MarViva

Marine Spatial Planning

A Guide to Concepts and Methodological Steps

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Jorge A. Jiménez

Foreword

In Latin America and the Caribbean, it is more common to hear about land-based management than coastal and marine zone management. However, in recent years, over-exploitation, pollution, increased marine traffic and the development of coastal infrastructure have had devastating effects on coastal and marine resources, necessitating the implementation of marine spatial planning policies in our countries.

An integral approach is needed to address the planning and management of human activities in the sea and the many actors involved in the process should participate. As learning experiences, the United States and Canada have made significant advances in marine spatial planning with technological tools and regulatory measures that support management. In order to support Marine Spatial Planning processes, the MarViva Foundation's development of this guide has benefitted from the contributions of various organizations and experts from several countries.

This guide develops aspects on the origin of marine spatial planning, the characteristics the process should possess, steps for its implementation, as well as the requirements for the construction of future scenarios and how to assess whether or not the proposed objectives are met.

The MarViva Foundation is grateful to the organizations that collaborated in making this document a reality and we hope that it will make a significant contribution to the conservation and sustainable use of marine resources in Latin America and the Caribbean.

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Disclaimer

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Chapter II

Introduction

Introduction

II.

For at least the last six decades, the pressure on marine resources, coastal pollution, maritime traffic, coastal infrastructure development and the use of marine spaces in general have skyrocketed. Far from declining, the number of users of the sea and the kinds of activities they carry out are expected to increase in coming decades. Tourism activities associated with the sea, shipping and mariculture will grow continually in the next decade. These activities will undoubtedly be of great importance for the development of Latin American countries.

On the other hand, living marine resources are limited in both abundance and geographic distribution. In many cases, their exploitation has been devastating to marine ecosystems. Strong conflicts are now occurring between users and the environment and even between different users. Fisheries production has shown a steady decline; pollution levels of coasts are rapidly increasing and high poverty rates remain in the coastal populations of Latin America and the Caribbean. Productive alternatives in the seas are reduced in the absence of marine policies, lack of spatial planning processes and conflict resolution among users and between users and the environment.

Planning the management of uses and reducing conflicts is essential for economic and social reasons. The development and implementation of a spatial management plan for human activities, where different users reach agreements on where and how to carry out activities in the sea, can only be achieved if there is an institutional arrangement and mechanisms for harmonization that will facilitate agreements among the different users. In Latin American and Caribbean countries, there is a fragile institutional framework and poor user participation in marine and coastal decision-making. Major challenges must be resolved in this area.

Coastal communities, the direct users of the resources, are generally detached or marginalized from the regional, national or international markets and they do not have the capacity for active and informed participation in governance processes. Without the strengthening of governance and the participation of the coastal communities and users in general, conservation measures will be weak, vulnerable to political change and in constant conflict with other users. A conflictive environment and a

Introduction

deteriorated natural base are detrimental to economic investment and the sustainable development of the seas.

Managing human activities in the sea is an effort that requires policies, participatory processes, and regulatory and institutional frameworks, without which success cannot be attained. Partial attempts to develop policies have occurred deep within some sectors, but these have not reached multi-sectorial levels nor gained the required backing of the political sector.

Today it is clear that without proper spatial planning and management of human activity in the sea, not only will we destroy marine ecosystems, the natural basis of many economic activities in the seas, but we will also lose many of the marine species and services that marine ecosystems provide.

Efforts to create methodologies to carry out this process have been occurring in several regions of the world (Semarnat, 2006; Ehler & Douvere, 2009). The complexity of the information and factors that should be included in the analyses can result in cumbersome methodologies that require a great deal of information and analytical capacity. In this work, a methodological approach is presented that allows analysis of the existing situation and development of future scenarios in a simple way, based on the best information available at the time.

Chapter III

The origin of marine spatial planning

The origin of marine spatial planning

III.

Marine spatial planning (MSP) has its roots in the policies and processes that states have been exerting on marine spaces for at least eight centuries. Pope Alexander's papal bull of 1493 and the Treaty of Tordesillas of 1494 divided the vast newly discovered oceans between the Crown of Castile and the Crown of Portugal. This arbitrary decision led to the first pronouncements for a mare liberum (free sea) by Dutch jurist Hugo Grotius in 1609 (Fig. 1). Since then, the concept of a Free Sea, open to use by all, has dominated International Law of the Sea.

Figure 1

Hugo Grotius (1583-1645) on an engraving from the 1800s. Engraved by J. Pofselwhite and published in London by Charles Knight, Ludgate Street.

However, in 1635 the Englishman John Selden defended the opposite concept, mare clausum (closed sea), for the exclusive use of the coastal state. In 1702, Dutchman Cornelius Bynkershoek reinforced this concept with the publication of his treatise De dominio maris, which defended control of a portion of the seas by coastal states.

His position, that the power of a state's control effectively ends at the end of the range of its weapons, led to the nearly universal adoption of the three nautical mile limit, the range of the cannons in that era, as the boundary of the seas under full domain of the coastal states.

Two centuries later, interest in access to petroleum and fishery resources on the continental shelf resulted in the expansion of this boundary by several countries to up to two hundred nautical miles.

Governance of the adjacent seas by coastal states, along with maintenance of a sea open to all, is being partially regulated by the United Nations Convention on the Law of the Sea (UNCLOS). In an attempt to plan and manage the use of the sea, this treaty recognizes the sovereign right of states over part of the sea adjacent to their coasts while also recognizing that another part of the sea and the ocean floor are "heritage of humanity" shared by all the nations of the world.

Territorial planning for that section of the adjacent sea, where the states have sovereign rights, has been a gradual process that has intensified in the last two decades, while the vast area of the sea outside of national jurisdictions (High Seas) is still awaiting a regulatory framework that will be conducive to management planning processes.

The origin of marine spatial planning

In Territorial Waters and Exclusive Economic Zones (where States have jurisdiction), some efforts have been made to plan and manage human activity. Marine areas have been designated for different uses: ports, fishing, protection areas and in a few cases, navigation routes have been defined. However, all these efforts have been developed from a single sector perspective.

The absence of an integral, multi-sectorial and trans-boundary process has resulted in areas where activities overlap, causing conflict with the environment or conflicts among users. The absence of integrated marine management is evidence of the lack of coordination between the authorities in charge of the different sectors. As a result, this has caused one sector to excessively exploit marine resources on which another sector depends, it has promoted the destruction of environments critical for biodiversity, and it has resulted in a loss of investment security for most users of the sea.

Chapter IV

The concept of marine spatial planning

IV. The concept of MSP

IV.

MSP is an integral, participatory and political process to plan and manage the uses of the sea, balancing ecological objectives with economic and social ones; it is developed through entities that legitimately represent the users of the resources and the space. It is being used in many countries as a mechanism for pursuing the sustainable development of marine areas.

MSP: an Integral Process

Sustainable:
It has a long-term vision based on the preservation of ecosystems that also brings economic and social components into the pursuit of sustainable development.

Participatory:
Stakeholders must be actively involved in the process.

Multi-sectorial:
Sectors and agencies at all levels must be involved.

Delimited:
The solutions resulting from the process apply to a spatially delimitated area for a specific time period. The area must be sufficiently large to incorporate relevant ecosystem processes.

Integrated:
It includes the analysis of interrelationships among activities of the area, its ecosystems, and existing mandates and administrative frameworks.

Adaptive and dynamic:
It is a process that involves learning from activities implemented and constantly changing realities, for progressive future rethinking.

(Ehler and Douvere, 2009)

The concept of MSP

In discussions regarding the process, MSP directly involves the users that depend on the natural resources of the sea, environmental organizations, the private fishing sector, chambers of tourism, grassroots organizations, universities, international agencies, governmental institutions and all those parties that have interests in the marine resources of the area, in the short and long term. Broad representation during the discussion process ensures greater political legitimacy. Users should be involved in the identification of uses and relevant ecosystems, their characterization, interactions' analysis and the construction of alternative management scenarios.

MSP **does not** replace sectorial planning and implementation processes. Fishing regulation plans, marine protected area management plans, etc., should always be prepared by the sectors in charge of these matters. MSP seeks agreement between the plans that each sector develops for a given area, but it does not take on the generation of those sectorial plans.

In this process, the building of alliances within and between all sectors is essential. Allies with common interests can assist by contributing resources, seeking alternatives to conflicts and ensuring informed and representative sectorial participation. The institutions with jurisdiction on the matters at hand should relate to and rely on the legitimately represented organizations and sectors so that these will endorse the social agreements and plans that will later be implemented.

Chapter V

Elements of marine spatial planning process

Elements of a MSP process

V.

MSP is developed within the political, technological and institutional context of each country. In many countries of the Latin American and Caribbean region, the development of MSP processes is constrained by weak institutional frameworks and scarce technological and financial resources.

The methodological approach described here maintains the conceptual core of an MSP process, offering simple methods that require uncomplicated analytical tools. Its development and implementation are restricted to the territorial waters (12 nautical miles), although it can be applied in most of the Exclusive Economic Zones of Latin America and the Caribbean.

MSP is a complex process dominated by key elements (Fig 2.). It is heavily influenced by inputs such as the existing legal and institutional framework and governability capacity, but also by governance processes existing within the geographical scope of the process. The MSP process, however, is likely to change this existing framework, an important output of the process itself. Key inputs for the process are ensuring active multi-sectorial participation and the existence of a coordinating body highly representative of the multi-sectorial uses of the area.

The MSP process has key outputs, such as the analysis of present and future conditions of the area, and the production of the management plan itself, which might include a zoning plan. Under the MSP approach, the zoning of an area is just one of the possible outcomes of the MSP process. The construction of a multi-sectorial, participatory, analytical process in which potential solutions are discussed and agreements are reached is the main outcome of the process.

The successful implementation of the Management Plan is highly dependent on the commitment of multiple sectors, the capacity of community and state organizations and the ability to bring market forces to bear in the process. Market forces are key drivers and contributors to the responsible use of the sea and its resources.

As a highly adaptive process, MSP also depends on a monitoring and evaluation component that is periodically influencing the analytical phase. Periodic evaluation on the success of management plan implementation and on changes in external and internal conditions within the area might justify readjustments of the plan itself.

Elements of a MSP process

Main Components in the MSP Process

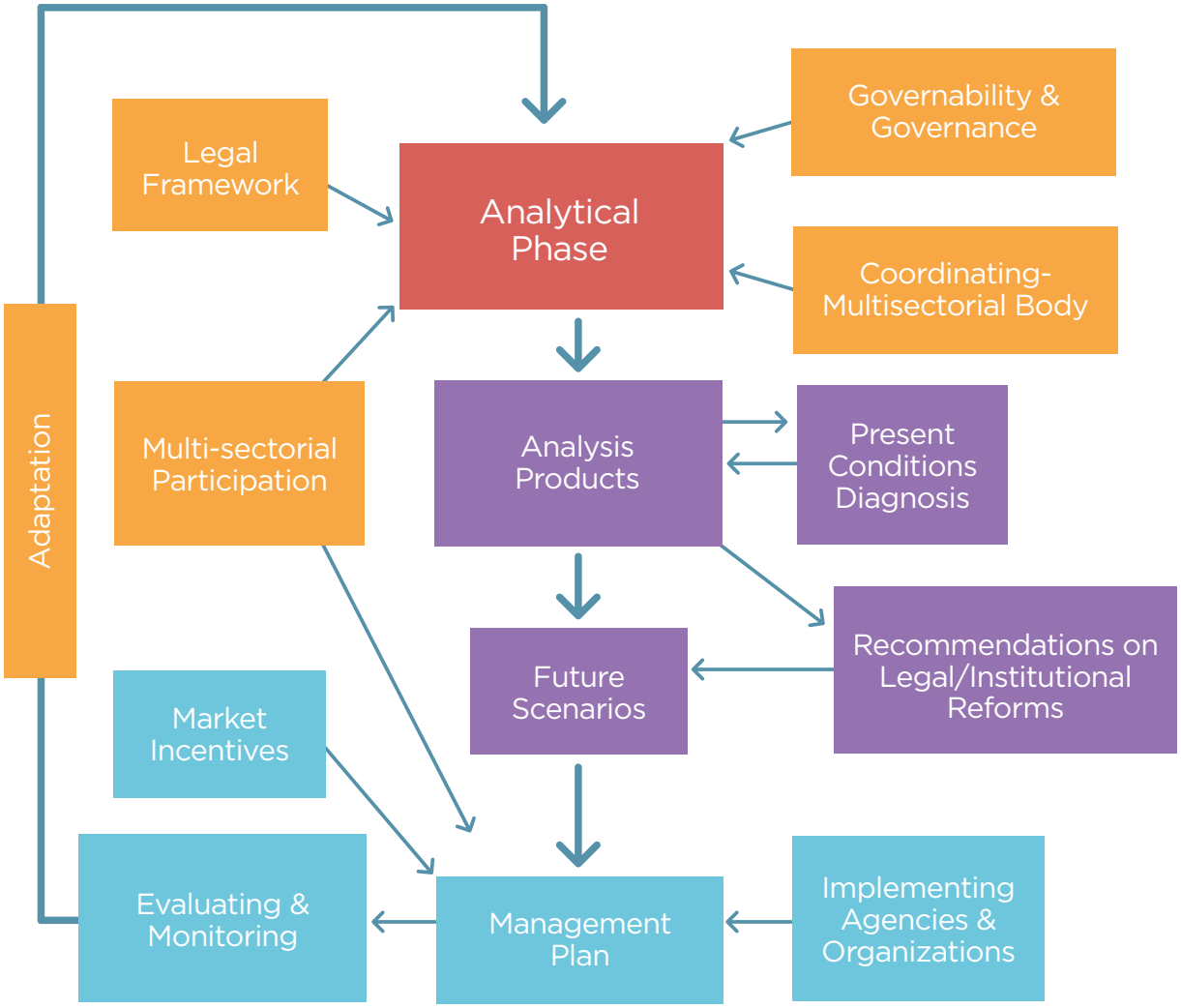


Figure 2

Main components within the MSP Process.

