governance challenge.

Chile has committed to implement international recommendations and agreements on the implementation of EBM [16,26]. In 1991, after returning to democracy, Chile implemented a new Fishery Law (Law No 18 892) which included definitions of industrial and artisanal fleets, five mile exclusive access to artisanal fisheries, individual quota systems, territorial user rights to artisanal fishers and the ability to create marine parks and reserves [27]. During the past 25 years fishery

management and conservation measures have been mainly implemented through National Decrees, Legal Regulations, International Treaties or Agreements, Conventions and Cooperation agreements and Public policy, plans and programs. In 2013, Chile passed a new Fisheries and Aquaculture Law (Law No. 20.657) which explicitly sets the objective of EBM (Articles 1b; 1c). In 2016 the Chilean government asked FAO to assess the Law, and their main recommendation was to pursue international recommendations and push for the further implementation of EBM [28] (FAO, 2016). Thus, it is particularly important to develop approaches which can help understand how Chile has internalized EBM, both in setting political agendas and in assessing regulatory responses which can allow to prioritize future policy development avenues which are consistent with international commitments to implement EBM.

The aim of this study was to systematically assess the presence of EBM principles in national fisheries and marine management policies by differentiating between their presence in agenda setting instances and in policy/regulatory responses [29]. The methodology is grounded by specifically exploring how EBM principles have become internalized in ocean governance in Chile. Results allow to identify progress, gaps and sources for further development of marine policy. The approach presented provides a more comprehensive understanding of how to address ways in which international commitments, regarding ocean governance, are being implemented. In this sense, while the study focuses on Chile, results are of significance for marine management and policy globally.

2. Methods

Data collection was conducted in the period running from December 2014 to July 2015 where a total of 1325 different types of documents concerning fisheries management and conservation were reviewed. Documents were analyzed using content analysis, which involved examining dominant themes within each document and identifying the presence or absence of each of the 12 EBM principles defined by the CBD [Table 1].

The publication period of documents ranged from March 11th, 1990 (return to democracy and re-writing of Chilean fisheries law) to December 31st, 2014 (approximately 2 years after an important reform to Chilean fisheries law during 2012–2013). Researchers who performed content analysis had prior training, experience and a systematic

protocol for the analysis from performing 7 yearly assessments aimed at assessing policy coherence, in different environmental domains, including marine ecosystems [30]. The search of documents was split into two main sources, differentiating between the presence of EBM principles in i) agenda setting or ii) policy/regulatory responses:

2.1. Sources related to agenda setting

In order to assess if EBM was identified as an explicit challenge in terms of agenda setting all government programs from winning presidential candidates were reviewed during the selected time period ($n = 6$), all State of the Nation Presidential speeches (state of the nation yearly accountability speeches; $n = 26$), national “*State of the Environment Reports*”¹ and international reports (e.g. Convention on the Organization for Economic Co-operation and Development assessments and recommendations on Chile; $n = 8$) were also analyzed. The documents were accessed through an Internet search of policy documents and policy archives in the national Congress Library website (www.bcn.cl) where records of all government programs and presidential speeches can be found in the Bibliographic Catalog (<http://www.bcn.cl/catalogo/>) and political history section (https://www.bcn.cl/historiapolitica/congreso_nacional/discursos/detalle?tipo=presidentes). *State of the Environment Reports* and the international reports or Organization for Economic Co-operation and Development (OECD) assessments were found through specific online search in Ministry and OECD websites. This suite of official documents (detailed in [Online Appendix 1](#)) were selected to be reviewed as they reflect ways in which policy agendas are presented (government programs), ways in which they are adjusted by either adding or suppressing items (adjustments reflected in the annual State of the Nation Presidential speech to plenary Congress) and ways in which they are periodically assessed and reframed through national and international environmental assessments (State of the Environment Reports and International Reports). In all the above mentioned documents fisheries, aquaculture, biodiversity topics and general EBM principles were carefully reviewed.

