

NOAA Project Final Report

I. Title: “Definition of a Network of Marine Protected Areas in the Continental Caribbean of Colombia”.

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II. Abstract

Socioeconomic information as well as normative and legislation framework related with protected areas in Colombia was reviewed, analyzed and integrated to the ecological information available for marine and coastal priority conservation sites, proposed to be part of the MPA network of the Caribbean of Colombia. A proposal of categories of management for each of the sites was developed through the integration of this information and discussed with communities and stakeholders from two different localities in the Caribbean of Colombia. Participative tools, surveys and secondary information were used to estimate the adaptive capacity of the community to the eventual establishment of a MPA.

III. Executive summary

Although nearly 50% of the national territory corresponds to marine areas of the Caribbean and Pacific seas, only 4.4% of the terrestrial and marine territory is included inside the National Natural Parks System-SPNN under some conservation category, and only 1% of this protected area corresponds to marine and coastal areas. However it is the Biosphere Reserve “Sea Flower” in the Archipelago of San Andres and Providencia in the Caribbean, which account for the 30% of the marine territory of Colombia. With the objective of establishing a MPA Network that represent the largest marine and coastal biodiversity of the country and guarantee connectivity, resilience of ecosystems and satisfy socioeconomic necessities of communities, different efforts have been developed to identify priority conservation sites that fulfill these requirements. The specific objectives of this study were to: 1. Select priority conservation areas that fill ecological, social, and economic requirements to conform a Marine Protected Areas Network in the Continental Caribbean of Colombia; 2. Examine the national legal framework available for Marine Protected Areas to find tools and gaps to develop a strategy, which allows declaring, establishing,

implementing and managing a Marine Protected Areas Network in the Continental Caribbean of Colombia; 3. Define the MPA category classification for each of the places selected for the network in agreement with biodiversity conservation requirements and stakeholders, indigenous groups and local communities necessities and 4. Involve representative actors present in the study zone in the whole process of defining the MPA network.

The results from the marine and coastal conservation priorities exercise (Alonso et al, 2007) and conservation Gap Analysis of the marine biodiversity from Colombia (Alonso et al, 2008) were used together with ecological criteria to select priority sites, the most important to marine and coastal biodiversity conservation, that could be part of a MPA network of the Caribbean of Colombia. Although ontogeny studies are still needed to understand ecosystem connectivity, a preliminary analysis of connectivity was pursued using criteria as distance between sites, oceanographic currents and life cycles, widely described in literature (Roberts and Hawkins; 2000, Mumby, 2006; Palumbi, 2004). Surveys and participative tools were carried out in three regions and 7 different villages of the Caribbean of Colombia, through 12 workshops with stakeholders and communities to evaluate socioeconomic viability of these sites as MPA. The information obtained was used to estimate the adaptive capacity of communities to the eventual establishment of a MPA. This estimation included socioecologic, socioeconomic and institutional indicators (McClanahan, 2008; Moreno et al, 2009). Due to social and institutional conflicts in Darien Region was not possible complete the activities to estimate the adaptive capacity. However, from secondary information obtained through workshops and surveys it was found a high potential to establish a MPA in this zone when conflicts will solve and communities empower. From the viability analysis it was found that to establish a MPA in this zone will need to promote economical activities with indirect use of natural resources and establish a strong control over illegal industrial fishing in the area.

During the development of this project two new regional areas were declared in Sucre with a significant contribution to the MPA network. The socioeconomic analysis in this zone shows that there is an important social and institutional capital which means an important strength to the conservation objectives. However the level of industrial and tourist development of this area and the high dependence of communities of natural resources limits the use of restricted management categories. The priority conservation sites in this area are already protected with the declaration of the new regional areas created last year.

With respect to the last region “Baja Guajira” the results show that the adaptive capacity of communities in this region is medium to high level and the establishment of a MPA in this zone will require improving communities working capacities.