The MSP process seeks answers to four fundamental questions: How does the area of analysis look now?, How do we want the area of analysis to look in the future?, How will we achieve the desired future scenario? How do we ensure that the desired outcomes are achieved? Through these answers, MSP aims to achieve a future organization of the marine space that would generate the greatest potential for human uses, while also reducing the conflicts that are occurring among different users and between users and the environment.

Chapter VI

Governability and governance in marine spatial planning

Governability and governance in MSP.

VI.

The formulation and implementation of a MSP process is associated with governability and governance schemes, which should be in operation from the start. Work on governability[1] and governance[2] is essential for the social and political viability of the initiatives that will be implemented.

As indicated earlier, MSP is a political process that aims to reach a proposal for the use of the marine space, backed by technical and scientific information and that meets ecological, social and economic objectives, with the participation of the varied stakeholders.

A fundamental part within the spatial planning process is the selection or formation of an entity that will facilitate the process. This effort will require legal support for the entity, with formal, legitimate and multi-sectorial representation that will seek social agreements and the steps to follow in its implementation. The skill with which multi-sectorial participation is managed will determine the social and political viability of the initiative. Undoubtedly, the organization that facilitates the process should be transparent and have a conciliatory attitude toward the different interests that will make up part of the negotiating table.

Generally in Latin American countries, such a body with multi-sectorial representation does not exist at the outset, and a process is needed to constitute one. An already existing entity (or one specifically created for this purpose) serving as a coordinating entity, should have legal backing as well as clearly defined functions and responsibilities to the institutions and sectors that comprise it.

The coordinating body or promoter of the process need not be a state entity. An academic institution or a non-governmental organization could take on this role. However, responsibility for the implementation of the agreed scenario should belong to a state agency or agencies. Therefore, when the moment comes to make a decision regarding the possible management scenario to implement, it should be clear which institutional entity would lead the implementation and its level of commitment.

[1] By Governability we mean the capacity to process and apply policy decisions institutionally.
[2] We refer to Governance as the processes for achieving social agreements among the different parties that comprise a social group, and not limited to actions by government only.

Governability and governance in MSP.

The coordinating entity should fulfill multiple roles:

- Identification of key players who legitimately and formally represent the sectors involved.
- Establishing relationships with these actors with sectorial representation.
- Strengthening key players, so they can legitimately represent their interests throughout the process and at the negotiating table.
- Encouraging the participation of state entities and user groups in the process.
- Surveying, mapping and validating information on uses and habitats with stakeholders.
- Promoting the process in government entities to ensure political support to its conclusions.
- Assessment of the conflicts generated between current uses and habitats.
- Consolidation of an inter-sectorial vision and goals for the future of the area of analysis.
- Evaluation of the drivers of change that would affect uses and habitats in the future.
- Coordination of negotiating tables among the different sectors to propose alternative scenarios according to the future conflicts among users and between users and habitats.
- Technical evaluation of alternative future scenarios for the area of analysis.
- Technical partnering in the implementation of the scenario chosen.

Governability and governance in MSP.

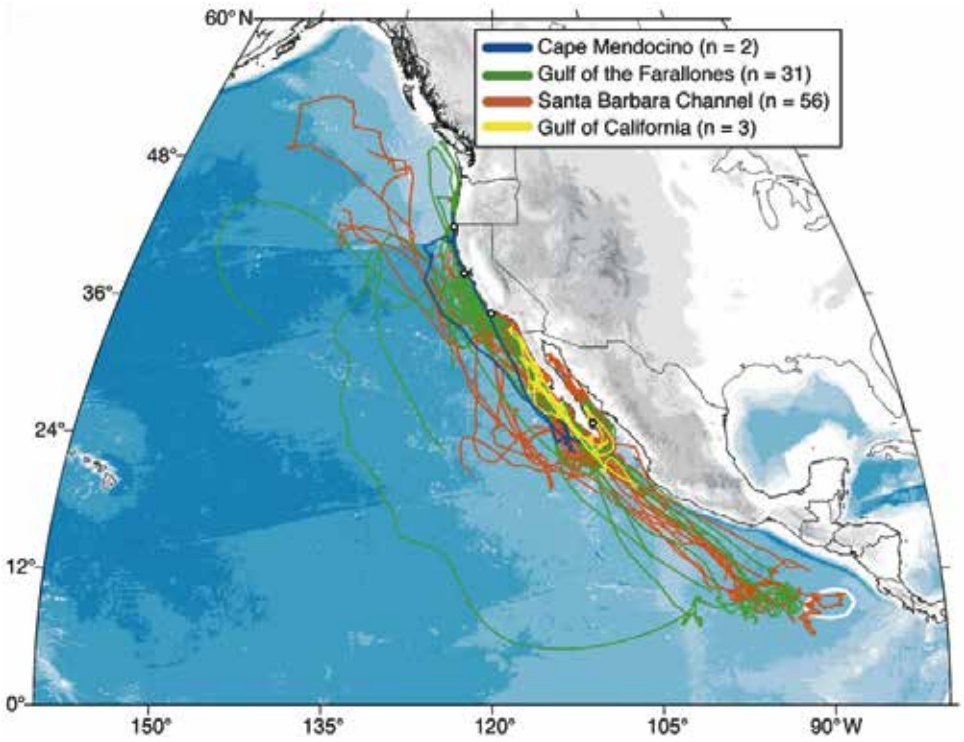


Figure 3

Migration pattern of Blue Whales between California and the Costa Rica Dome region (Bailey et al. 2009). The planning process for specific areas needs to consider long migration processes that link remote trans-boundary areas.

In most spatial planning processes, it is evident that many of the resources targeted for management in the area of analysis have strong relationships with other remote geographic areas, even trans-boundary ones (Fig. 3). Furthermore, management of marine resources needs to be linked to the analysis of and response to global processes, such as climate change, that might be affecting biological resources and physical-chemical processes on a regional scale.

In a trans-boundary context, dialogue between countries and international negotiations are a central aspect for achieving sound MSP. Attempting to involve regional organizations like the CPPS (Permanent Commission of the South Pacific) and the Regional Seas Programmes of UNEP is a critical step in the analysis and implementation of trans-boundary resources and processes. Regional organizations are better suited to these tasks than state governments.

Chapter VII

Participation in the management planning process

Participation in the management planning process

VII.

The marine theme is multi-dimensional and from a participatory vision there are dozens of actors who can meet, discuss, agree or disagree, build alliances and implement socioeconomic, political and legal processes.

Building alliances with other stakeholders to provide resources for a continuous, integral approach is essential. Relationship networks to communicate with all the different stakeholders in the initiative are key to the success of the entire process.

Representation for this number of players in an entity or body that constitutes a legitimate venue for discussion and decision-making is fundamental. It isn't possible to work with all the stakeholders involved, but care should be taken to ensure that the interests of all the sectors are represented in the process.

Figure 4

Participation of multiple sectors in the MSP process is critical. This participation should start from the onset of the process.

Chapter VIII

How does the area of analysis look now?

How does the area of analysis look now?

VIII.

A. Selection of the area of analysis

A first step in the process is to select the site where the MSP exercise will be carried out. The area defined should be large enough to incorporate many of the ecosystem processes that regulate the habitats and uses of concern. A balance must be found between incorporating all ecosystem processes, having the ability to analyze the entire area, managing it under appropriate jurisdictional frameworks and being able to implement possible management measures.

The surface area of the work site will also depend on institutional capacities, the quality and geographic coverage of the existing information, resources available and the dimension of the conflicts to be resolved. Areas of a few hundred to a few thousand square kilometers are usually selected where the information has been analyzed in units of 1x1 km2 or 4x4 km2 (Beck, et al., 2009).

Some relevant criteria for selecting an area of analysis are summarized below:

a. Occurrence of conflicts: Generally a spatial management plan becomes necessary when the current or expected uses in an area are going to generate strong conflicts. The relevance of the conflict within a given area, whether environmental, economic or social, is an important motivation for the parties to seek a solution in that area.

b. Ecosystem importance: The occurrence of vulnerable ecosystems or habitats with biological and ecological relevance in specific areas motivates the selection of these areas. Spawning areas for commercially important fish species as well as diverse and productive ecosystems that provide important environmental services and are endangered by human activities are strong candidates. The connectivity of ecological or biological phenomena between one area and another situated hundreds or thousands of kilometers away should be considered. An area may contain reproduction areas for species that are captured hundreds or thousands of kilometers away, and while the area may not be important for users within the boundaries of the

How does the area of analysis look now?

analyzed area, it is important for a use that occurs a long distance away.

c. Social capital: [3] Sites are sought that contain groups or communities with some degree of social cohesion, a strong socio-cultural identity, representative local organizations, relations of trust and an ability to organize and address their own needs. The existence of organized productive sectors with interests in the area is a positive factor at a site.

d. Governability: The existence of institutional jurisdictions in the area, protection or regulations already granted by laws and legal frameworks, are very relevant. The territorial waters, fully under the country's jurisdiction, ensure greater governability. Trans-boundary areas subject to regional or bi-national management agreements also facilitate the implementation of the plan.

e. Socioeconomic importance: Sites where economic activities are concentrated or where they would generate a large volume of production or jobs are prime candidates for planning processes.

B. Analysis of marine habitats:

The relevant or important marine habitats must be identified, delimited, geo-referenced and characterized in a way that their locations and their ecological importance or values can be shown on a map.

The ultimate goal of the habitat analysis is to assess the habitats present in the area, their location and boundaries and their relative importance. This stage consists of four components:

[3] **Social Capital** is the variable that measures social collaboration between different groups of a human collective, and the individual use of the opportunities resulting from three main sources: mutual trust, effective norms and social networks (in the broadest sense, not as a virtual approach). It points to those factors that address us as individuals, increasing opportunities for collective action and group welfare (World Bank: 1998).

How does the area of analysis look now?

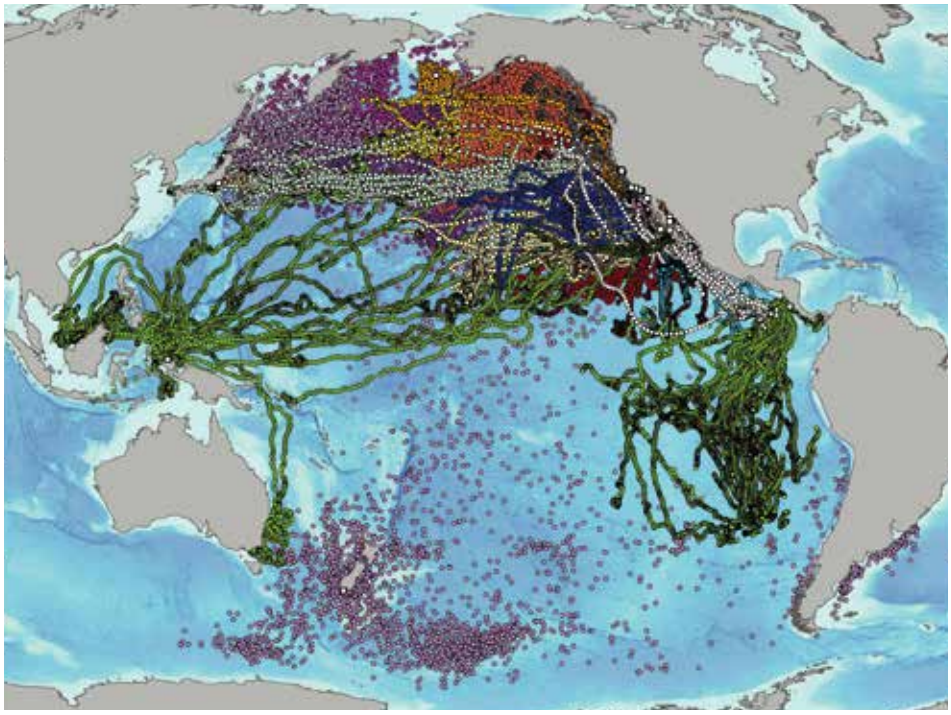
1. Identification and categorization of habitats

Identifying and mapping areas with key ecological/biological characteristics for the MSP work represent a double challenge. In contrast with terrestrial habitat mapping, which can be done in a relatively more simple way by means of direct observation or the use of photographs and satellite images, marine cartography is more complex because most of the habitats are hidden under water.

