



## **Zoning instruments for “Coastal and Marine Protected Areas of Multiple Use” – An Example in Southern Chile**

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### **Abstract**

Chile is a threshold country whose economic development is primarily based on the exploitation of natural resources. Within that context, the fishery sector and its products play a major role. In the course of application for membership into the Organisation for Economic Co-operation and Development (OECD), Chile has to commit to put 10 % of its total territory including its marine areas under protection. However, until today, a very small fraction of its territory has been reserved. The percentage of marine areas is extremely low compared to the percentage of terrestrial areas. In order to increase the percentage of marine areas, the instrument of “Coastal and Marine Protected Areas of Multiple Use” was established. The aim of this instrument is to combine resource protection, sustainable use, and economic development. However, previous implementation approaches regarding the declaration of these areas were not very successful. There exists not only a lack of financial means and of acceptance regarding the necessity of conservation and protection of natural resources, especially marine ones, but also a lack of scientific experience in this field. This paper examines the existing categories of zoning instruments in Chile and compares them to respective international categories. The result is a proposal of a re-categorisation of these instruments in order to provide policy makers in the Chilean government with a useful concept for future planning and implementation of “Coastal and Marine Protected Areas of Multiple Use”.

### **1 Background and motivation**

In order to become a member of the Organisation for Economic Co-operation and Development (OECD), Chile has to achieve the aim of reserving 10 % of its territory for environmental protection, including the surrounding marine areas. Additionally, the National Coastal Politic (SubSecMar 1995) demanded the zoning of the coastal strip along the entire country by the end of March 2009. However, the politic did not provide the necessary tools which are needed to obtain this target. Therefore, up to this point this aim has not yet been accomplished in Chile due to limited financial resources and because of insufficient technical knowledge of the executing authorities.

The Coastal and Marine Protected Areas of Multiple Use constitute one instrument for the Chilean Government to obtain OECD membership. Their purpose is to combine the protection of natural resources with a sustainable use of the same and with economic development (SubSecMar 1995).

### **2 Objectives**

The first and most important objective is to elaborate an approach of zoning instruments for the Chilean coasts. However, some aspects must be considered previously in order to understand the approach. A zoning is necessary and reasonable to integrate multiple uses in practice. But for the process of developing a zoning, a suitable concept or instrument is advisable, i.e. to be able in the first

place to integrate different uses of resources. It is precisely the presence of such an instrument that is currently lacking in Chile.

The second objective is to apply the elaborated approach accordingly in a preliminary zoning proposal for the pilot region Fresia, a commune in the Llanquihue Province in South Chile.