2.2. Sources related to policy/regulatory response

In order to assess if EBM was present in policy/regulatory responses 1284 documents issued between 1990 and 2015 were reviewed. These included laws, decrees, legal regulations, public policies and plans and international agreements and conventions signed by Chile in policies which dealt with fisheries management [[Table 2](#)]. To identify regulatory response a broad set of keywords in Spanish was used to preliminary select relevant policies and regulatory responses (list of keywords in [Online Appendix 2](#)). The initial list of regulatory responses was then qualitatively assessed by expertly trained researchers in order to identify the absence/presence of EBM principles. The website from the national congress library which keeps public record of all government regulatory acts, (www.leychile.cl) was used to find and download policy/regulatory responses, these included those which ratify international agreements. Treaties and agreements were then searched in their respective webpages. In addition, hard to find documents were requested through the Chilean Transparency Law Protocol. Policy/regulatory response documents were registered with the date in which they were published and the presence or absence of specific EBM principles within their content. EBM principle 1 establishes that “The objectives of management of land, water and living resources are a matter of societal choices”. Having a policy response already defines some type of social choice thus making the operationalization of this principle complex. Therefore, this study only assessed the existence of

this principle, when new institutional structures were created to include marine management as a social choice within articles of Laws.²

In order to assess if the presence of EBM principles had shifted in time in terms of agenda setting and policy/regulatory response the study period was divided into 4 main time periods. Time periods were determined considering important benchmarks in the development of an international EBM agenda or key developments in national legislation. In this way, time period 1 corresponds to the years 1990–1994 (begins with the establishment of new fisheries legislation in Chile); Time period 2–1995–2003 (begins with the publication of FAO code of conduct for sustainable fisheries); Time period 3–2004–2009 (begins with the establishment of CBD ecosystem management guidelines); and Time period 4–2010–2014 (begins with the ratification of Aichi Biodiversity targets).

3. Results

3.1. Agenda setting

Traditional fisheries management has been part of agenda setting instances throughout the study period. It has been explicitly acknowledged as a challenge in the “State of the Nation Presidential speeches” of 1992, 2003, 2010, 2012 and 2014 [[Fig. 1](#)]. Traditional fisheries approaches were also explicitly part of government programs in 2010 and 2014. EBM on the other hand has not been mentioned explicitly during the study period in any of the 24 State of the Nation Presidential speeches which were analyzed. The setting of the EBM agenda has been mainly established through international agreements and documents [[Fig. 1](#)]. The internationally supported OECD- Ministry of the Environment (MMA) reports (2005 and 2011) on the national *State of the Environment*, set agenda by recognizing the need to follow a precautionary and ecosystem approach through adequate measures ([Fig. 1](#)), such as the fight of illegal fishing, ban of trawling, establishment of marine protected areas, and development of regional administration organizations. In 2012 the Ministry of the Environment (MMA) led the *State of the Environment Report* which mentioned the need for management of ecosystem services and the sustainability of whole ecosystems in time [[31](#)] [(MMA 2012; P. 247)]. Results from this analysis indicate that although Chile has subscribed international agreements which promote EBM these have only recently and weakly become part of the national agenda setting process and have not made it through to presidential agenda setting discourses.

3.2. Regulatory responses

While agenda setting for EBM has depended on international agreements and documents, policy/regulatory response shows that some specific EBM principles have been present as a regulatory response throughout the study period. EBM principles began being included mainly as elements within international agreements, but have made their way into national decrees and regulations which begin operationalizing the implementation of the measures throughout the study period [[Fig. 2](#)].

During the 1990–1994 period, regulatory responses related to EBM principles were found in international agreements [[Fig. 2a-b](#)]. In fact 60% of all international agreements which included fisheries management referenced the need for some element of EBM [[Fig. 2b](#)]. Only five percent ($n = 6$) of decrees issued during the time period include some element of EBM [[Fig. 2a](#)]. These mainly consider the adjacent effects of fishing practices over other ecosystem components and the management of fisheries at appropriate limits. The national decrees related

¹ These reports were sponsored by UNEP between 1999 and 2008 and prepared by the University of Chile, and are named Informe País (country reports). Then in 2011 the report was prepared by the Ministry of Environment (MMA) by legal mandate.