Ideally, complete coverage of the area selected should be available to visualize and analyze the extent and distribution of all habitats present at an appropriate scale and resolution, as well as discerning the boundaries between adjacent habitats. However, chances are there is no prior geospatial information for the relevant environmental characteristics or if there is, it only encompasses a small proportion of the habitats present in the area, with information limited to only a few months of sampling or at a resolution that is not appropriate for the purposes needed; moreover, there are few resources at hand for completing the mapping, putting many of the methods and technologies that require specialized equipment and personnel out of reach.

How does the area of analysis look now?

Migrations And MSP Processes



SOURCE: WWW.GTOPP.ORG <HTTP://WWW.GTOPP.ORG>

Oceans are interconnected spaces. Many of the key organisms in the planning unit are likely to undertake large migrations to far regions of the ocean. Processes occurring thousands of kilometers away from the planning unit can affect fisheries dependent on migratory resources, such as sharks, dolphin, or tuna. In this case planners need to incorporate this reality into their assessment and the creation of future scenarios. The need for regional institutions that coordinate trans-boundary efforts to manage and preserve these highly mobile resources is evident. Even within national boundaries some processes (such as fish reproduction, or contamination sources) might be generated outside the Planning Unit and the Planning Team needs to take this fact into consideration. This reality usually demands a higher degree of coordination among state agencies and the establishment of more sophisticated monitoring programs.

How does the area of analysis look now?

In practical terms, there will probably be some documents that describe the geological, biological, morphological and oceanographic characteristics of the area under study, inventories restricted in time and space, some nautical charts, some aerial photographs and satellite images to interpret and rapid field verification for mapping the habitats.

Participatory mapping of expert and local knowledge will certainly be a key tool for this and other stages of the methodology proposed. In some cases, it may be the only tool feasible for use. In any event, all information available that will allow making deductions is relevant for consideration. Possibly the most feasible is resorting to expert opinion. The effort is aimed at conducting the analysis with the best information available at the time. A simple categorization for systematizing habitat information is presented as an example. Here, the habitats are divided into eight categories (Table 1). In this case, the categories used emphasize criteria that distinguish habitats according to important ecological aspects.

Different MSP processes could involve other categories, but whatever categorization system is chosen, habitats should be classified into categories that allow their mapping and analysis. Expert and local knowledge will be of great importance for the identification and characterization of habitats. The use of local knowledge will possibly be the means to remedy or complement the lack of scientific data, only obtainable through advanced technologies that are often financially inaccessible.

How does the area of analysis look now?

Table 1

Characterization of habitats into categories that distinguish important ecological criteria

CATEGORIES OF SITES
Sites of importance for stages of a species' life cycle (spawning, nesting, aggregation, migration, reproduction, etc.)
Sites with high biological productivity
Sites with high biological diversity
Sites with scenic value
Sites that are pristine or have a low degree of degradation
Sites that carry out important ecosystem functions (water purification, storm protection, etc.)
Sites with high relative densities of rare, threatened or endemic species
Sites that are key in the life cycles of rare, threatened or endemic species

2. Mapping of habitats

Spatial and temporal information about the habitats selected should be entered into a geographic information system.

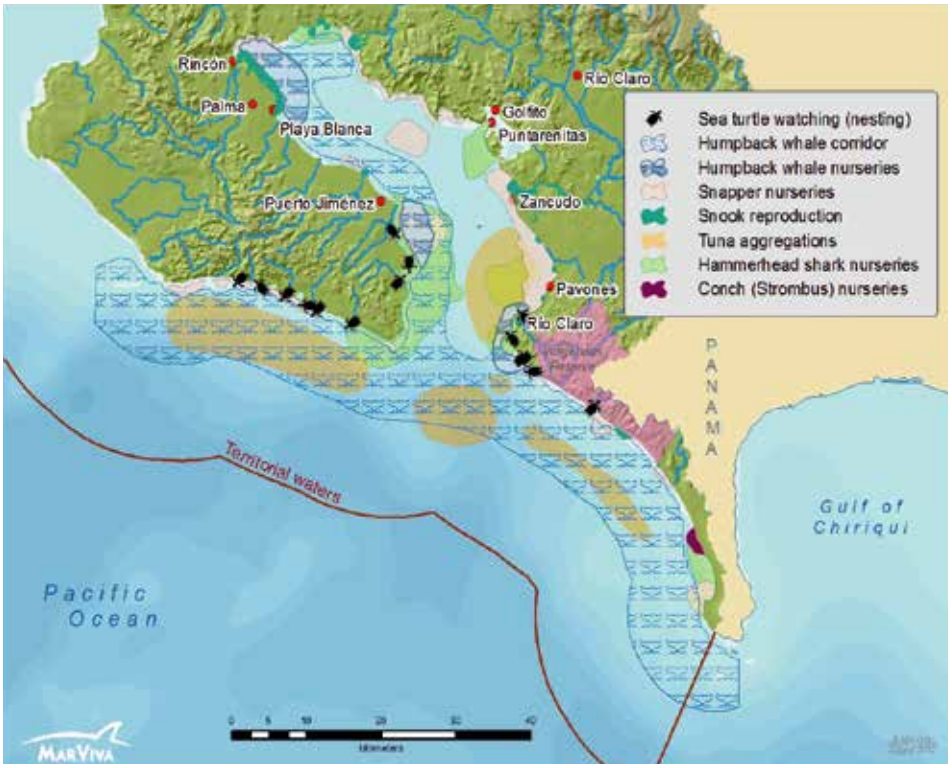
The objective of this stage is to develop maps that help visualize and analyze the extent and distribution of all the habitats already categorized that are present in the area of analysis at an appropriate scale and resolution and that also indicate the boundaries between adjacent habitats.

Figure 5 is a map that locates the habitats of importance for the life cycles of some species identified in the southern Pacific of Costa Rica. Not only the location of the different habitats is observed, but also clear overlaps among habitats are evident as, for example, between humpback whale transit areas and snapper nursery areas.

How does the area of analysis look now?

Figure 5

Location and delimitation of habitats of importance for the life cycles of several species in the southern Pacific of Costa Rica



SOURCE: MARVIVA FOUNDATION

3. Determination of Values

Mapping of the selected habitats will allow us to locate, distinguish and delimit the different habitats within the area under study, but it says very little about the relative importance of each habitat. Is one turtle nesting area more important than another? Or is a turtle nesting area more important than a tuna aggregation site?

To answer these kinds of questions, values or scores must be assigned to the criteria used to create each category. These values will provide guidance about ecological importance, for each habitat identified and mapped.

Table 2 is an example of a valuation exercise for the criteria used in the habitat categorization step. Sites of importance to life cycle stages of a species, for example, must be analyzed to determine whether the criterion (importance for stages of the life cycle) has a low, medium or high value in that specific site. In this example, a subjective value is assigned (number column) that will help determine the relative importance of that site with respect to the criterion used to categorize it.

How does the area of analysis look now?

Table 2

Values assigned to different criteria used to categorizehabitats

CRITERIA	SCORING		JUSTIFICATION
A. Importance to life cycle stages of a species	Very important Important Medium importance Little importance Very little importance	10 8 6 4 2	
B. Biological productivity	Very high High Medium Low Very low	10 8 6 4 2	
C. Biological diversity	Very high High Medium Low Very low	10 8 6 4 2	
D. Pristine or degraded state	Maintains its original characteristics Slightly affected Moderately affected Quite affected Very affected	10 8 6 4 2	
E. Ecosystem functions	Very important Important Medium importance Little importance Very little importance	10 8 6 4 2	
F. Population size of rare, threatened or endemic species	Very large Large Medium Small Very small	10 8 6 4 2	
G. Importance to the life cycles of rare, threatened or endemic species	Very high High Medium Low Very low	10 8 6 4 2	

How does the area of analysis look now?

An Experts Panel will assign the scores and justify the reasons that led to these scores. This same Experts Panel will decide the relative weight to be given to each one of these criteria, and even the inclusion of additional criteria or the exclusion of others.

Not all the criteria need to have the same relative weight at a given site, therefore the score for a criterion, instead of ranging from 2 to 10, could range, for example, from 1 to 5, if the experts feel that this criterion does not have as much importance in the site analyzed.

For this reason the final value assigned to the site should correspond to a weighted average resulting from the sum of the relative weight assigned to each criterion and the number of criteria used.

4. Cartographic Analysis of Habitats

The value assigned to each habitat will be the result of the weighted average of the point scores assigned to each one of the variables considered. These habitats with their corresponding values can be represented on a Habitat Valuation/Assessment Map, indicating not just the location and boundaries of the different habitats, but also their ecological importance, according to the valuation criteria selected.

For the preparation of the Habitat Valuation Map, the elements identified and characterized are entered with their corresponding valuations into a Geographic Information System, a tool that facilitates the translation of all this information into an integrated map output (Fig. 6).

How does the area of analysis look now?

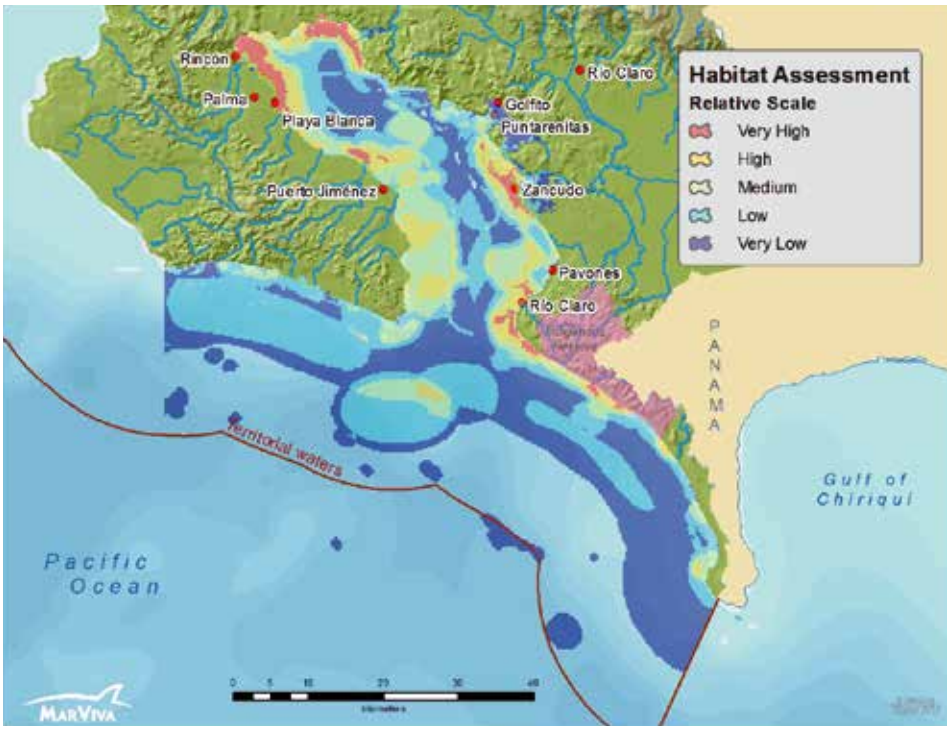


Figure 6

Habitat Valuation Map in the southern Pacific of Costa Rica

In these kinds of maps, not only can we see the distribution and boundaries of the habitats identified, but also their relative importance, according to the criteria selected. Sites in red color have high importance since several of the criteria selected for those sites had high score values.

C. Analysis of human activities and uses

The different uses or activities that occur in the area targeted for planning must be identified, delimited, geo-referenced and characterized, producing a map to show not only where they are located but also the relevance or value these activities have. This process consists of four main steps:

1. Identification and categorization of uses

The human activities, within the area of analysis, must be identified and their spatial boundaries located. There are activities that take place on land but, directly or indirectly, they affect marine ecosystems or habitats (terrestrial activities with marine impact). In these cases the sea spaces under the effect of these activities (for example, sedimentation, contamination) must be identified and delimited, since in a way they are being "used" for the dumping of polluted water.

How does the area of analysis look now?

The uses identified can be many and to facilitate the analysis they should be organized into categories. Table 3 presents an example of the categorization of the main uses in the region. The categories could vary depending on the conditions of the area of analysis. In some regions, categories such as the generation of wind energy or oil platforms could be added.