The national legislation available in the country with respect to marine conservation strategies, as well as the legal framework for other countries, was reviewed to make an approach to find strategies to declare and manage marine protected areas in Colombia. As a result of the integration of socioeconomic and ecological criteria and

the results of the legal framework's approach, a proposal of categories of management for each of the 37 priority conservation sites was obtained in agreement with conservation objectives of the National System of Protected Areas. Stakeholders were involved in the whole process during the project, taking part in workshop preparation and activities developed. Regional and local authorities as well as NGO's, Institutions and some industries were also involved through the activities of workshops where was communicated the state of knowledge of MPA and necessities and objectives in the short time.

IV. Purpose

A. Description of the project that was addressed

Colombia has a high biodiversity associated with marine and coastal zones which is threatened by industrial development, over-exploitation of resources, pollution and the lack of knowledge about the connectivity between resources and ecological systems which limit the implementation of politics of management. One of those problems is reflected in the decline of inshore fishing capture and diversity of fishes and shellfish due mainly to destructive fishing methods and environmental disturbances. In this case the quality of life of the population living in coastal zones is directly affected because they live from the artesanal fishing which represents the main economical activity. As strategy to conserve in situ biodiversity, Colombia has been working to achieve the goals of the CDB-COP-VII 2004, identifying priority conservation sites and conservation gaps. From this work is expected to obtain priority sites for conservation and restoration due to their ecological relevance. However not all the priority places, obtained from this work, could be delimited and implemented as MPA, due to reasons as grade of development, economical constricts or even due to the level of threaten which could exceed in some cases the ecosystem resilience.

In Colombia the MPAs represent less than 2 % of the Colombia Ocean areas, which is completely insufficient to protect biodiversity and represent ecosystem. Decreasing fish diversity and size has a direct effect in biodiversity conservation as in population welfare due to the decrease in economic incomes. Also It has been observed recently, that companies have built ports in sites with high ecological and cultural relevance affecting important ecosystems and indigenous sacred places. For that reason delimitation and design of a MPA network is an imperative necessity to guarantee biodiversity conservation, population welfare and to preserve cultural indigenous interests.

The project proposed here pretends to evaluate priorities conservation sites, found previously through the Ecoregional Planning, to select sites that fill the requirements to constitute a MPA network, in terms of high biodiversity, ecosystem function, low vulnerability, good health conditions and connectivity between sites and over all that satisfy population necessities and interests and politics commitment.

B. Objectives of the project

1. Select from the priority conservation areas (obtain through the Marine and Coastal Ecoregional Biodiversity Planning as well as from the Gap Representative Analysis) sites that fill ecological, social, and economical requirements to conform a Marine Protected Areas Network in the Continental Caribbean of Colombia.
2. Examine the national legal framework available for Marine Protected Areas to find tools and gaps to develop a strategy, which allows declaring, establishing, implementing and managing a Marine Protected Areas Network in the Continental Caribbean of Colombia.
3. Define the MPA category classification for each of the places selected for the network in agreement with biodiversity conservation requirements and stakeholders, indigenous groups and local communities necessities.
4. The last objective pursues to involve representative actors present in the study zone in the whole process of defining the MPA network. As a result we expect to make pre-agreements with institutions and communities concerned in the decision making process guarantying their participation in the MPAs network definition. In addition the project looks for accomplishing public awareness.

V. Approach

A. Description of the work

Objectives 1 and 3 were achieved through the examination of ecologic and economic criteria which were integrated to the analysis of priority conservation sites. Key information to include in the analysis of categories of management was gathered through the development of workshops with stakeholders. These activities helped to achieve objective 4th, involving communities, authorities and industries representatives in the examination of MPA viability in their influence area and advantages and disadvantages for stakeholders and communities.

The information obtained previously from the ecoregional planning process was overlapped with the conservation gap analysis and key ecological criteria were used to select 37 priority conservation sites (Figure 1) which conform, the proposal of a National Representative marine and coastal System. The representative system includes 12 sites of the system of National Natural Parks.

To continue developing this objective, the research team identified three priority areas of the Caribbean, where few coastal or marine protected areas have been established and as a consequence marine biodiversity is little represented. These places are from north to south: Guajira, Sucre and Darien (Figure 1). An important number of priority conservation sites were identified in these places.