² Operationalizing sub dimensions of this broad principle in policy responses was beyond the scope of this paper. Research into operationalizing specific dimensions of social choices is currently under development and can be requested from the corresponding author.

Table 2
Definition of types of regulatory response assessed.

Norm	Definition	Example
Law	Declaration of legislative bodies, executive and legislative branches, general and compulsory in its character, created by procedure defined in the Constitution. It aims to command, prohibit or allow certain behaviors.	Law 18892, General Law on Fisheries and Aquaculture (Sept. 6, 1991).
Decree	Statement issued by any authority on matters within its competence. When it is issued by the President of the Republic, it is called the Supreme Decree.	Decree 833, Ministry of Economy, Development and Reconstruction; Under secretariat of Fisheries. Annual global catch for the species “congrío dorado” year 2004 (December 30, 2003).
Legal regulations^a	Issued by the executive authority, they are regulations that specifically contain rules, descriptions of ways, instruments, among others, which allow the implementation of a law.	Decree 200, Ministry of Economy, Development and Reconstruction; Under secretariat of Fisheries. Regulating of the use of nets and fishery systems in crustacean fisheries that indicates (March 8, 2004).
International Treaties or Agreements, Conventions and Cooperation agreements	They are signed between states and are rules governed by legally binding international law. They can be bilateral or multilateral. International agreements are specifically between States. International conventions aren't legally binding. Cooperation agreements can be signed between internal agencies of countries.	No 272, Ministry of Foreign Affairs. Agreement on the conservation of albatrosses and petrels and its annexes (December 27, 2005).
Public policy, plans and programs	Public policies are government actions with public interest objectives arising from decisions based on a diagnostic process and feasibility analysis. Plans and programs implement public policy. Plans include all dimensions of the problem and target the long term; programs specialize in one part of the problem and tackle medium term.	Decree 198, Ministry of Economy, Development and Reconstruction; Under secretariat of Fisheries. Approves national action plan for the conservation of sharks (November 30, 2007).

In Chile, this legal instrument is called “Reglamento” and are published as a Decree which specifies its role.