Table 3

Categorization of Uses

CATEGORY	SUB-CATEGORY	TYPE
a. Fishing	Sport or recreational	Sport fishing, tourism fishing
	Artisanal	Harpoon, cast net, seine, hand line, trammel, traps, bottom line, etc.
	Industrial or semi-industrial	Trawling, purse-seine, surface long line
b. Port infrastructure	Marinas	
	Ports	
	Canals	
	Wharves	
c. Tourism	Ecological	Nesting sea turtles, whale watching, recreational diving, snorkeling
	Adventure	Skiing, kayaking, kite surfing, stand up paddle surfing (SUP), surfing, windsurfing
	Traditional	Sun and sand
d. Navigation routes	International traffic	Merchant ships, fuel tankers, cruise ships
	Local traffic	Transit of persons, shipping merchandise, jet skis
	Fishing vessels	Commercial fishing vessels, sport fishing vessels
	Police and military patrols	Military, police
e. Terrestrial activities with marine impact	Chemical contamination	Agrochemicals, hydrocarbons
	Organic contamination	Wastewaters, solid wastes
	Sedimentation	Formation of sand or mud banks, solids in suspension (plumes)
	Urban development	Commercial, residential, tourism
f. Other extractive activities	Sand and rock	
	Mangrove resources	Firewood, conchs, other
	Diverse	
g. Military use		Restricted access, testing areas
h. Oil infrastructure		Platforms, drilling sites

How does the area of analysis look now?

The identification of uses may require different research techniques for gathering the necessary information, such as rapid assessments, participatory mapping, Experts Panels, interpretation of satellite images, surveys, aerial photography, technical deduction and review of existing documentation and statistics. As mentioned earlier, participatory mapping is one of the favorite techniques for obtaining information, but in no event should it ever be the only source of information.

All the data available, in organizations and institutions, should be located and systematized. It is essential that all existing quantitative data are included. Information obtained through different means must be complemented, compared and systematized for use.

How does the area of analysis look now?

2. Mapping of uses

The uses identified and delimited should be mapped to show their location and geographic extent and grouped into different categories to facilitate analysis. Those marine areas affected by terrestrial activities will also be identified and delimited as subject to a given use (i.e. the discharge of substances without treatment from an agricultural field or an urban area).

Uses: Whale Watching

The observation of whales, dolphins, porpoises and other cetaceans has grown more than 10% annually throughout Latin America. More than a million people in this region participate in the observation of cetaceans, sustaining an industry of associated activities (tours, restaurants, hotels, etc.) that generates hundreds of millions of dollars per year (Hoyt & Iñiguez, 2008).

The fast growth of this activity has prompted its regulation and has raised concerns about the impact of the activity on the resource itself (Lusseau & Bejder, 2007). Too many boats disturbing reproduction and calving activities in the region might deteriorate the resource upon which the activity relies. Guidelines on the proper ways to observe cetaceans and reduce conflicts with the resources are emerging. At the same time conflicts with other uses has become apparent. Boat traffic in the seas is increasing significantly. Collisions with whales will increase and the noise itself is affecting cetacean behavior throughout the sea (Lusseau, et al. 2009).

Harmonizing the boat traffic with whale habitats and whale watching activities demands MSP processes. Cases such as the rerouting of commercial vessel traffic in the Stellwagen Bank National Marine Sanctuary have proved to be efficient mechanisms for reducing conflicts and achieving maximum benefits to habitat conservation and boat traffic (NOAA, 2009).

PARTICIPATORY CARTOGRAPHY WORKSHOP

Figure 7

The use of Participatory Mapping allows tapping into the extensive information handled by site users.

How does the area of analysis look now?

Figure 8 summarizes the distribution of a category of use (fishing) in the southern zone of Costa Rica, showing the location of the different sub-categories of this use. A similar analysis can be made for each category of use identified in the zone, providing a suitable location and delimitation of the different uses identified. At the same time, with the location and distribution of the uses, the distribution of several categories of use can be combined in one map to understand their placement and relative extent or the possible spatial overlaps that occur between two or more categories of use.

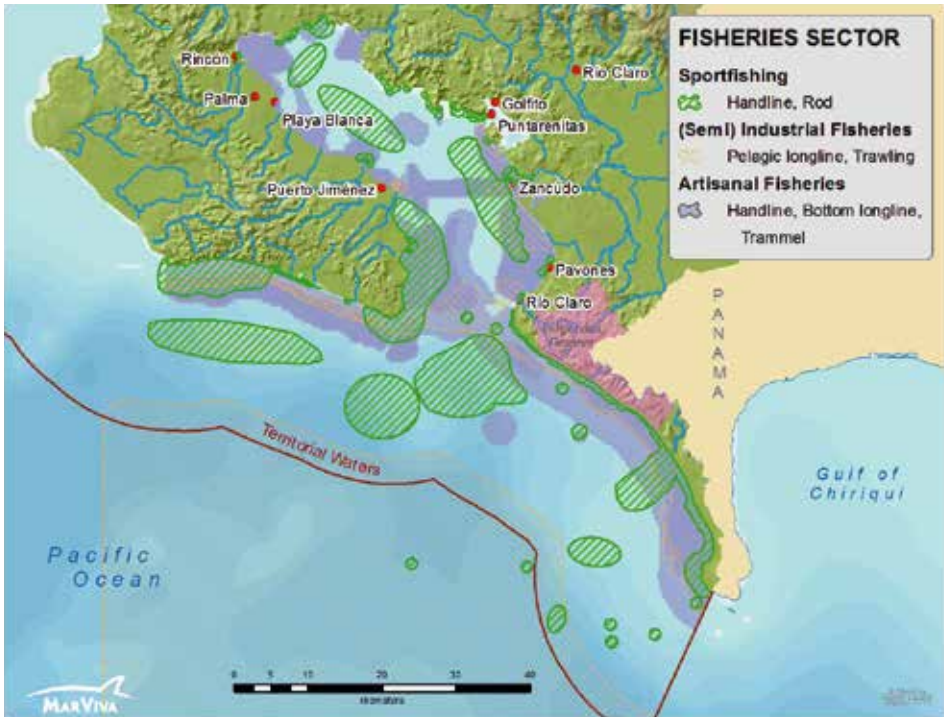


Figure 8

Map of uses (fishing category) in the southern Pacific of Costa Rica

3. Valuation of Uses

As in the case of habitats, identifying and locating diverse uses in an area does not say much about the relative importance of those uses. Therefore, once the uses are categorized, they should then be assigned a point score (valuation of importance) according to pre-selected criteria. As an example, Table 4 below gives four criteria for assigning value to each use. According to the criteria of an Experts Panel, values are assigned to each criterion.

How does the area of analysis look now?

CRITERIA	DEFINITION	SCORING		JUSTIFICATION
a. Number of users that benefit	- Number of tourists, passengers, etc.	Very high quantity Large quantity Medium quantity Small quantity Very small quantity	10 8 6 4 2	
b. Number of people who depend on the activity	- Self-employed, directly employed, indirectly employed	Very high quantity Large quantity Medium quantity Small quantity Very small quantity	10 8 6 4 2	
c. Economic importance	- Amount of money generated in the site or region	Very high High Medium Low Very low	10 8 6 4 2	
d. Sociocultural importance	- Economic dependence of vulnerable groups - Association with a regional or country vision - Cultural relevance	Very high High Medium Low Very low	10 8 6 4 2	

Table 4

Criteria for the valuation of uses

The total value assigned to each activity will be the result of the sum of the points assigned to each one of the criteria considered. Scores are relative to the demographic and socioeconomic context of the area in question. It will be the Experts Panel that determines the valuation for each one of these criteria based on the information available, and it will be this same Experts Panel that will decide the relative weight to be given to each one of these criteria, or even the inclusion of an additional criterion or the exclusion of another. With the point score assigned to each criterion, a weighted average can be calculated.

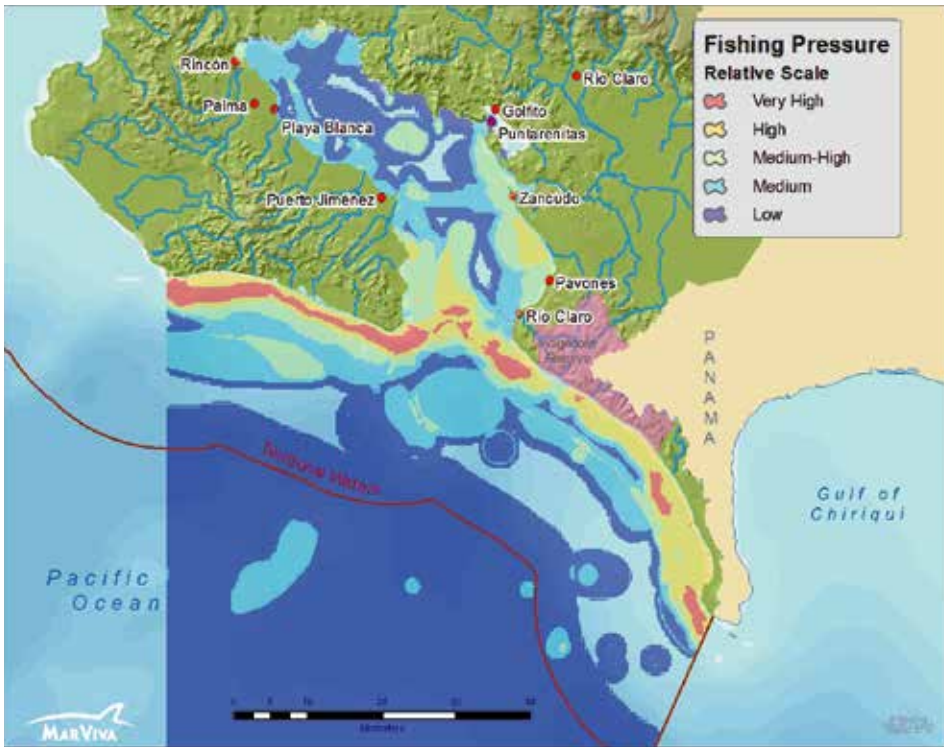
4. Cartographic Analysis of Uses

The uses identified and their corresponding values can be represented on a valuation map of uses. The uses identified and characterized are entered with their corresponding valuations into a Geographic Information System, a tool that facilitates the translation of all this information into an integrated map output. Figure 9 is a map that illustrates the valuation made for the category of fishing use in the southern Pacific of Costa Rica. Those sites identified with the color red indicate the location of fishing sites of greater importance according to the criteria used in the valuation.

How does the area of analysis look now?

Figure 9

Valuation map of fishing use in the southern Pacific of Costa Rica



D. Overlap of uses and habitats

In this stage of the process, detailed information has been obtained about the uses as well as the habitats within the area of analysis. The information accumulated for preparing the different maps offers criteria for understanding the importance of the uses and habitats that converge in this area. But management planning seeks to maximize the sustainable use of an area, reducing conflicts among the desired uses in an area as much as possible. It would then be interesting to determine the extent to which the uses identified can coexist and how much these uses affect existing habitats. Carrying out this analysis and simultaneously incorporating all the uses and habitats identified can become very complex and complicated. There are analytical methods and systems that can carry out these complex analyses (http://www.ebmtools.org/); however their use can be difficult in many institutions that do not possess the information or the technology required by those systems.

How does the area of analysis look now?

A more simplified way of carrying out this analysis is presented below. Those sites in which the most important uses (with the highest valuations) and habitats converge are selected for further analysis. A similar analysis can be done between any combination of uses and habitats where interest exists. The information can be summarized on a map that shows the overlap of uses and habitats.

Figure 10 shows the overlap between habitats with high levels of primary productivity and recreational fishing in the southern Pacific of Costa Rica. This type of map allows the identification of areas, as in the internal part of the Gulf or to the south of Río Claro, where recreational fishing is done in sites with high productivity.

E. Analysis of compatibility between habitats and uses

The fact that two uses converge in an area or a habitat overlaps with some use does not necessarily mean that there is some kind of conflict. Therefore, it must be determined whether there is compatibility among overlapping uses and habitats or whether this overlap creates important conflicts.

The effect of the uses on a habitat depends on the characteristics of the use as well as those of the habitat. The practice of trawling will not have the same effect on a muddy bottom that it has on a coral reef. At the same time, the practice of diving on a coral reef will not have the same effect as the practice of trawling on one. In those areas of overlap that are of interest, it is therefore critical to carry out an analysis whereby the characteristics of the habitats are compared with the characteristics of the uses, to determine the level of compatibility or incompatibility between the two.

How does the area of analysis look now?