Figure 1. Priority conservation sites in the Caribbean of Colombia and localization of study sites.

Through the collaboration of the environmental coastal authorities and the information available from results of the integrated zone coastal planning from these particular areas, a list with the information of key stakeholders that have influence in the marine and coastal zone was obtained. Stakeholders correspond to local and regional administrators; users as representatives of the productive sector and organized communities of fishers and mangrove resources users; and information providers.

The first series of workshops were carried out during the second week of August/08. These workshops were planned with the help of the SIRAP-Caribe and the Environmental Coastal Authority of each region. The first workshop was placed on Riohacha-Guajira in August 11th. That day, the workshop was not carried out due to the low attendance. For that reason was canceled and re-scheduled to October 21st when was successfully completed. In August 13th a workshop was effectively performed in Tolú-Sucre. In August 15th a workshop was developed in Capurganá, which is a small coastal village located in Darien Coastal System. Through the workshops the project was presented to the groups interested and important ecological, social and economic information was gathered.

During the first workshop in Sucre were identified two important priority conservation sites (Boca Guacamaya and Ciénaga de la Caimanera), viable to be

managed and integrated at the MPA Network of the Caribbean of Colombia. These sites were also identified by regional environmental authorities like important conservation sites and for this reason have been considered as regional protected areas. The main socioeconomic activities in this zone are industry of tourism and hydrocarbons exportation. The size and impact of these industries limit the number of job opportunities of communities that depend on natural resources. Few natural areas remain in this zone and the best conserved are those mentioned before. The adaptive capacity of communities was not estimated in this zone.

A second series of workshops was developed at Acandi-Darien between 11/25/08 and 11/26/08 La Guajira between 01/27/09 and 01/29/09. These workshops had as objective to identify socioeconomic characteristics and estimate the adaptive capacity of these communities in the case of establishing a marine protected area. Participative tools based on methodologies proposed by Geilfus (1997) and McClanahan et al. (2008) and modified and adapted by the Research Group of Economy of Environmental and Natural Resources -GEMAR from University of Andes in Colombia, were used during workshops. This workshop was organized in collaboration with the Regional Environmental Authority CODECHOCO and the local community's organizations. They were responsible for the logistic of the activity. The workshop counted with the participation of 38 people that represented local authorities, NGOs, fishermen communities, local communities' organizations from north, center and south of the region. Workshops in La Guajira were also developed with the support of the regional environmental authorities as well as the communities.

The methodology consisted in the use of six different activities designed to obtain information about the ecological knowledge that communities have of their environment, as well as their dependence on natural resources and the social capital available. The participative tools were developed through simple questions made to the participants to identify the jobs diversity, knowledge of environmental rules, advantages and disadvantages of MPA from the point of view of communities, etc.

Finally, this information together with secondary information and semi structured interviews were used to estimate socio-ecological, socioeconomic and institutional indexes (Figure 2) that are added to estimate and measure the adaptive capacity of communities from La Guajira. The maximum possible value obtained for each index was 100 and the capacity of adaptation was the result of the sum of the three indexes.