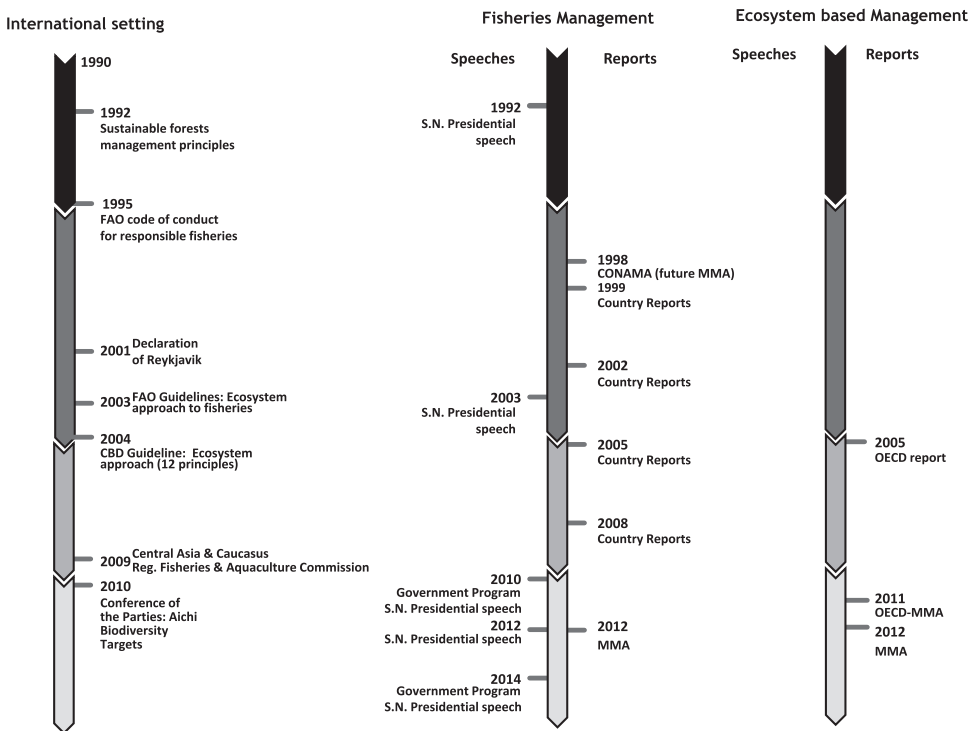


Fig. 1. International setting, agenda setting discourses and reports related with Fisheries management and Marine ecosystem based management in Chile between 1990 and 2014. In the figure OECD (Convention on the Organization for Economic Cooperation and Development); MMA (Ministry of the Environment); S.N. (State of the Nation). Different shades of gray represent time periods used to assess regulatory responses.

mainly with the setting of bycatch limits (e.g. Decree 232, Ministry of Economy, Development and Reconstruction, Establishes percentage of catch of yellow shrimp as accompanying fauna of red shrimp, June 2, 1993). In the 1991 fisheries Law the possibility of artisanal fishers to voluntary apply for territorial user rights for fisheries (TURFs) signals an important way in which management of benthic resources can become a matter of social choice (EBM principle 1).

Between 1995 and 2003 a total of 13 international agreements were signed including elements of EBM (Fig. 2c-d). An example was the Protocol to the Antarctic Treaty on protection of the Antarctic ecosystem (No. 396, 1998). A total of 21 national decrees included a single

EBM principle, this represents less than 5% of all decrees issued during the study period [Fig. 2d]. The decrees relate with addressing adjacent effects of impacts on other ecosystems. No national action plan or specific regulation targeted EBM principles during the 1995–2003 period [Fig. 2c].

The analysis shows that during the 2004–2009 time period, 6 international treaties including some EBM principle were signed or ratified, this represents around 45% of treaties analyzed [Fig. 2e-f]. Eleven decrees were approved, all following the tendency to regulate adjacent effects of fishing, these represent less than 5% off decrees for the time period [Fig. 2e-f]. During this time period the main change relates to