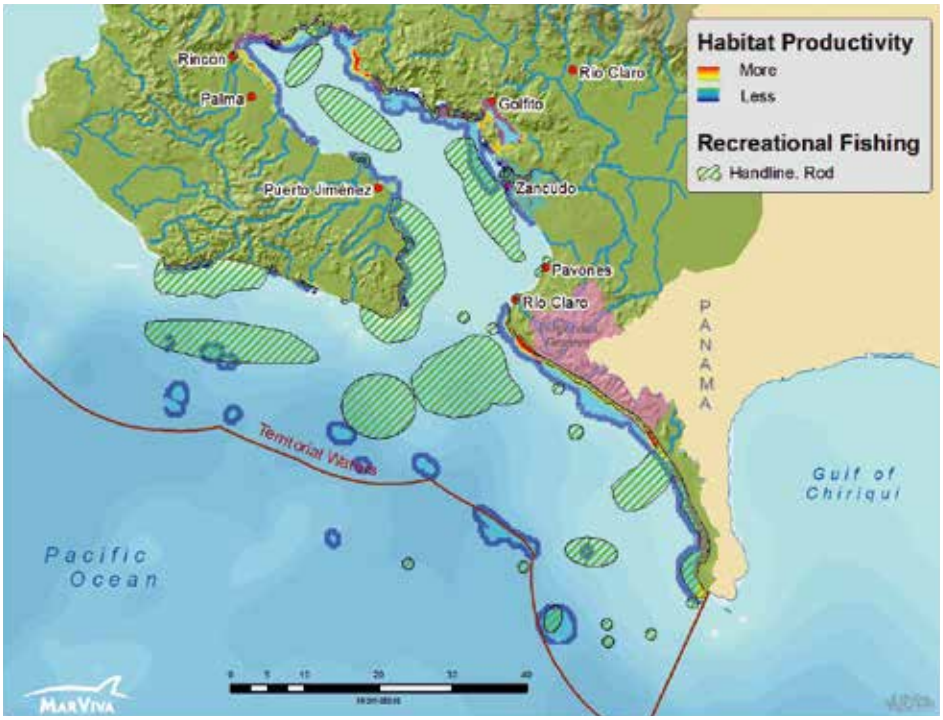


Figure 10

Map of overlapping uses and habitats Of the southern pacific of Costa Rica

This analysis should evaluate how fragile the habitat is against the pressure of the overlapping use. Criteria must be developed to assess the capacity of the habitat to tolerate the use as well as the magnitude of the pressure generated by the use. One example of this kind of criterion and its possible valuation is summarized in Table 5.

The use pressure that a habitat can tolerate will depend greatly on its level of stress, resiliency, degradation and/or accumulative effects[3]. A mangrove stressed by high levels of salinity is more susceptible to being impacted by logging than one that is growing in low salinity. A reef that is already degraded by fishing or sedimentation will tolerate fewer additional uses than one in pristine condition.

[4] Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions.

How does the area of analysis look now?

CRITERIA		DEFINITION	VALUATION	
HABITATS	Degradation	Current status of the habitat as a consequence of degradation by anthropic activities (sole or cumulative effects). More degraded habitats are more susceptible to further pressures.	Very high High Medium Low Very low	10 8 6 4 2
	Resilience	Capacity of a system to withstand disturbances	Very low Low Medium High Very high	10 8 6 4 2
	Level of environmental tension (stress)	Natural conditions of the habitat itself that "stress" the communities present (e.g. higher levels of "natural" sedimentation or salinities).	Very high High Medium Low Very low	10 8 6 4 2
ANTHROPIC ACTIVITIES	Intensity	Quantity, volume, weight, users or other variable that helps measure the size or extent of the activity.	Very high High Medium Low Very low	10 8 6 4 2
	Frequency	Regularity with which the anthropic activity is practices	Permanent 9-11 months of the year, daily 6-8 months of the year, regularly to frequently 2-5 months of the year Sporadically	10 8 6 4 2
	Extension	Proportion of overlap between the anthropic activity and the habitat	>75% of the area 55-74% of the area 35-54% of the area 15-34% of the area 5-14% of the area	10 8 6 4 2
	Number of trophic level affected	Number of links or trophic levels that are affected	Four or more levels Three levels Two levels One level No level (activity not extractive nor additive)	10 8 5 2 0

Table 5

Criteria for the valuation of the fragility of a habitat and the pressure exerted by a use

How does the area of analysis look now?

Anthropic activities might impact the habitat depending on its extension, frequency or intensity. A use that overlaps with most of the habitat present and also has a high number of users all year long produces a greater impact than a use that only overlaps with a small part of the habitat, involves a small number of users and only occurs for one month of the year.

The Experts Panel can add or subtract criteria that facilitate valuation of habitat fragility or use impact. Particular attention should be given in the analysis to the impact of cumulative effects on a given habitat (Gilliland, P.M. et al. 2004).

Each criterion will be assessed by an Experts Panel through a scale of subjective values that may vary between criteria. The Experts Panel must justify the score assignment made in each one of the criteria.

In applying a valuation to the criteria selected, a quantitative measure is obtained on habitat fragility and the pressure exerted by the use. It must next be determined whether the level of habitat fragility is compatible with the level of pressure exerted by the overlapping use.

The use of compatibility matrices or graphs are simple techniques that help identify and categorize those activities that could be compatible, that could be compatible under management measures, or that are completely incompatible.

A compatibility graph is presented below between several levels of habitat fragility and use pressure (Figure 11). A compatibility matrix is presented in the next section (Figure 14).

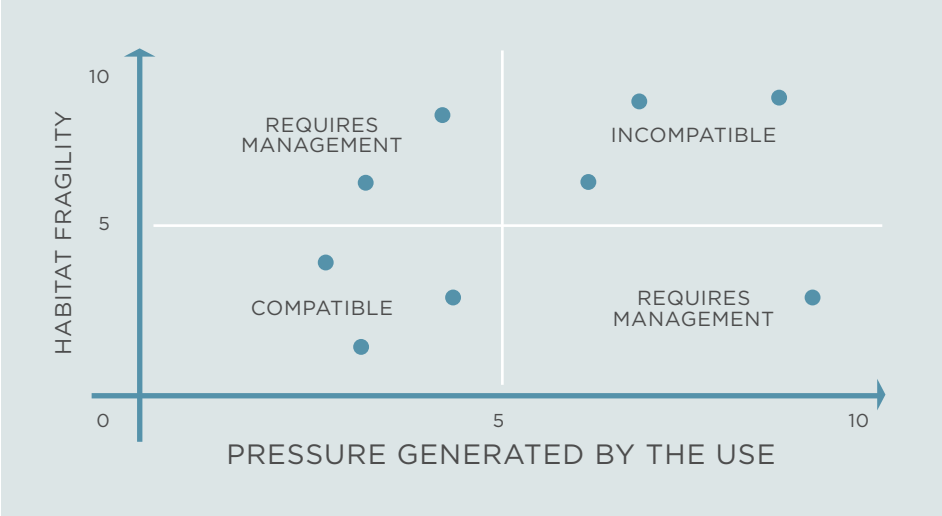


Figure 11

Compatibility of habitat fragility and use pressure (each point represents the combination of the pressure generated by a use X in a habitat with fragility Y).

How does the area of analysis look now?

Combinations of low habitat fragility values and low use pressure values are generally compatible, whereas combinations of high habitat fragility values and high use pressure values are not compatible. Combinations with intermediate values require management measures to make the desired use compatible in the selected habitat.

In those sites where habitats and uses of importance or interest converge, it can then be determined whether the use-habitat combination is compatible, incompatible, or requires some form of management (e.g. reduction in the number of users or in the spatial extent of use) to achieve compatibility.

In addition to having data on the compatibility (or incompatibility) between uses and habitats, this relationship can be expressed in a compatibilities map between habitats and use (Fig. 12).

This map allows easy identification of the areas with the greatest conflicts between them, in this case, bottom-line fishing and important habitats for different species. The map shows the level of incompatibility between the uses and the habitats.

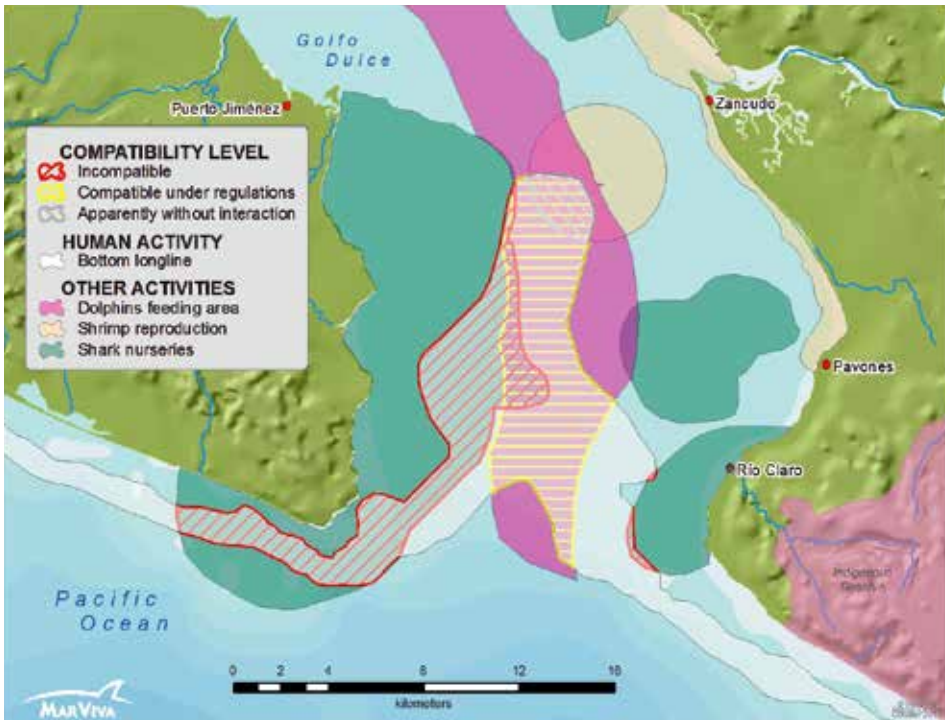


Figura 12

Map of compatibility between bottom-line fishing and three important habitats (feeding grounds for dolphins, shrimp reproduction and shark nursery)

How does the area of analysis look now?

F. Analysis of compatibility between uses

In addition to the analysis of compatibility between habitats and uses, an analysis of compatibility among different uses is also necessary. Some uses can occur in the same site without relevant conflicts occurring between the two. There are, however, uses that compete for the same resource, or ones that affect another use in a way that the two cannot co-exist.

From the map of uses generated previously, those sites where two or more uses of interest converge can be identified. Two activities present at a site can be completely compatible, compatible under some regulation or totally incompatible. The level of compatibility will depend on the characteristics of each use.

In the case of incompatibilities, determining the directionality of this incompatibility is relevant. If the occurrence of use A can affect use B, but the occurrence of use B does not affect use A, this is a case of uni-directional incompatibility; in cases where the occurrence of use A affects use B, and the occurrence of use B affects use A, this is a case of bi-directional incompatibility.

In the case of compatibilities requiring regulation, the goal of any regulation would be to reduce the impact of one activity on the other to achieve greater compatibility between the two uses (i.e. reduction in the number of vessels or type of gear in the industrial fleet to reduce its impact on the artisanal fleet).

Generally the incompatibility between two uses can be evaluated in the light of at least two main criteria:

a) One use competes for resources on which another depends, for example, biological (fish, crustaceans), landscape, mineral or quality water resources.

b) One use physically impedes the development of the other use, for example, it uses nets that interfere with another use, it uses

How does the area of analysis look now?

infrastructure or is located in sites where the mobility of the other user is hampered, or its activity destroys nets or structures used by the other user.

An Experts Panel can analyze these criteria for any pair of uses and determine the degree of compatibility between them. It will be the Experts Panel that determines the valuation for each one of these criteria based on the information available, the relative weight to be given to each one of these criteria, and whether or not to include any additional criteria. With the valuation assigned to each criterion, a weighted average is obtained for the compatibility of two uses.

Table 6

Possible analysis of compatibility (uni-directional) between hypothetical use A and hypothetical use B

CRITERION	VALUATION	POINTS
A competes for resources of B	Competes a lot Competes somewhat Competes a little Do not compete	4 2 1 0
A physically impedes B	Greatly affects Somewhat affects Slightly affects Does not affect	4 2 1 0

Table 6 gives an example of a possible analysis of uni-directional compatibility between uses A and B based on the two criteria discussed.

In this example, a subjective numerical scale was used in which the weighted valuation would help classify the relationship between these two uses in four valuations. If the weighted score reaches a value of 4, the two uses are clearly incompatible; if it reaches a value of 2, they are compatible under some kind of regulation; if a value of 1 is obtained the uses are compatible; and if a value of 0 is obtained, there is no apparent relationship between the two uses.

The overlap of uses and their compatibility levels can be presented in maps that would readily allow identifying and locating conflict areas (Fig. 13). This feature will help in the analysis, discussion and search for possible solutions. In Figure 13, it is obvious that some areas used for whale watching are incompatible with existing navigation routes and trawling areas.

How does the area of analysis look now?