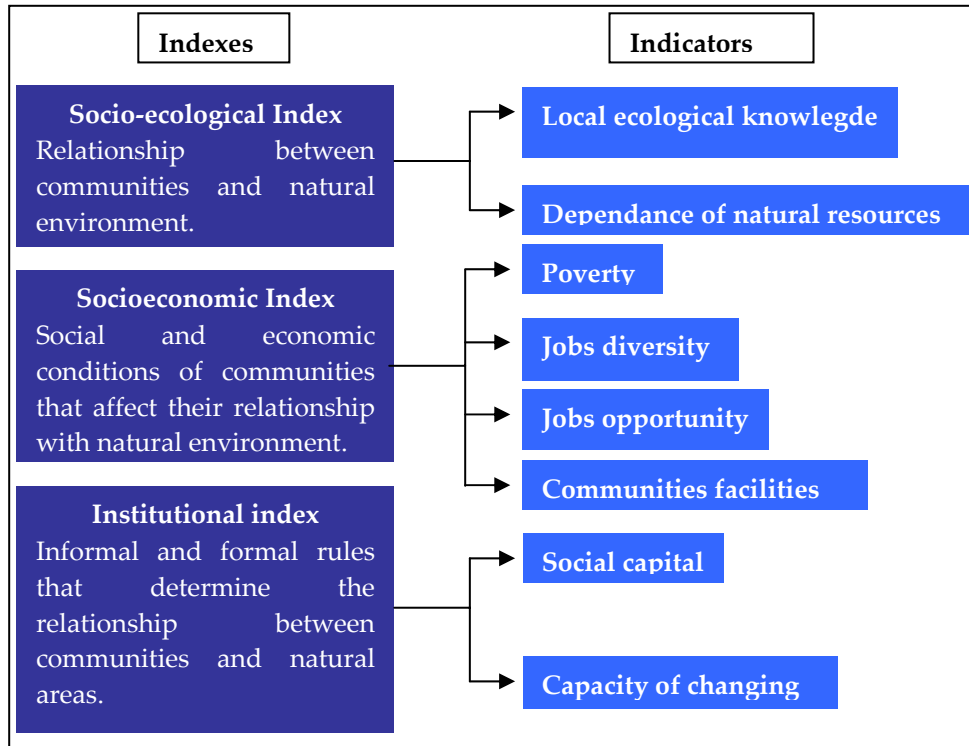


Figure 2. Indexes and indicators used to estimate adaptive capacity of communities in case of establishing a MPA in their area of influence.

In Darien was not possible to carry out all the participative tools due to the presence of negative leaders and the violence history that prevented the successful development of activities. A few weeks after the second workshop, the presence of illegal armed groups was registered at the region, preventing any additional effort to access to these communities. The information acquired from these communities was not enough to estimate the adaptive capacity; however information obtained during workshops and interviews was useful to analyze the possibilities of the priority conservation sites in this area.

A proposal of MPA categories classification was build using information obtained from the first and second workshops series, as well as previously achieved ecological information. The approximation to develop this proposal was from ecological and socioeconomic criteria related with the objectives of management included in conservation objectives of the National System of Protected areas in Colombia.

An analysis of connectivity of priority conservation sites was developed to set up the distance between MPA, using theoretical models, information about dispersion distance of species, relationship between ecosystems and habitats during different life stages of species and oceanographic patterns.

A final series of workshops was developed between 04/21/09 and 04/28/09 in Baja Guajira and Sucre. The workshops were developed in the city of Riohacha, and towns of Camarones, Dibulla and Palomino between April 21st, 22nd and 23rd and in Tolú-Sucre in April 28th. The objective of these workshops was to show the results about the adaptive capacity of communities, assessed through analysis of secondary and primary information obtained in previous workshops. The methodology used to identify the management goals of priority conservation sites was also presented. A proposal of objectives of conservation and categories of management for priority conservation sites in these areas, in agreement with the conservation objectives of the National System of Protected Areas of Colombia-SINAP and the management categories that exist in the National Natural Parks System of the country, was socialized and discussed with stakeholders and communities.

To achieve the second objective a lawyer with wide experience in environmental and protected areas legislation examined the national legal framework available as well as the international legislation of marine protected areas. Finally, it was proposed a mechanism to declare and manage marine protected areas in Colombia.

B. Project management

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VI. Findings

A. Actual accomplishments and findings

1. Socioeconomic viability of priority conservation sites:

Baja Guajira: The results show that adaptive capacity in Baja Guajira is intermediate and Palomino is the community with the highest capacity of adaptation in case of the establishment of a MPA. The opportunity to establish a MPA in this region will depend on the designing of strategies that promote better quality of life for communities as well as high diversity in job opportunities, not depending on natural resources.

Table 1. Adaptive capacity of communities in Baja Guajira.