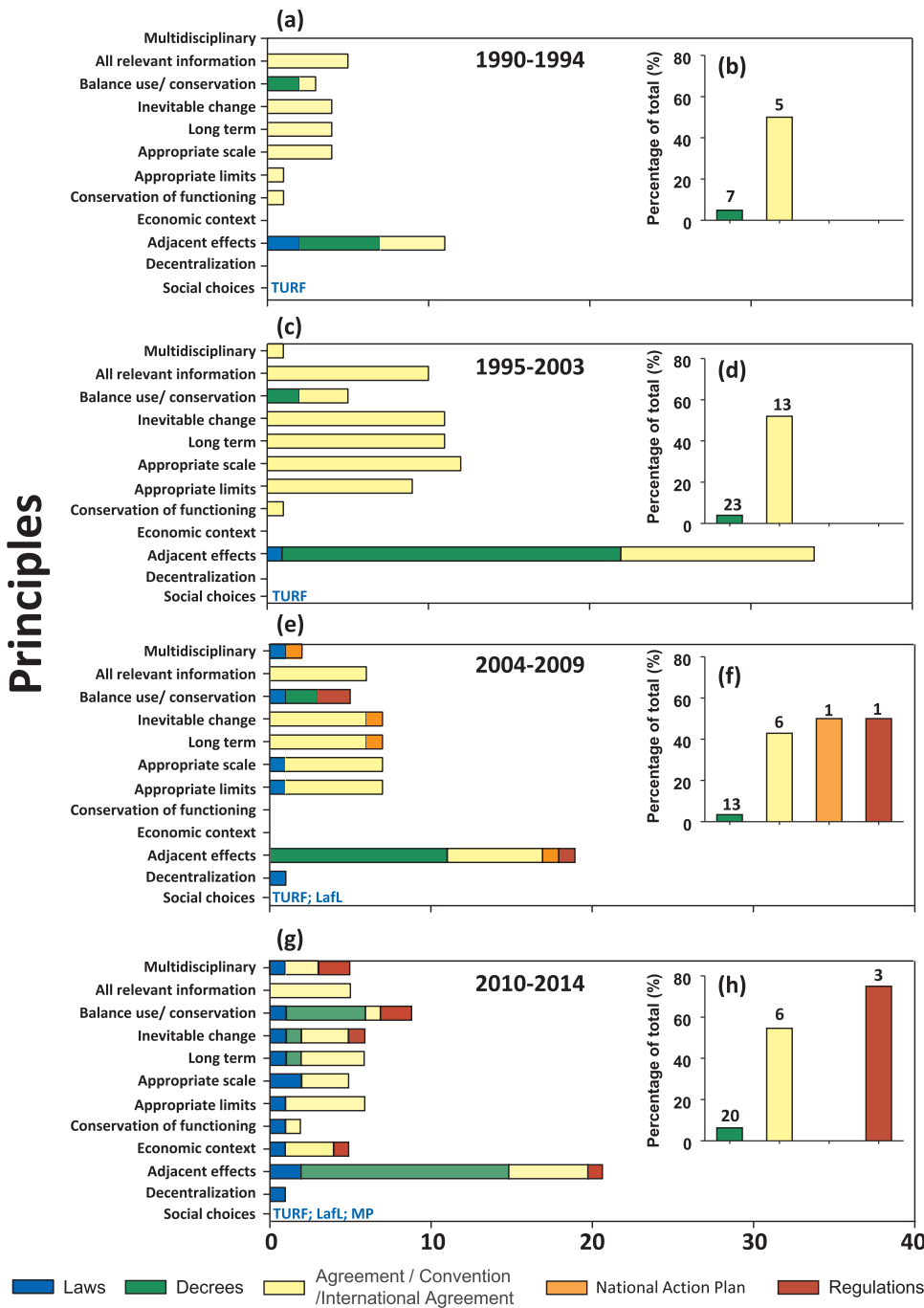


Fig. 2. Number of policy/ regulatory responses which include EBM principles for specific time periods in Chile. The small inset graphs represent the percentage of total documents analyzed and the number on the bars the total amount which included some EBM principle. In the graph TURFs Territorial User Rights to Fishers; MP Management Plans; LaFL Marine Coastal Areas for indigenous people Law.

the establishment of a national action plan, regulation and law modification which included some EBM principles [Fig. 2e-f]. In addition, in 2008, a Law which allows the creation of Marine Coastal Areas for Indigenous People was approved (Law N°20.249) to enable these communities to locally manage coastal areas with sustainability and cultural objectives.

During the 2010–2014 period, results show new EBM principles included within a law [Fig. 2g]. During 2012–2013 Chile reviewed and considerably changed the fisheries and aquaculture Law, as part of this change new articles were added that address ecosystem based management as a key management benchmark. The resulting new law (Law 20.657, 2013) specifically added article 1B and 1C which for the first time uses the words and defines EBM. It also added article 2, which defines the national fisheries policy explicitly mentioning an ecosystem approach. In this way, the 2013 Fisheries and Aquaculture Law is the

first contribution towards the inclusion of EBM beyond specific principles and towards Chile's inherent management structure. The 2013 fisheries policy also sets a new institutional structure termed Management Plans (Article 8). Management plans allow the management of a species or group of species through the establishment of management committees, which are multi-stakeholder arenas, providing opportunities for the management of fisheries to become a matter of social choice. In addition, six international treaties which include some EBM principle were ratified during 2010–2014 [Fig. 2h]. These international treaties are increasingly explicit about including the concept of EBM. For instance, during this period, the protocol on the prevention of marine pollution, defining upper and lower limits in order to protect and preserve the marine ecosystems was signed (No. 136, 2012). During this period Chile also subscribed to the establishment of the advisory committee of the Convention on the conservation and

management of fisheries resources on the high seas with ecosystem criteria (No. 143; 2013). An international agreement between Chile and Peru under the UNDP project named "Towards ecosystem management of Large Marine Ecosystems" (No. 113) was developed in 2014. During 2010–2014 sixteen decrees which include EBM principles were declared [Fig. 2g-h]. One of these decrees defines concepts such as how "ecosystem are made up of connections between the environment and species".