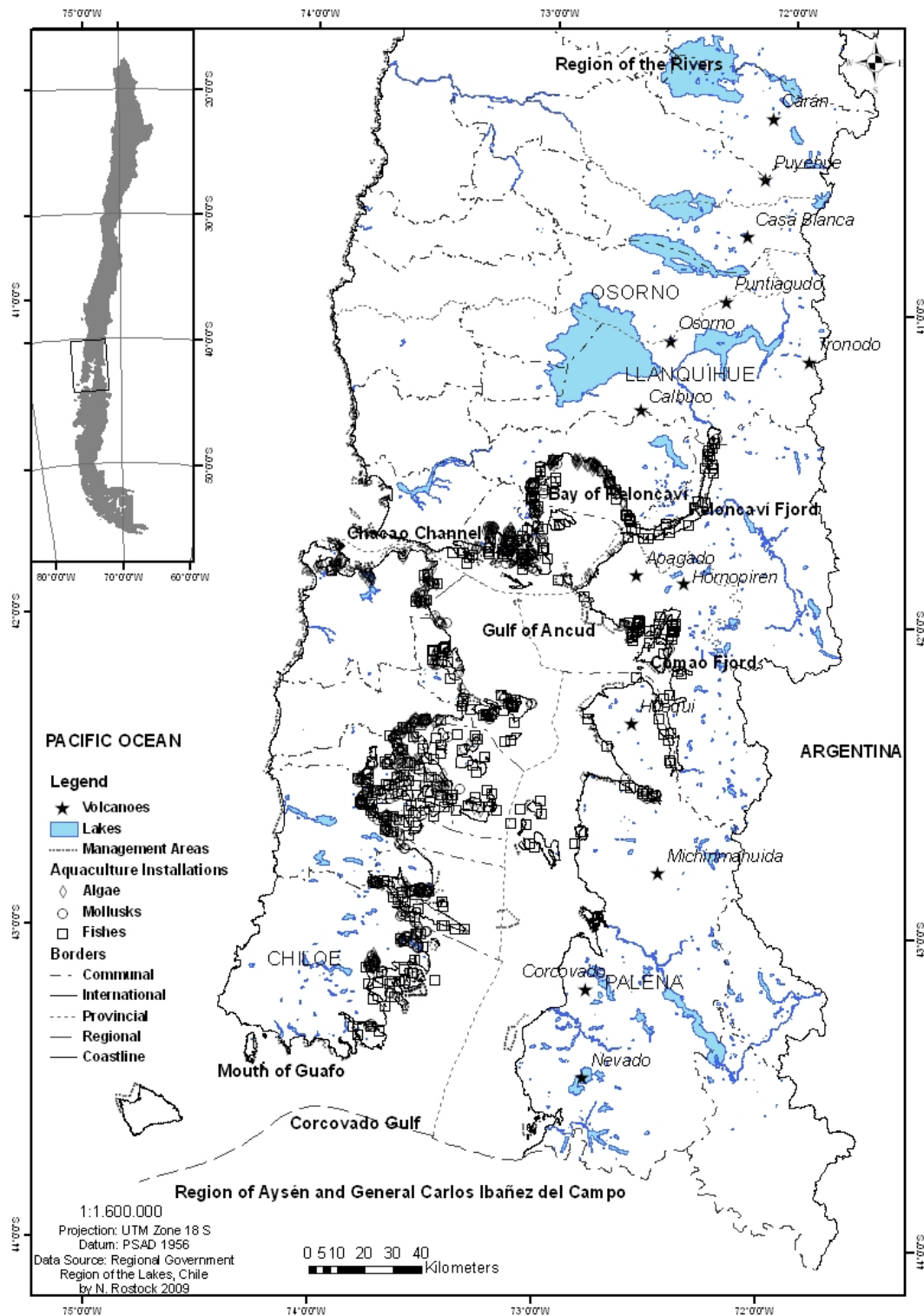


Figure 1: The Los Lagos Region in South Chile: overview and spatial distribution of main economic activities in coastal waters. The circle indicates the location of the pilot region Fresia (Data Source: Regional Government of the Los Lagos Region; modified by the Author)

### 3 Regional setting

The study area is located in the southern part of Chile approximately around 41°S latitude in the Los Lagos Region. This region is influenced by the west wind drift with high precipitation rates of around 2,000 mm/year and relatively low differences in temperature between the seasons (Jan. 14.4°C; July 6.6°C) (Mühr 2000). The adjacent marine areas are strongly influenced by the Humboldt-Current-System and the Cape Horn Current. These currents are shifting in accordance to changes in the overlying atmospheric pressure systems: the subtropical high-pressure area and the subpolar low-pressure area. In winter (July), the region is dominated by the Cape Horn current because both pressure systems are moved towards North. During summer (Jan.) it is dominated by the Humboldt Current because of the southward movement of the pressure systems which leads to seasonal upwelling events near the coast (Thiel et al. 2007). The mountains of the Andes at this latitude are characterised by a chain of glacial lakes and active volcanoes (figure 1).

The coasts of the Los Lagos Region can be divided into two distinct sub regions with respect to location, morphology and origin. The open Pacific coast is a rugged rocky shore characterised by cliffs and small bays (figure 2). It is a high energy environment where the swell and waves reach the coast nearly without previous energy dissipation. The beach material consists mainly of gravel and boulders. Few smaller sandy stretches exist only in the vicinity of river mouths or in calm and small cliff protected embayments.



Figure 2: The Pacific coast in the Los Lagos Region, South Chile (Photo: N. Rostock, May 31<sup>st</sup> 2008)

The second sub region is the Inner Sea, east of the Big Island of Chiloé. It is an enclosed part of the sea consisting of the Gulfs of Reloncaví, Ancud and Corcovado (figure 3). It was formed under the influence of the Pleistocene glaciations as observed in the fjords at the eastern rim of the Inner Sea. It comprises many small islands grouped into archipelagos which are divided by channels. The same characteristics continue to the south. The beaches are often sandy with a relatively low energy environment. Locally the formation of marshlands is in progress.

Fishing and aquaculture are the main economic activities in the coastal and marine areas. These include small-scale coastal and offshore industrial fisheries as well as the cultivation of fishes, mussels and algae (figure 1). In official Management Areas (Spanish: Areas de Manejo y Explotación de Recursos Bentónicos) near the shore all kinds of benthic resources are allowed to be extracted from

their natural environment. Each Management Area comprises a strip of sea of approximately half a nautic mile in width and varying extension up to kilometres alongshore. Onshore economic sectors are agriculture, forestry and tourism.