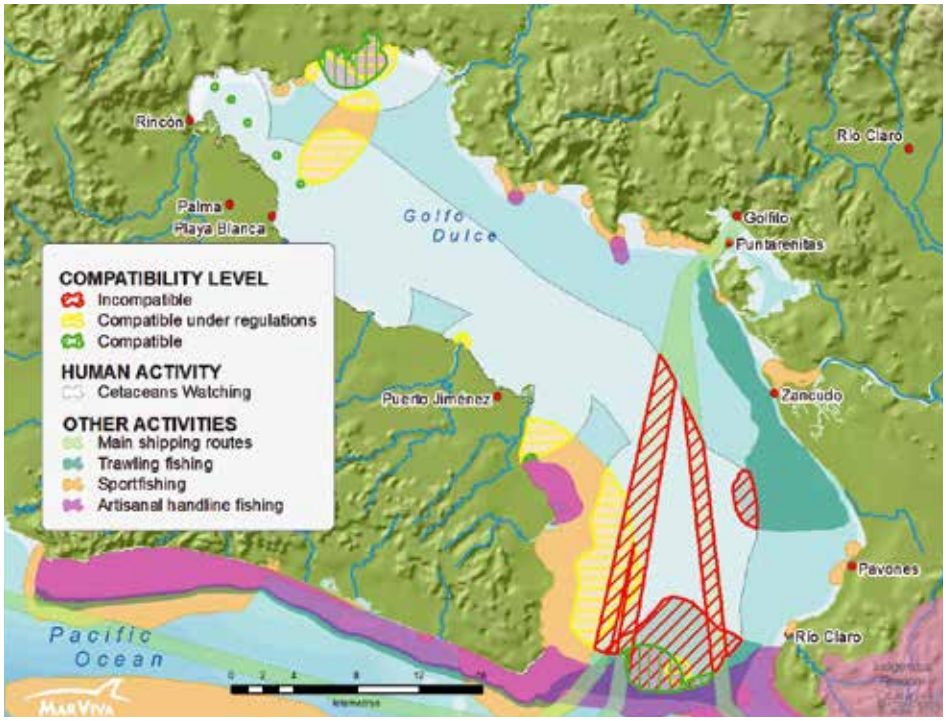


Figure 13

Overlap analysis of whale-watching activities and other uses indicating use compatibility levels on the south Pacific coast of Costa Rica.

At sites where a simultaneous analysis of the compatibility of multiple uses is desired, matrices or graphs for compatibility are highly useful. The relationships between any pair of uses can be presented in the matrix, facilitating rapid appreciation of the pressure generated between different uses.

Figure 14 presents a matrix of compatibility for multiple uses that occur in Golfo Dulce, Costa Rica. Many uses are represented in this format, which allows rapid identification of those activities that can be compatible, compatible under regulation or completely incompatible, or those uses that are incompatible with a large number of uses. For example, this figure clearly shows that trawling and the transit of large vessels are incompatible with many other uses in the area.

How does the area of analysis look now?

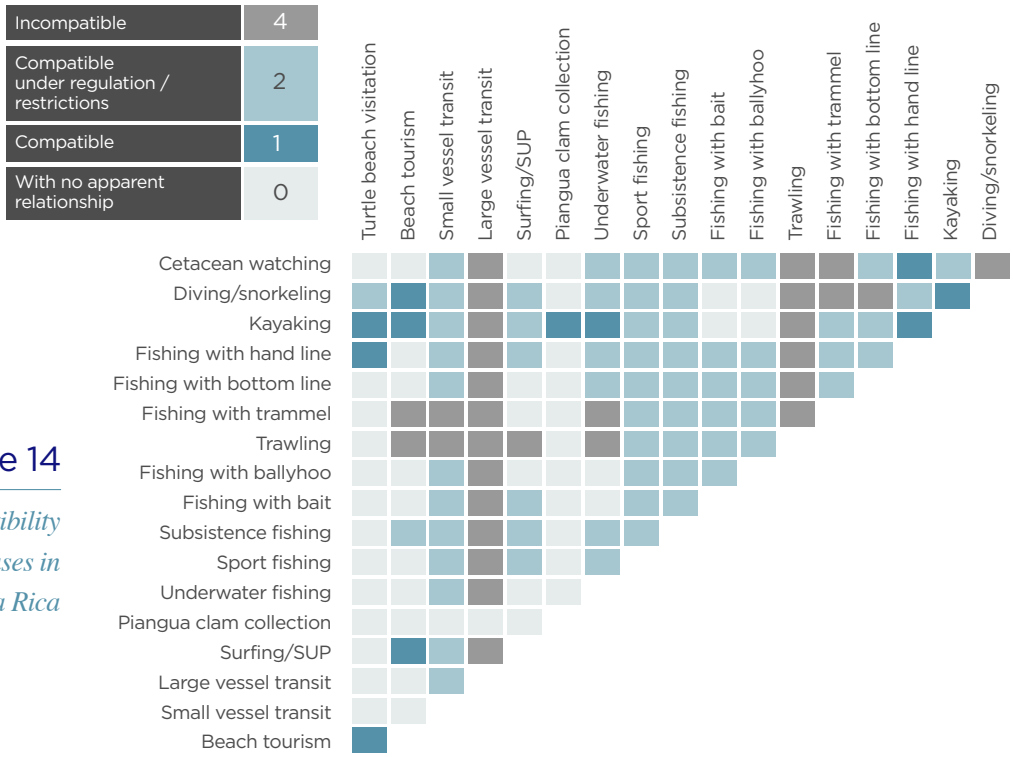


Figure 14

Analysis of compatibility among uses in Golfo Dulce, Costa Rica

G. Regulatory Mapping

Analyzing the existing regulatory framework that affects the area is relevant to understanding which regulations affect the uses that are carried out in the area. These regulations include: closed fishing seasons or restrictions on the use of certain fishing gear, navigation routes, military use areas with restricted access, etc.

Legal regulations related to management practices, spatial as well as temporal, must be identified and mapped if possible. Often the spatial dimension of the legal regulations and management agreements are not sufficiently explicit. The mapping of these regulations helps elucidate the specific spatial coverage of the existing regulatory framework.

Figure 15 gives an example of a map of the regulatory framework that affects the marine waters of the southern Pacific of Costa Rica, with respect to fishing use of the area. The map gives the regulations for long-line, purse seine and trawling fisheries, as well as the boundaries of the Marine Protected Areas (MPA) and the Marine Areas for Responsible Fishing (MARF).

How does the area of analysis look now?

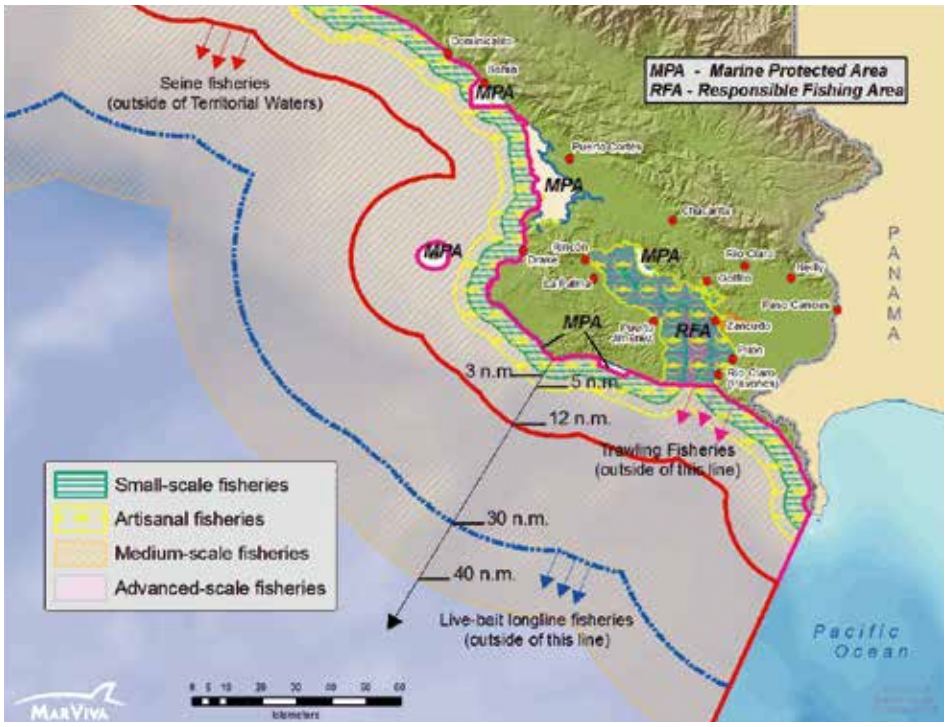


Figure 15

Map of fishing regulations in the southern Pacific of Costa Rica-2011

The comparison of the map of uses and the map of the legal regulations in a given zone allows the rapid identification of sites where certain uses are occurring in violation of the existing regulatory framework. This conflict between uses and regulation can easily be represented on a map of conflicts. Of particular interest will be those sites where overlaps occur between uses of high importance and use prohibitions.

Figure 15 shows that trawling activities (green zones) are taking place in areas that restrict this use (behind the purple line). Moreover, gill-net fishing (cross-hatched areas) is taking place within marine protected areas (white zones).

This kind of information will be the basis for determining whether new regulations, reforms to existing regulation or greater efficacy in the enforcement of current regulations are necessary.

How does the area of analysis look now?

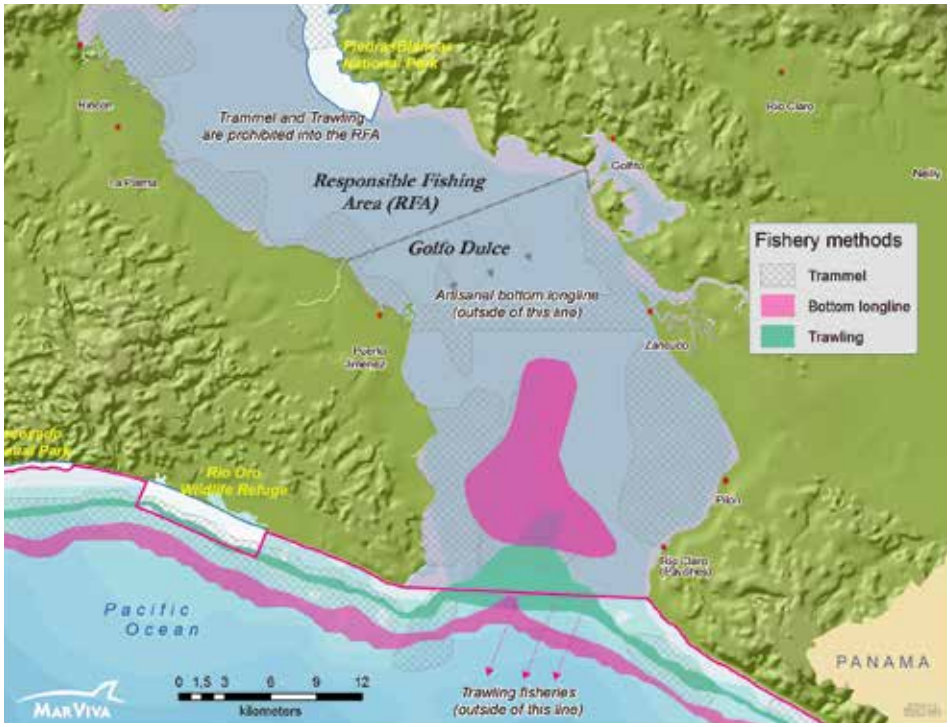


Figure 16

Conflict identification between existing uses and the regulatory framework in the South Pacific region of Costa Rica

H. Integral analysis of the area targeted for analysis

During this process, we have obtained a good response to the question: **How does the area of analysis look now?.** We have identified, located and characterized the habitats present in the area and determined which ones are the most important. Similarly, we have identified, located and characterized the real uses (not perceived ones) and their social and economic importance. We have also come to understand how the uses and habitats relate to one another and to what degree these can co-exist in a given site. Additionally we have formed a clear idea of the impact that the uses have on the habitats identified and how these habitats react to the uses. Finally, we now understand the extent to which the existing regulatory framework is being respected in the area and whether additional regulation should be generated or reformed.

It is highly relevant that this process has been carried out under an integral vision, where multiple uses and habitats have been analyzed jointly,

How does the area of analysis look now?

identifying the location of the three most relevant kinds of conflicts: conflicts between uses, between uses and habitats, and between uses and regulations.

Before continuing further in the MSP process, it is essential that all this information be analyzed, synthesized and shared among the different sectors with interests in the area. A communication process with the generation of materials suitable for the different target audiences and workshops for discussing and refining the conclusions generated by this analysis should be promoted. All sectors must be familiar with the synthesis of this analysis before proceeding with the construction of future scenarios.

Chapter IX

How do we want the area of analysis to look in the future?

How do we want the area of analysis to look in the future?

IX.