During the whole study period 8% of all the assessed documents include some element which relates to EBM principles. Fifty three national decrees include some EBM principle, 43 of these decrees aim at regulating effects of fishing on adjacent ecosystems and species, out which decrees regulating bycatch were the most abundant. In fact, decrees regulating bycatch were approved on a yearly basis from the year 2000 onwards. Whereas before 2000 they were approved in 1992, 1993, 1995 and 1997. During the study period there are 30 ratifications of international agreements which include some EBM principle. These were approved steadily between 1991 and 2014. Of these agreements, 1/3 are measures regarding conservation of Antarctic living resources. These measures were approved between 1991 and 2010 steadily. On average, Chilean policy increasingly reflects specific EBM principles but representation has focused mainly on a few issues and is low in comparison with other more traditional and sectorial coastal/fisheries management regulations.

4. Discussion

Ocean management policy discussions aimed at reducing marine impacts through EBM emphasize the importance of national-level approaches [14,18,32]. The implementation of national management policy is achieved through setting agendas and creating regulatory responses [29]. This study operationalized a way to explore the extent to which EBM is being implemented at national scales by analyzing agenda setting documents and national level policy instruments. In doing so it complements research on EBM implementation by showing how national level policies can be analyzed under the lens of an EBM framework.

Since the concept of EBM began to be developed at international fora, national scale implementation has lagged behind [17,32]. Results show that although countries, such as Chile, are ratifying international environmental conventions, measures are often not included in political agendas or drafted as fast as expected into national policies. However, results also show that some specific EBM principles, as defined by the CBD, are slowly but increasingly becoming present in national legislation. Results show a shift from the presence of EBM principles mainly as part of international agreements during the early nineties, towards their presence within national regulations and decrees by the end of the study period (2014). Unfortunately, principles such as "using all forms of information" are only weakly represented and when mentioned, only as part of international agreements. EBM implementation at a national scale seems to be currently taking place in different forms with various combinations of principles, mainly those related to biological reference points and impacts on adjacent effects. Thus, during the past 25 years in Chile, there have been opportunities to include only some specific EBM principles into the management process.

Strategies used to initiate, coordinate, and maintain EBM implementation need to resonate with the individuals, organizations, and institutions in place [33]. This might be explaining why some EBM principles get more traction than others. Results suggest that for the adoption of EBM in national policies, a differentiation between general rules aimed at internalizing a holistic cross-sectorial EBM approach and specific individual regulation aimed at targeting specific EBM principles could shed important insights [34]. In Chile, specific individual regulation, such as bycatch permits or the setting of more stringent requirements on the effects of fishing on adjacent ecosystem, has supported path-dependent shifts towards the implementation of specific

EBM principles, based on gained knowledge of the relevant environment. On the other hand, general rules such as the establishment of EBM as a guiding objective for the Chilean Fisheries and Aquaculture Law in 2013, is hopefully beginning to enable major shifts in managers and stakeholders perceptions and procedures regarding the future of EBM implementation. The interplay between general rules which can trigger transformative change and specific regulations which build upon existing structures and provide momentum for change provide hope that implementing marine EBM might be more feasible in the future than has typically evolved during the past decades [5,35–37].

National implementation of EBM has slowly advanced through the inclusion of specific and individual EBM principles. Time appears to be a key process through which existing management regimes and institutions begin internalizing EBM. If EBM is a radical departure from existing management, it may not be accepted, so there is a balance between transforming towards EBM and maintaining current management processes [25,24]. The inclusion of a specific article (article 8 Law No. 20.657) in the Fisheries and Aquaculture Law in February 2013 allows for the possibility to implement Management Plans. This appears to be a shift towards a more polycentric management system [4], which provides an opportunity to scale EBM management in Chile from individual regulations that include specific EBM principles towards a place-based holistic approach to EBM. These Management Plans can be established for all fisheries, including benthic and pelagic fisheries, as well as those with shared stocks between industrial and small-scale fleets essentially allowing the management of a species or group of species within a bay, an administrative region, part of a region, or a set of regions through the establishment of participatory management committees [4]. The establishment of deliberative management committees within management plans, can potentially enable the integration of different knowledge systems and the constant monitoring of social–ecological feedbacks for EBM [38]. It is through putting special emphasis on the co-production of knowledge by creating collaborative demonstration-scale experimental trials or learning platforms, that such an approach can be fostered [39]. Thus, if the Management Plan policy is supported with necessary financial, human and scientific capacity it has the potential to increase the institutional diversity and place-based examples upon which EBM can flourish. Paving the way for new successful innovations towards EBM.