INDEX	Baja Guajira	Camarones	Dibulla	Palomino
Socioecologic index	59.25	54.73	60.94	62.08
Socioeconomic index	56.01	51.55	55.88	60.60
Institutional index	55.35	54.44	54.48	57.14
TOTAL	56.87	53.58	57.10	59.94

The necessity of increasing the institutional compromise in this area is evident and one of the first challenges that should be accomplished. However the level of involving of the communities during the different stages of the project bring out the valuable human component available in this region, which represents an important opportunity to the establishment of an effective MPA Network.

Communities are interested in implementing strategies to regulate the use of natural resources and many of them see the establishment of a MPA as an opportunity to stop the damage caused by industrial projects. Communities reclaim the necessity of industrial sector involvement as well as institutions and authorities to define agreements that integrate all different points of view.

Sucre-Tolu: In this zone, there is a high pressure over land and resources due to the hydrocarbon industry, between others, which have important piers. Also, there is an important tourist industry which limits the economical activity of communities. The high dependence of communities on natural resources as well as the limited economical activities makes difficult think in "no take" areas. For this reason, the categories of management of protected areas in this region should approach to the sustainable use of resources to guarantee the social and economical wellbeing of communities.

There is in this zone, an important, social and institutional capital, and although in this zone still exist conflicts in the use of natural resources, the level of organization

of communities represents a high potential to achieve the effective management of these conserved areas.

Regional authorities have developed a local system of protected areas and through this system, two coastal areas have been declared as regional areas of protection. These areas coincide with the priority conservation sites, candidates to be part of the national MPA network.

Darien: Biodiversity of this sector exhibits unique characteristics, which are not protected at all because; there are not national protected areas in this zone to assure conservation of this marine and coastal biodiversity.

Communities are highly dependent of marine and coastal natural resources, which mean a risk to ecosystem, habitats and species conservation. Furthermore, illegal industrial fishing has evident impact in coral reefs, soft sediment bottoms and fish's sizes and abundance.

Fishing is one of the most important economical activities carried out in this zone, any effort to establish a MPA will require looking for alternative economical activities with less impact over natural resources.

Analysis of indicators as: job diversity, poverty, basic infrastructure, local ecological knowledge and social capital, exhibit strong socioeconomic and socioecologic aspects of the communities in this zone, these could allow high adaptive capacity. Exogenous factors represent an obstacle that can stop and affect capacity of the communities to face changes in their environment. Any effort to establish a MPA in this zone will require make stronger the social and institutional capital.

2. Proposal of MPA categories:

The proposal with conservation goals and category of management for each of the sites candidates to be part of the MPA Network in the Caribbean of Colombia is presented in table 2.

Table 2. Conservation goals and category of management for sites candidates to be part of the MPA Network in the Caribbean of Colombia.

Site number	Site	Conservation goals	Category of management in the actual system
6	Punta Taorita	To maintain or pursue the natural re-establishment of representative ecosystems of the country or characteristic combinations of them.	Regional natural park
7	Bahía Hondita		
10	Arroyo Apure		National natural park
9	Bahía Portete		
17	Frente Salinas Manaure - Carrizal 1	To conserve the productive capacity of natural ecosystems or of those in process of re-establishment, as well as the viability of native terrestrial and aquatic, marine and continental species, to guarantee a perdurable offer of biologic resources.	National Reserve of sustainable use
18	Frente Salinas Manaure - Carrizal 2		
21	Ciénaga Buenavista - Sector el Pájaro Este		
22	Región Buenavista Este		
25	Sector corrientes Ay. La Mula - Ay. Guerrero		
26	Sector Ciénaga Ocho Palmas	To maintain the necessary habitat to guarantee the existence of species terrestrial and aquatic, continental and marine, that has particular or limited conditions of distribution.	Territory of fauna
28	Punta Caricare	To maintain the necessary habitat to guarantee the existence of species terrestrial and aquatic, continental and marine, that have particular or limited conditions of distribution.	Extension of the sanctuary of fauna and flora Los Flamencos
34	Frente playa de los Holandeses	To conserve areas with unique fauna or flora characteristics, or combinations of them, that represents unique or rare spaces due to their scientific or cultural importance.	National Reserve of Sustainable use
33	San Salvador - Punta de los Remedios		
39	Frente a PNN Tayrona 1	To maintain or pursue the natural re-establishment of representative ecosystems of the country or characteristic combinations of them.	Extension of the National Natural Park Tayrona
40	Frente a PNN Tayrona 2		