MSP is not a diagnosis of the present conditions and existing conflicts within the area of analysis, it is above all a process to develop and implement an agreed future scenario. It is mainly driven by the answer to the question: **How do we want the area of analysis to look in the future?**

Knowing the present conditions of the area and understanding the present interactions among users and habitats is a fundamental first step, but new key elements need to be added to the process. Trends in current uses, climate change impact on existing habitats and new potential uses likely to be generated in the area of analysis are some of the elements we need to understand before agreeing on the desired future status of the area.

The future status of the area of analysis will depend, in part, on the goals that each sector has for the area; in turn, these depend a great deal on the vision and values under which each sector develops its activities. At the end of this stage, it must be understood how the prospects for growth of the different sectors will be accommodated within the area of analysis. It needs to be kept in mind that this is an area where external environmental factors, such as climate change, will also affect the future conditions of the existing habitats, since decisions made today are done in the context of a changing natural environment.

The number of years for which the status of the area should be planned will depend on political and institutional realities, the amount of information and the degree of uncertainty in the work context. In most areas of analysis, there are high degrees of uncertainty, scant information and weak institutional frameworks, therefore relatively short terms are recommended. Periods of around five to ten years are typical in most of these efforts.

The construction of a future scenario is based on six main steps for analysis:

How do we want the area of analysis to look in the future?

A. Determination of Social Values

It is critical to identify and agree on social values that will govern the process of generating a future scenario for the area. Topics such as the right to a healthy environment, living within environmental limits, the sustainable generation of wealth and development, solidarity and the equitable division of resources, should be discussed at this stage.

Through discussion workshops, the multi-sectorial team will reach an agreement on the values that govern the management of the area and will obtain commitments from the sectors to be governed by these values throughout the process of defining and implementing the marine spatial management plan.

B. The Generation of a Joint Vision

Building a shared vision, based on the predominant values, is a necessary step. A vision includes not only what the different sectors want, but also what is possible under existing political, environmental and socioeconomic conditions. Participants must recognize the human, technological and environmental limitations that the area imposes on their aspirations.

Most of the exercises to generate a vision conclude with an inclusive vision, where elements of production, recreation, conservation and security are combined in the same area. A vision where the multi-sectorial team agrees that they want to have "productive, biologically diverse, healthy and safe seas" is one of the typical results.

The achievement of this agreement, however, demands a mature discussion where each sector recognizes the right of another user to co-exist within an area, so long as that activity is not in conflict with the accepted social values.

This process can benefit from an analysis on national policies related to the sea and its resources. Although many countries of the region do not have integrative marine polices, sectorial policy analyses for fishing, tourism and/or navigation may aid the process.

How do we want the area of analysis to look in the future?

The multi-sectorial team's discussion at workshops should produce an integrated vision. The skill of the facilitator in these workshops is critical at this stage. The multi-sectorial team will benefit from the support of specialists in directing these kinds of discussions, similar to those exercises held in other planning processes.

C. Construction of the Map of Aspirations

Based on the values and vision decided, the different sectors must transfer their goals onto maps that delimit their aspirations in the use of the marine space.

Where will they want to fish in the future? How and where will they want to expand tourism operations? Where do they want to declare marine protected areas?

Before developing a "map of aspirations", several operational principles should be agreed upon at the onset. Such operational principles usually deal with biophysical, socioeconomic and cultural factors that would influence the construction of the map. While none of them have been developed in the Latin American region, we can use as a guide those developed by the Great Barrier Reef Marine Park Authority (in Australia) related to the establishment of no-take zones within the planning area. In the case of socioeconomic and cultural factors they have used (BRMPA 2002 a) the following operational principles, among others:

i) No-take zones should be established to complement the human activities, opportunities and values in the region. This implies a consultative process, the recognition of traditional owners, the protection of areas that the communities recognize as having special value (biological, aesthetic, cultural, historic, etc.), and the minimization of conflict with extractive uses.

ii) Communities should have a clear understanding and recognition of the social costs and benefits of establishing a no-take zone. This would include the concept of spatial equity of opportunities for the different sectors of the community, a clear understanding of the planned activities within the area and the requirements for its monitoring.

How do we want the area of analysis to look in the future?

iii) No-take areas should be part of existing management arrangements (i.e. a proposed zoning plan), designed with simple shapes and clearly identified boundaries.

In the case of biophysical operational principles the BRMPA (BRMPA 2002b) includes the following:

i. No-take areas should have a minimum distance across of no less than 12.5 miles. This minimum distance would ensure maintenance of populations and reduce edge effects. It is better to have a few large areas than a larger number of smaller areas.

ii. Replicate no-take areas within a region to reduce risk and allow connectivity.

iii. Reefs are integral biological units. Splitting them into no-take and take zones is detrimental for the whole unit. Maintain the whole reef within the no-take area.

iv. Represent at least 20% of each community within the no-take area network.

The multi-sectorial construction of a "mosaic of aspirations" can be generated using a methodological process similar to that used to generate the map of current uses. Locating the aspirations for use on a map allows us to identify future demands for space that will be created and those sites where two or more future uses might overlap.

At the same time it must be recognized that many existing uses could continue to grow, demanding spaces that are not currently occupied. An analysis of the trends and future demands of that growth then becomes imperative. The analysis of driving forces (the next step) complements this trend analysis.

Related activities may result from increasing existing uses. For example, an increase in tourist visitation could require the construction of a dock, more urban development, water treatment plants, etc.

This process allows us to translate in space and time the future space demands that users will have according to their goals.

How do we want the area of analysis to look in the future?

Several analytical techniques based on the development of predictive models can be used to analyze future trends (http://ebmtoolsdatabase.org/). If one has the means and the information, these analytical techniques can be extremely useful.

However, maps of future uses can be used to show the sites that each sector aims to use for its activities, employing techniques similar to those used for the determination of current uses. Participatory mapping and Expert Panels offer rapid results without having to rely on complex analytical processes and modeling.

In Figure 17 we represent a hypothetical map showing the likely aspirations on space demands by different sectors with activities in the southern Pacific coast of Costa Rica. Obvious overlaps on the future distribution of uses (e.g. trawling and protected areas) would generate significant conflicts among different sectors in this area

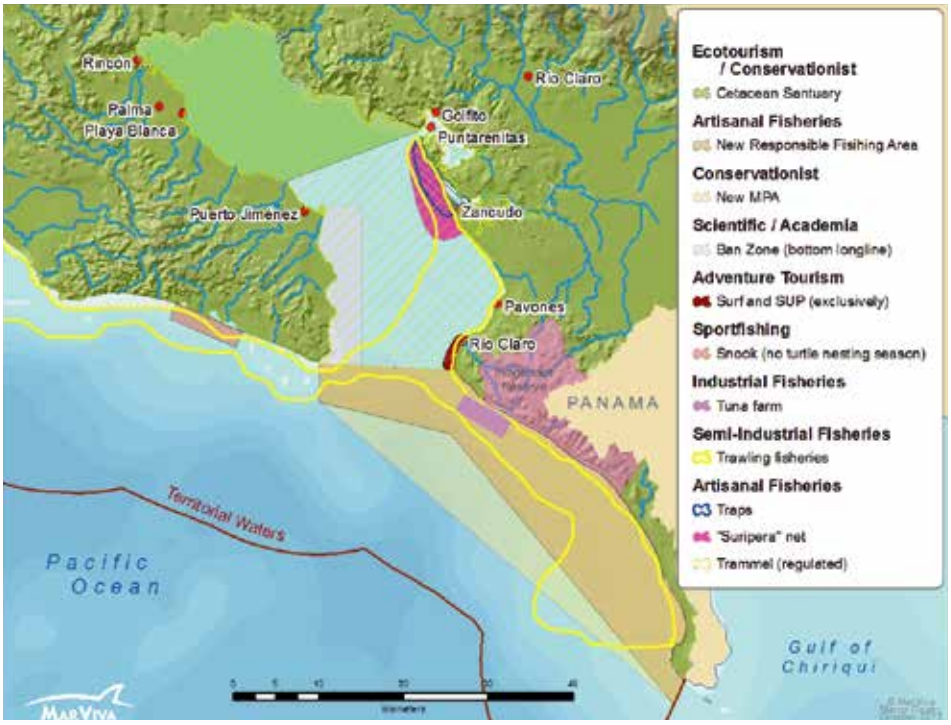


Figure 17

Spatial representation of different user aspirations regarding space demands in the future.

How do we want the area of analysis to look in the future?

D. Analysis of driving forces:

Understanding the goals, values and principles desired by the different sectors should be complemented with an analysis of the forces that may generate changes in the future; whether they are environmental (e.g. climate change), social (e.g. market forces) or technological (e.g. new technology). This analysis will support the construction of the future state of human activities and habitats within the area, adding factors beyond the aspirations of each sector.

The Panel of Experts can contribute much to this process by offering information on possible changes that will occur in the area in the next five or ten years. Technical information on the effects of climate change within the area, the reactions habitats may have to those changes, the implications for the infrastructure of the area, and expected uses, among other topics, should be analyzed. The habitats present are being affected by current uses but they will also be affected by the growth of those uses that remain or new ones that are developed in the future. What will be the changing trends in the habitats of the region, stemming from changes in current uses or the appearance of new uses in the area? In addition, changes in the surrounding environment, such as climate change, sedimentation processes or changes in sea level can affect habitats and future uses. How will the habitats in the area respond to these environmental changes?

Combining the analysis of driving forces with the "map of aspirations" can help generate a good approximation of the location and extent of the future uses and habitats within the area of analysis.

E. Identification of conflicts and compatibilities between goals:

Having an idea of the future status of the uses and habitats in the region allows us to identify future conflicts or compatibilities.

Analytical tools such as Sea Sketch, Mapmaker, etc., (http://ebmtoolsdatabase. org/) are very useful in the process and they should be used if possible.

How do we want the area of analysis to look in the future?

But using the same tools that were used to determine the compatibility between current uses and habitats (Participatory Mapping, Panels of Experts, Compatibility Matrices, etc.), generate a good approximation on the types and locations of future conflicts in the area.

The early identification of future conflicts helps generate agreements and solutions during the planning process, long before the generation of future conflicts.

F. Negotiation among Stakeholders:

Identifying the current situation, analyzing trends in uses and habitats and identifying and characterizing the future sites of conflicts between uses and habitats will reveal weaknesses in the current management scheme and the challenges for achieving the agreed vision.

At this point in the process, it is clear that the stakeholders should initiate negotiations, since some of them may have to yield part of their goals in order to accommodate the aspirations of other users. Continuing with the activities of one sector may mean that another sector must reduce activities.

The negotiation process is facilitated if the parties succeed in clearly identifying those management measures and the geographic areas that provide the greatest benefit to stakeholders while achieving the minimum level of conflict possible. Similarly, the process is facilitated if we clearly achieve the cost that each sector incurs in accommodating the activities of another sector. Key tools at this stage are cost-benefit analyses and Alternative Resolution of Conflicts.

1. Opportunity Cost Analysis.

The interaction and interdependence among uses and habitats make it inevitable that conflicts will arise. Not every use or environmental service can be maximized simultaneously, so decisions must be reached where one use is preferred over another, one habitat service over a use, or a use over a habitat service.

How do we want the area of analysis to look in the future?

The central concept in a cost-opportunity analysis is that the simultaneous maintenance of uses and environmental services in an area has an inherent cost. Maintaining a given level of use has an effect on the level of environmental services the habitat provides, likewise, maintaining a given level of environmental services impacts the amount and type of uses that could be developed.

Based on the economic theory of production, the opportunity cost analysis recognizes that different levels of inputs generate different levels of products (Lester et al. 2012). For example, if a mangrove area (input) is reduced, there will be a reduction in coastal fisheries (product), or if the water quality (input) of a site is reduced, the number of tourists visiting the site (product) will be reduced.

To use this kind of analysis the amount of "product" that a use or habitat protection level would generate must be estimated for different management schemes and spatial locations. A fishery, for example, would vary its production depending on the management schemes (kinds of gear, number of fishers, number of tourists allowed, kinds of regulations, etc.), its location and spatial extent. A habitat would maintain a greater or lesser amount of environmental services (fish larvae habitats, water quality, etc.) depending on the intensity and number of activities carried out there, as well as the habitat location and extent.

The critical step in this process is to be able to estimate the quantity or degree of change that will result from any adopted management scheme: How much is this activity being reduced to favor the other activity? How much habitat is being lost to increase this use? Any sector in the negotiation wants to have a good estimation of the economic or ecological implications that the proposed scenario will have on their particular interests.

Although modeling tools are available, their use is not always practical. A Panel of Experts (including natural resource economists) can estimate the amount of "product" that would be generated under different conditions at one site or another, and under different management measures. Having a good idea of the estimated impact of each scenario, the multi-sectorial team must make the decision on which possible alternative interaction should be implemented. This process invariably involves reconciling positions that are often extreme.