One of the complexities for the implementation of international agreements in national policies relate to dealing with inconsistencies [20]. For instance, [40] observed inconsistencies between global biodiversity regimes and national policies in the context of biodiversity governance in Latin America and [41] reported poor integration between national and international climate and energy policies. Similarly in the implementation of EBM in Chile, some incoherence is apparent. In March 2004 a decree on the use of trawl fisheries for crustaceans was published (Decree 200, Ministry of Economy and the Undersecretary of Fisheries). This decree introduces an exception to the ban of trawls for shrimp in 2 regions of Chile (Paragraph 2 of Article 49 of the General Law on Fisheries and Aquaculture). Fortunately in Chile the inclusion of EBM in 2013 as a general rule and guiding principle in the Law could become a key element to deal with these types of inconsistencies and achieve coherence in the EBM challenge.

The analysis of regulatory responses show that there has been a shift towards the implementation of some EBM principles in national level decrees and regulations. While this is good news, years of work await until EBM is fully incorporated. Results point towards a particularly concerning difference between core underlying principles of EBM, and those few being actually included in national policies. This key insight which stresses that important principles of EBM, from a national legislation perspective, can differ greatly from core EBM principles highlighted in the literature [42], has practical implications. To target broader EBM implementation, a better recognition of national scale legal priorities from an EBM perspective, may generate greater on-the-ground support and thereby aid implementation. In essence, effort

should be placed on coupling specific national fishery management needs to each EBM principle. In doing so, an attempt to keep the scope of an EBM initiative framed under the Management Plan, Marine Coastal Areas for Indigenous People or Territorial User Rights policy frameworks could provide a key element. In doing so it is important to consider that the attempt is limited enough to allow for defining clear roles and responsibilities, embrace transparency and generate co-learning mechanism. Particularly as these policy settings are still undergoing frequent shifts in understanding what EBM represents.

National and then regional implementation of EBM is significantly constrained by capacity and inter-sectorial coordination [32,38]. National agenda setting instances such as government programs must state clearly the goal of achieving EBM and at which level it wants to incorporate ecosystem concerns into marine management. FAO assessment of the Chilean Fisheries Law has effectively placed EBM implementation at the forefront of policy discussions and could possibly open new opportunities to further implement EBM principles and general guidelines. Chile should now clearly set the agenda for EBM, defining visions and objectives from political leaders and government agencies, while also harnessing the abilities of local actors [43]. Such engagement would enable broader shifts towards EBM and stimulate innovative research [33]. In essence, the consideration of existing governance arrangements, an understanding of how specific fishery management issues in existing policies influence or impede the application of EBM and the development of learning platforms seem to be key features to initiate and maintain trajectories for the implementation of EBM in national policies.

5. Conclusion

International agencies and scholars have advocated about the need for EBM approaches as crucial for effective coastal zone management, but little has been done to operationalize ways to assess the extent to which such management approaches have been adopted within national policies. This study has clarified the key EBM principles and opportunities driving actual implementation within national policy. Three points can be raised regarding national level implementation. First, EBM must be incorporated appropriately into existing governance arrangements. Second, time seems a critical variable in the process of generating shared EBM objectives into legislation. Third, it is important to understand how specific fishery management issues in existing policies influence or impede the application of EBM. An examination of connections between such issues can lead to a greater understanding of challenges that stand in the way of the successful implementation of a suite of EBM principles.

The use of EBM principles as a lens through which to assess policy/regulatory response has proven useful to identify progress, gaps and possible sources of future development of EBM in Chile. It is hoped that by highlighting the evolution of EBM within agenda setting and policy responses researchers, policymakers and practitioners gain a deeper understanding of the dynamics that can underlie the EBM implementation process.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.marpol.2018.01.017>.

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