Figure 3: The coast of the Inner Sea in the Los Lagos Region, South Chile (Photo: N. Rostock, June 7<sup>th</sup> 2008)

#### 4 Methods

The basic assumption for this method was that every activity is a use and therefore can be defined as a use category. It is a necessary prerequisite so that in the process of zoning each zone can be defined by a use category. At the end, the zoning integrates all different kinds of uses. In this approach the instruments for zoning are the suggested use categories (table 1).

The basic procedure was a category assessment which was followed by analysis of the usefulness of these categories for the purpose of zoning.

At first, an assessment and analysis of the legislative framework in Chile regarding marine and coastal areas was conducted. The most important law is the Fishing and Aquaculture Act (FAA) from 1991. This law defines and regulates nearly all permitted activities carried out in Chilean waters: fishing and aquaculture, the extraction of benthic resources in the Management Areas (see above) as well as environmental protection in Marine Parks and Reserves. Subsequent regulations and changes of the law are set in additional declarations such as Supreme Decrees.

The second step was an assessment and analysis of international categories such as the United Nations Biosphere Reserves Programme and the Management Categories of the International Union for Conservation (IUCN). These were compared with the Chilean categories. If necessary, they were used to complete use categories which were not yet represented in the current Chilean legislation.

Additional possible uses which have not been taken into account by all these previous categories but seemed reasonable were considered. Their usefulness was analysed and if proven worthy an additional use category was defined.

Finally, all worked out categories were evaluated and integrated into one common approach of re-categorisation. This re-categorisation relates especially to the contents of these categories. The categories themselves might have existed before but not necessarily in this form or context, respectively. So, only their contents and possible meanings were re-defined.

## 5 Results

### An approach for zoning instruments

The categories presented here constitute an approach for zoning instruments (table 1). However, they should be considered as a concept and not as a rigid instrument. These categories are use categories which can be assigned to an area or a site inside the area to be zoned. Then, this area is bound to a specific use according to the use category. In this way, a zoning can be obtained for the whole area needed. Thus, all multiple uses can be integrated.

According to the FAA, the first category, fishery, is divided into three subcategories: small-scale coastal fishery within the five-nautic-mile-zone; industrial fishery in the exclusive economic zone (EEZ) which in exceptional cases only are allowed to operate within the five-nautic-mile-zone, but never further onshore than one nautic mile; and last but not least the sports fishery.

A similar subdivision is applied to the aquaculture activities and the extraction of benthic resources in Management Areas reported in the FAA. These last two categories are divided according to the species cultivated or extracted, respectively.

Tourism is not specified in the FAA. Nevertheless, it plays an important role for coastal areas all over the world, including Chile. Therefore, it will be considered and given a separate category. This category will also be divided into two subcategories according to the activities carried out. It is already an attractive activity to watch Blue Whales and Humpback Whales in the Inner Sea, but also sea lions, dolphins and a variety of sea birds can be seen. Regarding the rich benthic flora and fauna, they could be considered as possible basis for participative activities such as diving.

Besides all that, the protection of these natural environments must be taken into consideration. For this category the basic concepts of preservation and conservation (table 1) were provided by the FAA in terms of Marine Parks and Marine Reserves, respectively. Both concepts form the basis for a further division into subcategories. However, a buffer area and an area with restricted access are still missing. The buffer area concept originates in the UN-Biosphere Reserves but until now it does not exist in Chile. The areas with restricted access originated from the IUCN categories and their conditions of protection degrees – another aspect which has not been considered in Chilean legislation.

The next main category is transportation. After all the consideration of possible activities carried out in the coastal and marine areas in Chile, the transportation as the main supporting action has not been taken into account. However, without marine transport none of these activities can be realised. In order to perform them there will be subcategories for each transaction, basically to conduct the associated operations and to prevent misuses of the according traffic routes. As a result, routes will be designated for tourism such as animal watching, for productive activities such as fishery, and finally for surveillance in order to monitor all activities and to assure their correct use plus scientific monitoring.

Last but not least, a category for infrastructure installations at onshore sites of such Coastal and Marine Protected Areas of Multiple Use will be included. They are also subdivided into the following subcategories: quays or other anchoring and landing places in order to alleviate the access to the coast and to transfer the catch; processing centres for subsequent treatment of the catch like storage, drying and slaughtering; and finally, buildings and other installations for scientific and administrative purposes.