Site number	Site	Conservation goals	Category of management in the actual system
44	Isla Arena	To maintain or pursue the natural re-establishment of representative ecosystems of the country or characteristic combinations of them.	Extension of the National Natural Park Isla de Salamanca
46	Frente a Vía Parque Isla de Salamanca		
51	Galerazamba	To conserve the productive capacity of natural ecosystems or of those in process of re-establishment, as well as the viability of native terrestrial and aquatic, marine and continental species, to guarantee a perdurable offer of biologic resources.	National Reserve of Sustainable use
52	Frente a Ciénaga El Totumo 1		
53	Frente a Ciénaga El Totumo 2		
56	Punta Canoas 2		
60	Tierra Bomba - Isla Barú	To conserve the productive capacity of natural ecosystems or of those in process of re-establishment, as well as the viability of native terrestrial and aquatic, marine and continental species, to guarantee a perdurable offer of biologic resources.	Extension of the Protected Area of Islas del Rosario y San Bernardo
65	Alrededores del SFF El Mono Hernández	To maintain the necessary habitat to guarantee the existence of species terrestrial and aquatic, continental and marine, that has particular or limited conditions of distribution.	Extension of the Sanctuary of Flora y Fauna Mono Hernández
67	Frente a SFF El Mono Hernández 2		
68	Punta Comisario - Punta San Bernardo	To conserve the productive capacity of natural ecosystems or of those in process of re-establishment, as well as the viability of native terrestrial and aquatic, marine and continental species, to guarantee a perdurable offer of biologic resources.	National Reserve of Sustainable use
69	Boca de Guacamaya	To maintain or pursue the natural re-establishment of representative ecosystems of the country or characteristic combinations of them.	Regional national park
73	Puerto Viejo	To maintain the natural coverage and those in process of re-establishment, as well as the environmental conditions to regulate the water offer, to prevent and control erosion and sedimentation, and to guarantee air quality.	District of management integrated-DMI
74	Ciénaga de la Caimanera		
75	Delta estuarino del Río Sinú		

Site number	Site	Conservation goals	Category of management in the actual system
77	La Rada	To conserve the productive capacity of natural ecosystems or of those in process of re-establishment, as well as the viability of native terrestrial and aquatic, marine and continental species, to guarantee a perdurable offer of biologic resources.	National Reserve of Sustainable use
78	Isla Fuerte		
84	Isla Tortuguilla		
91	Posterior a Ensenada de Río Negro	To maintain the natural coverage and those in process of re-establishment, as well as the environmental conditions to regulate the water offer, to prevent and control erosion and sedimentation, and to guarantee air quality.	Regional Natural Reserve, District of Management integrated-DMI
94	Darién	To maintain or pursue the natural re-establishment of representative ecosystems of the country or characteristic combinations of them.	Regional natural park
97	La Playona	To maintain the necessary habitat to the guarantee the existence of species terrestrial and aquatic, continental and marines that present particular conditions of distribution or when their distribution will be limited.	Sanctuary of fauna y flora
99	Bahía Pinorroa - Bahía Aguacate	To conserve the productive capacity of natural ecosystems or of those in process of re-establishment, as well as the viability of native terrestrial and aquatic, marine and continental species, to guarantee a perdurable offer of biologic resources.	National Reserve of Sustainable use
100	Capurganá		

3. Legislation analysis:

Important advances have been achieved to consolidate the National System of MPA, however the legal framework still has a lot of gaps that must be filled at the short time to give legal support to entities that make part to the conformation and implementation process of the MPA Network. The legal process to declare MPA in Colombia is clear enough since the juridical point of view; however the administration of MPA is still confused at the local and regional level. For this reason it will be necessary to work on this inside the National System of Protected Areas and in the National Subsystem of MPA. The key points that will need to be worked are the following:

- Functions and competences at the national, regional and local scale.
- Available tools to pursue conservation goals, including categories of protection for marine and coastal ecosystems, as well as the institutional role to declare and manage protected areas.
- Mechanisms to connect MPA and other kind of tools as regulation of use of territory and management plans that can contribute to conservation goals establishing restrictions, prohibitions and conditions to use resources.