How do we want the area of analysis to look in the future?

2. Alternative Resolution of Conflicts.

In the process of resolving, or at least reducing the conflicts, the stakeholders in the conflict (present or future) must feel as though they have gained something and obtained acceptable benefits. During this stage, the multi-sectorial team may require support from people skilled in conflict resolution, who can facilitate discussion and help the group generate proposed solutions.

At this point, it is essential that everyone understand that **interests are negotiated, not positions.** Interests are much broader than positions; therefore one should explore what they are, identify and prioritize them. Once interests are identified and analyzed, options for responding to the conflict must be sought. Solutions can be generated based on common interests for the two users or from the divergence of interests between them. These proposed solutions must be aligned with the values and the vision generated for the area targeted for analysis. A selected group of solutions, objectively formulated, with technical information and with a clear understanding of the economic, social and environmental consequences of their implementation, is what we call "scenarios".

G. Creation of Scenarios:

Through the process described above, alternative scenarios are generated whereby different ways of resolving future conflicts are proposed.

These scenarios are not necessarily extrapolations from current patterns; rather they may involve substantial changes in current use patterns. If two use trends (for example, establishment of marine parks and development of fisheries) have dominated the discussions in the spatial planning process, two extreme scenarios (one area dominated by marine parks versus one area dominated by fishery activity) can be generated, describing the "products" that each sector will have under each scenario. In parallel, two intermediate scenarios can be generated where the parks as well as the fishery activity coexist within the area of analysis, and similarly the "products" that each sector would generate in each case are described.

How do we want the area of analysis to look in the future?

It is important to remember that any scenario is based on a set of objectives, goals and assumptions about the future. The basis of the proposed scenario is a projection of the trends in current needs (spatial and temporal) of the users together with an estimate of their future spatial requirements as well as an estimation of future conditions of activities and habitats of the area.

One advantage of this process is that eventually there will be maps showing the future spatial distribution of the uses and habitats for each alternative scenario (Fig. 18). These maps generated using the same methods mentioned earlier will indicate not only the distribution but also the importance of the uses and habitats to be found in the future. The graphic presentation of the future scenario will facilitate discussions and decision-making.

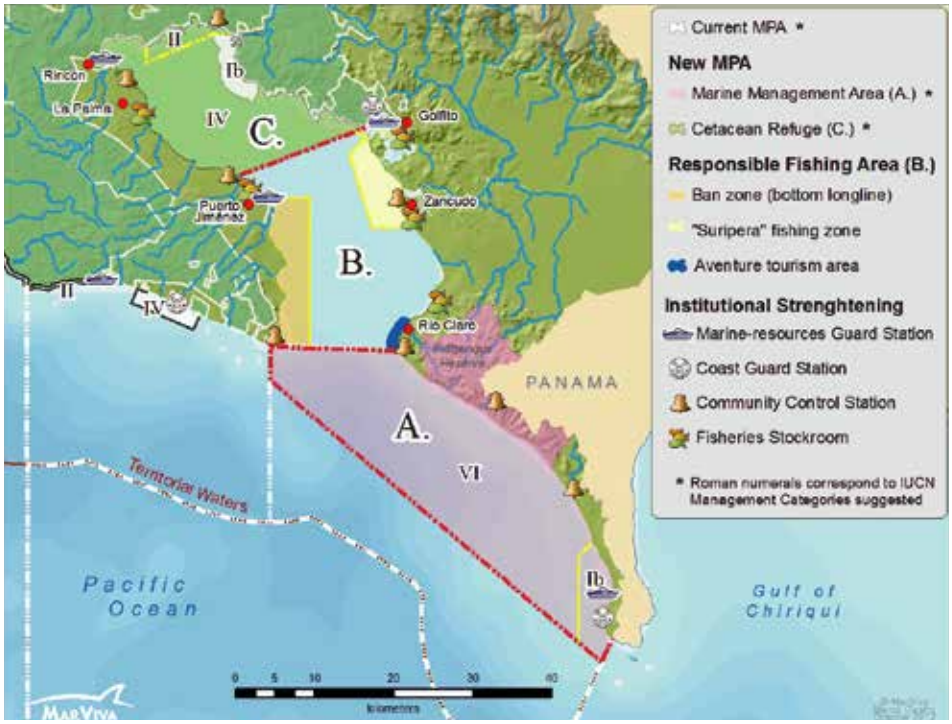


Figure 18

A hypothetical scenario for the southern coast of Costa Rica

How do we want the area of analysis to look in the future?

The multi-sectorial body might go beyond building alternative scenarios and actually decide to recommend one of the alternative scenarios for adoption. In this case, this multi-sectorial body needs to be sure that it has implemented throughout the process, a solid advocacy and communication program that would secure the political backing needed on its decisions. Eventually, it would be a state authority (if the multi-sectorial body is not) that will decide which scenario to implement. The existence of detailed cartography and analysis of the implications on implementing each scenario will make the decisions easier.

But here, a critical stage in the whole process is reached. MSP is a political process and if not conducted properly, the state authority might choose an alternative scenario not supported by the multi-sectorial body. Here a political (not technical) failure might be reached. An alternative scenario that is technically strong but weakly negotiated in political terms might be not feasible, representing a great waste of willingness, time and effort.

On the other hand, implementing a scenario solely on political terms, without taking into account the MSP process just finished, and the technical and sectorial input provided, might also be a failure. Those users involved in the process might feel deceived and will refuse to comply with the new regulations.

High levels of communication, with users as well as decision makers, are vital for the MSP process. Without them the process is certain to fail. The alternative scenarios generated should be discussed and validated by users and decision-makers. No surprises are allowed at this stage of the process.

Chapter X

How will we achieve the desired future scenario?

How will we achieve the desired future scenario?

X.

A future scenario is reached through the development and implementation of the marine spatial management plan. The development of the plan requires a high degree of interaction and coordination among state agencies with interests in the sea and in the particular area targeted.

This plan is not meant to substitute sectorial plans, but it represents a mechanism for integrating the different sectorial plans that pursue the comprehensive implementation of a common vision for the development of this area.

The plan must be backed by a clear declaration of a state policy that indicates what the state wants to do with the sea and its resources, what are the objectives sought and what are the public investments that will be associated with the implementation of this plan.

The multi-sectorial team that has led the scenario-building process so far will (in many cases) give up its leadership to the state organization or organizations that will implement the plan. Although some of its non-governmental members can support the implementation of some components of the plan, this is a state-driven process.

The key components of the plan include:

i. A clear presentation of the previously agreed vision for the area,

ii. A description of the strategic goals to be achieved. This stage is meant to generate specific and measurable objectives that seek economic development within environmental constraints, and promote good marine governance. Many of these objectives can be very specific (for example, having the infrastructure to promote commercial activity) or more general (the marine environment is used to maximize sustainable activities and prosperity for all).

The coexistence of objectives for production and conservation are typical in these processes (e.g. activities in the sea recognize environmental constraints and their social responsibility within the area). The more general the objective is, the more difficult the performance evaluation for the process will be. This is why the generation of specific and measurable objectives is recommended.

How will we achieve the desired future scenario?

iii. A definition of the administrative and management framework under which the plan will be implemented. In most cases, the implementation of specific components of the plan will be carried out through existing sectorial institutions.

Thus the framework and the inter-institutional cooperative agreements necessary should be clearly defined. In management actions, communication processes will be key for disclosing the plan and its progress in implementation to all stakeholders.

iv. The definition of the activities to be undertaken by each sector specifying where, when and how these activities will be carried out. Based on this definition, the regulatory framework may require reforms, so it will be necessary to design and carry out a process of regulatory reform. At the same time, many activities will benefit from the development of an incentive plan that would facilitate and motivate users to adopt new regulation.

v. A description of the zoning plan to be implemented, indicating the location of the main uses (including habitat conservation) to be developed in the area. The zoning plan can include tri-dimensional zoning aspects, such as deciding to zone the water column at certain sites or to separate benthic environments from pelagic ones. Temporal zoning can also be described, when the distribution of uses varies seasonally.

vi. Environmental impact assessment, although included in the previous stages of the methodology, can be a formal requirement in many countries, so there must be compliance with the development of an Environmental Impact Study, which should pay particular attention to the generation of cumulative impacts in the habitats of the area.

vii. The public sharing of the plan, even if not a formal requirement in some countries, it is a highly recommended stage. The plan should be presented at public hearings aimed at different affected sectors. Different stakeholders and state institutions that will be involved in its implementation should be able to review and validate the plan before its implementation. Once all the required state authorities have approved the plan, its implementation can begin.

How will we achieve the desired future scenario?

The implementation of the plan is one of the biggest challenges of the process. Merely establishing regulations does not change people's behavior, even in participatory processes like these. There are no "recipes" for the implementation of the plan, but there are key elements for its success.

Its development through a participatory process ensures a significant commitment from many sectors. However, maintaining a high level of awareness among users is essential. Communication campaigns for this purpose should be part of the Implementation plan and must be maintained throughout the implementation phase.

While different kinds of incentives should be developed during the implementation of the plan, market forces, through the development of value chains, for example, are powerful allies in the implementation phase, and they emphasize the concept that production can be achieved sustainably. Building or strengthening a range of coastal and marine services or products with criteria for environmental responsibility that would generate greater income for the sector have been achieved in diverse artisanal fisheries.

Such schemes relieve the financial burden in the process of implementing the plan. Market forces, properly regulated, encourage users to comply with criteria for sustainability, if the market recognizes these. Programs for community control and surveillance have been successful in many areas of our region. Hotels and restaurants financially support beach cleanups and marine parks. The same users oversee the proper management of the area and its resources, since their conservation benefits them economically.

How will we achieve the desired future scenario?

Value Chains in the Implementation of the Management Plan






The economic activities of coastal communities are linked to local, regional and international markets. Ensuring that the commercialization of these products complies with sustainability criteria not only helps the implementation of the spatial management plan but opens a commercial advantage to the communities themselves. Products and services generated under sustainability criteria can secure higher prices in the national and international markets. This advantage is an important incentive for users of the area that become highly interested in the proper management of the marine resources.

The implementation phase of the spatial management plan needs to develop this type of process. Supporting the development of value chains between the local markets and their national and international buyers, assisting in marketing activities and even the design of alternative businesses, are strong allies in the implementation of the Spatial Management Plan.

Chapter XI

How do we ensure that our proposal is achieved?

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Evaluation is an essential step in the marine spatial planning process. Establishing aspirational goals and measurable objectives is critical to the plan. Users must be able to determine whether progress is being made in achieving the goals, objectives, and vision. Therefore, it is important to establish important but achievable goals, objectives and indicators from the start, to maintain enthusiasm and interest in the process.

The establishment of monitoring and evaluation processes is critical at this stage. These should assess the status of the resource and the environment during the implementation of the plan, but at the same time, they should evaluate the results of the management measures that are being applied. Determining whether the changes expected are being achieved is critical to the survival of the plan. Are socioeconomic conditions in the coastal community being improved? Is the reef in the bay undergoing recovery? Has fishery income improved?

The generation of a baseline for those indicators used should occur right at the beginning of the implementation of the plan. The quality of the data used in this evaluation stage should be carefully considered. The use of concrete and specific measurable indicators, economically viable for implementation, is critical at this stage. Performance indicators should be defined once a scenario is selected for implementation and the responsibilities and functions of the implementing agencies have been assigned. The information and analysis necessary for determining any amendments must be provided.

The users themselves should be implementing many of these monitoring processes. Not only do these schemes cost less, they also play an important awareness-raising role, since it is these same users who will take the pulse of the status of the resources or perform the management measures. For example, participatory fisheries monitoring is an ideal choice for the production of fisheries information.

Preferably the institutions responsible for the implementation of the plan will not be part of any evaluation of monitoring information, but they should insist on having a third party do it and they should support the adaptation of management measures and the ongoing process of improving the overall management plan. The evaluation report should be concrete and aimed at those who make decisions. At the same time it should be widely known by all stakeholders in the area. Based on the evaluation of the results, changes and adjustments to the management plan will arise that should be implemented.

XI. How do we ensure that our proposal is achieved?

Evaluating and Monitoring

Monitoring is a fundamental component of the MSP process. Changes in the habitats and uses within the marine management area will be occurring during the implementation phase of the process. How big are they and how much are affecting the goals and objectives previously established is critical information for the MSP process. Also monitoring can provide information on how well are resulting the measures established in the management plan. This might result in adaptation measures designed to cope with the detected changes in the political, socio-economic or ecological environment. Adaptive management is a key component of the MSP process and it is sustained by the monitoring activities that should start even before the implementation of the spatial management plan.

The marine spatial planning process has been conceived as a dynamic and adaptive process. This means that work will be done with the best information available at the time and as one moves into the processes and knowledge of a site, improvements to the spatial management plan will be implemented. It is a continuous and adaptive process.

Chapter XII

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Literature Cited

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