### Proposal for a preliminary zoning in the pilot region Fresia

Fresia is a coastal municipality in the Llanquihue province, located northwest of Puerto Montt. The access to the coast is relatively difficult. The single road has only one lane, it is unpaved and might temporarily be intrafficable. It leads to the southern end of Fresia, the mouth of the Llico River. The northern parts can only be reached by boat, on horseback or by foot. However, all these ways take various hours and might be impassable during bad weather conditions.

The economy of this municipality is characterised by agriculture and forestry as well as small-scale coastal fishery and the extraction of benthic resources in Management Areas (figure 2). However, no official infrastructure installations of any kind are constructed onshore.

Table 1: Suggested use categories for coastal and marine areas according to the new approach

Main category	Subcategory	Application and/or purpose to CMPA-MU Authorized individuals and/or users
Fishery	Artisanal Industrial Sport	Artisanal fishermen Industrial fishermen Person with licence for sports fishing
Aquaculture	Fishes Mussels Algae	If not already present, they will not be allowed to develop, due to high potential environmental impact and alterations of the environment itself; if already present they might continue, but under conditions of ecological keeping (best practices)
Benthic Resources	Mussels Crustaceans Algae	Permission to extract resources in a sustainable way, consequently the permissions will be granted temporarily for each economically important species, not effecting the non-commercial species
Tourism	Whale and Bird Watching Participative Activities	Such as marine mammals and sea birds with certified and/ or licensed guides only Showing the practice of extracting benthic resources such as Loco and Algae for demonstration purposes only
Ecosystem and Habitat Protection	Conservation Preservation Restricted Areas Buffer	Keep the present state and avoid destructive or wasteful use; through management the conservation shall be granted Keep safe from harm, destruction or decay; provide access for scientific purposes only “No take zone”: neither access nor extraction is allowed in order to protect the ecosystems itself including all living species; such areas could be spawning grounds or nurseries A transitional area between the protection area and the other uses to obtain a spatial separation allowing access for scientific purposes only
Transportation and Transit Traffic Routes	Tourism Productive Surveillance	The routes for animal watching to get to the linger places The routes for vessels of industrial fishery to get passed the five-nautic-mile-zone, between their allowed fishing grounds and the harbour; The routes for artisanal fishermen to go to their fishing grounds, that lie within the five-nautic-mile-zone, they may be allowed to pass that zone further offshore to get there The routes for authorities to supervise and monitor the activities, included are passages for scientific reasons
Buildings and Infrastructure (coastal-productive and coastal-scientific)	Quays Processing centres Observation facilities	Anchor places for local fishermen and to unload the catch Catch to be processed (storage, drying and slaughtering) Buildings and installations for scientific and administrative purposes