4. Connectivity analysis:

The distance between priority conservation sites is between 50 km and never to more than 100 km. In this range occurs the dispersion of the majority of small fish and invertebrates as well as algae, plankton and benthos (Palumbi, 2004; Roberts and Hawkins, 2000).

Priority conservation sites satisfy heterogeneity criteria which were considered to their selection. These sites present high heterogeneity assuring the interchange of resources and habitats for different life stages.

In the Caribbean of Colombia are two seasonal surface currents, the Caribbean current in east-west direction, mainly at the North Coast, and the Colombia contra current in west-east direction in the Southwest coast of the Caribbean. Although these currents are seasonal affect species dispersion. Following the recommendations in literature the strategy to guarantee the connection between MPA, is to establish them in the direction of the current. In the case of the Caribbean, it means to locate conservation sites toward the south of the Guajira Peninsula and toward the north of the Golfo de Urabá.

Although the knowledge about larval dispersion, oceanographic current patterns and connectivity (physical, chemical and biological) in the Caribbean of Colombia is limited, from previous analysis is stood out, that priority conservation sites, candidates to be part of the MPA network, satisfy the minimal requirements to assure MPA network connectivity.

B. Problems

Different limitations were found during the development of this project. The main problem encountered was the reticence of a leader to take part in the participative tools during workshops in Darien. This attitude had a negative effect in the rest of the people, dividing the group and wasting the valuable and expensive time of workshops. This experience occurred during both workshops for the same reason. Few weeks after the second workshop, illegal armed groups were present in this area, restraining the rest of activities of the project in Darien.

The lack of institutional capital and the low involvement in this project showed by authorities, regional and local administrations and some NGO's in Darien and Guajira, are constraints that must be modified before making any effort to establish a MPA in these zones.

Finally, there are some places in Colombia (ex. Alta Guajira), where accessing is difficult and expensive, this over cost were not budgeted in the original proposal and were impossible to afford during this project. It was found also that workshops work better if they were carried out in the communities' villages and towns. However, to do these implicate additional logistic effort and an increase in time and financial resources.

C. Additional work

It will be necessary, to replicate this exercise and estimate adaptive capacity of communities in other places in the Caribbean coast: Alta Guajira, places between cities of Cartagena and Barranquilla, and Cordoba coastal zone.

VII. Evaluation

A. Attainment of project objectives

- Objective 1 – 37 priority conservation sites satisfy ecological and socioeconomic criteria to be part of the proposal of the MPA network in the continental Caribbean of Colombia.
- Objective 2 – The national and international legal framework to declare and establish marine protected areas was examined to find opportunities to declare new MPAs in Colombia.
- Objective 3 – A proposal of six different categories of management for the 37 priority conservation sites, candidates to be part of the MPA Network, was developed, having in account, the conservation objectives of the National System of Protected Areas and ecological and socioeconomic criteria that satisfy ecological conservation goals and socioeconomic requirements of the stakeholders and communities.
- Objective 4 – 192 people, 44% of communities, 26% of organized groups, 14% of state institutions, 7% of NGO's and 7% of universities and private industries, were

involved in workshops and received informative material of MPA, took part in the socioeconomic analysis and in the discussion of the proposal of categories of management.

B. Dissemination results

- A booklet with the main findings of this project, designed to address governmental and non governmental audiences that plays a role in the declaration and implementation of the MPA Network.
- Memories of all the workshops were prepared and given to the participants.
- Results obtained, after the workshops, were published through the electronic bulletin “*Red Costera*”-Coastal Network administrated by INVEMAR, which can be seen through the web page www.invemar.org.co (<http://www.invemar.org.co/noticias.jsp?id=3711&idcat=121>).
- A manuscript with the results is being prepared to be sent to an indexed journal.

VIII. Literature cited

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