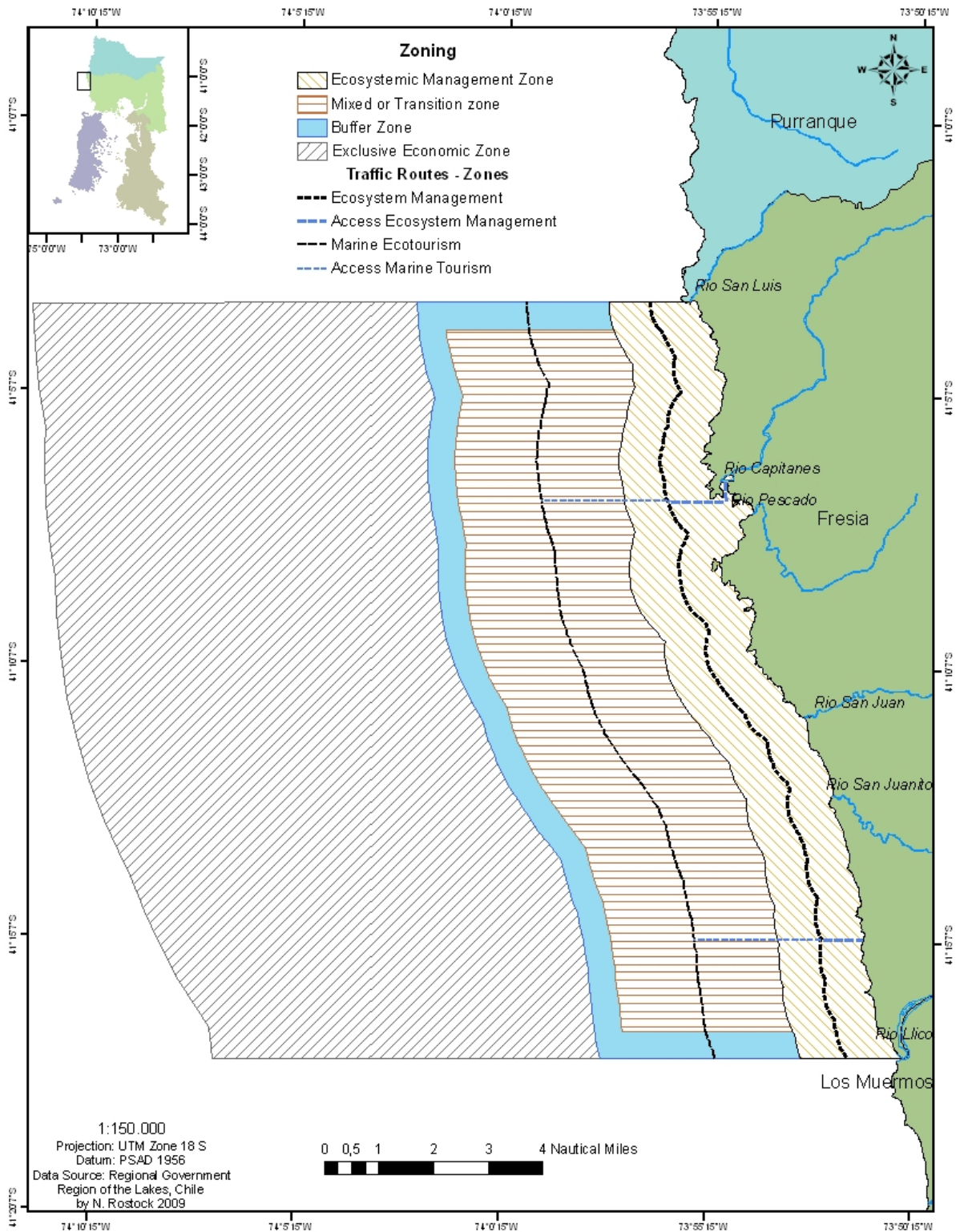


Figure 4: Suggested zoning in the pilot region Fresia according to the new approach (Data Source: Regional Government of the Region of the Lakes; modified by the Author)

Hopefully, this will change with the implementation of a Coastal and Marine Protected Area of Multiple Use in this municipality. The preliminary zoning (figure 4) proposes a minimum area of a width of five nautic miles. This minimum area will not be negotiable. The adjoining seven-nautic-mile-zone shall be negotiable with the responsible authorities (e.g. the Regional Coastal

Commissions). At best, this future Coastal and Marine Protected Area of Multiple Use will comprise a total of 12 nautic miles along the entire coastline of Fresia. If possible the parts now belonging to the Management Areas (figure 4) will be included as well.

The five-nautic-mile-zone shall include a buffer zone of half a nautic mile in width that surrounds the Transition or Mixed Zone in the North, East and South. In the Mixed zone, several uses of the suggested use categories shall be integrated such as small-scale fishery and tourism. The next zone toward shore is an Ecosystem Management Zone. In this proposal a width of about one and a half nautic mile is suggested. This zone shall integrate the protection of coastal habitats and the sustainable extraction of benthic nearshore resources. Both zones, the Mixed Zone and Ecosystem Management Zone, need further subdivision according to the use categories. Unfortunately, the data available for this municipality are not sufficient to develop a more detailed zoning. Especially, specific data about ecology and the impacts of extracting benthic resources are lacking.

## 6 Discussion and conclusion

These categories are suggested to be used by policy makers in coastal and marine affairs in Chile. They shall provide a new concept or even instrument to conduct zoning at the Chilean coasts. During the process of zoning all desired uses can be combined, and undesirable uses can be excluded for certain reasons. However, final decision has to be made by persons which are competent or executing authorities. For this reason all possible uses were included in the present approach.

Until now this re-categorisation has been used to elaborate the zoning of the coastal strip of Fresia by the Non-Governmental Organisation CODESOSUR-SINERGIAS as it was demanded by the National Coastal Commission. Together with the preliminary zoning presented in this paper, both proposed zonings constitute an attempt of Integrated Coastal Zone Management in Chile for the first time.

It is clear that this approach still needs to prove its value in practice. But due to the lack of feasible nearshore zoning in Chile up to now, it is a step forward toward future Integrated Coastal Zone Management.

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