



Community-based Management of
Environmental challenges in Latin America



“STAKEHOLDER VISION ON SOCIAL- ECOLOGICAL-SYSTEM SITUATION IN ARGENTINA CASE STUDY”

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1. INTRODUCTION

Oceans cover 70% of our planet and they are the source of a tremendous wealth of biodiversity and ecosystem services which, however, are not infinite. The oceans and coastal areas face many threats from overfishing, destructive fishing practices, pollution and waste disposal, among others. The current context of climate change will worsen this situation as marine biodiversity will significantly deteriorate in the next 20 years and lead to greater marine losses (UNEP, 2010). Coastal zones are one of the most dynamic habitats on Earth subject to continuous impacts from different forcing factors which are constantly changing in strength and direction (Perillo and Piccolo, 2011). From a human perspective, population density on the world's coast is estimated to double by 2050, with an increase of about 50 % between 2010 and 2050 (Syvistki et al., 2005). Thus, coastal environments are subject to greater anthropogenic influences than oceanic regions. The impact of everyday expansion of urbanization and industrialization of the coastal areas are resulting in higher pollution and intense modifications to the coastal habitat. These changes often have negative effects on human populations, particularly, for those on lower incomes that are dependent directly on the resources of the coastal system.

The relevance of studying the management of ocean and coastal zones is straightforward. This importance might be even higher in a country as Argentina, which has one of the most extensive coastlines in Latin America and where preliminary studies show that beaches are subjected to erosion, with coastal retreats of the order of 3-5 m per year (Pratolongo et al., 2006; Bustos et al., 2009).

For this reason, following the objective of *identifying sustainable community-based governance models for the management of natural resources in different socio-ecological systems*, the COMET-LA proposal includes the case of the marine and coastal areas in Argentina to complement the study of water and biodiversity systems in Colombia and forest systems in Mexico.

The main purpose of the Argentinean group during the COMET-LA three years research period is *to propose community-based sustainable management and governance models in marine and coastal systems by analyzing its application in the Argentina case study, and up-scaling the results to higher geographical levels*. The sub objectives to be fulfilled are: the characterization of the social-ecological system; the identification of the role played by the different variables in the current and potential functioning of the ecosystem according to the perceptions of the local communities; the identification of community-based sustainable management and governance models in marine and coastal systems; and the inclusion of community and local stakeholder's knowledge and views in the process to develop the learning arena and to match scientific and local knowledge about the problems and their solutions. All these objectives will be addressed through the field work performed jointly between researches and the community stakeholders in a participative dynamic process, in the "learning arena" proposed by the project.

Therefore, regarding the relevance of the context of climate change and increasing competition for the use of natural resources, the first step of the Argentinean research was to inquire and to understand the perceptions of both local stakeholders and decision makers on socio-economic problems related to the environmental context in a particular zone of the country.

The study area is the Monte Hermoso - Bahía Blanca Estuary region (Fig. 1), located on the southwestern coast of the Buenos Aires Province. The zone has been chosen by the Instituto Argentino de Oceanografía (IADO) and Fundación Aquamarina (AQM) experts on marine and coastal areas, and socio-economic researchers from the Universidad Nacional del Sur (UNS), considering its relevance for the COMET-LA objectives.

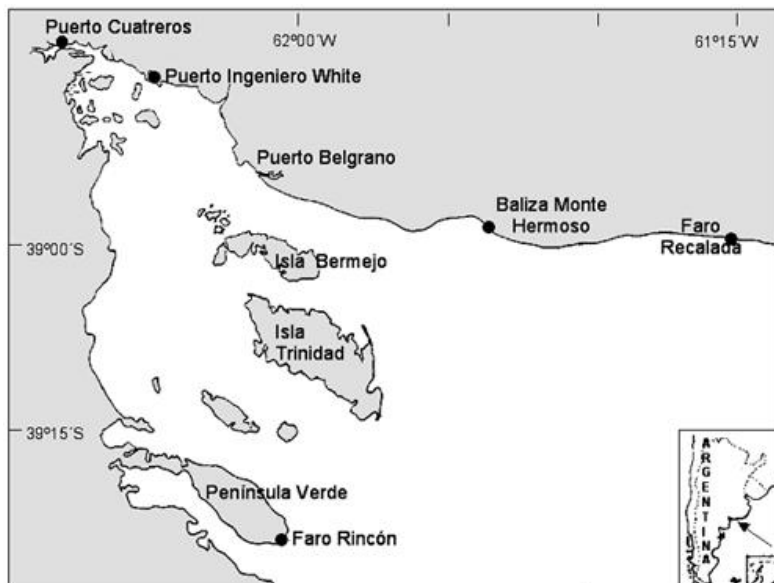


Figure 1: Monte Hermoso - Bahía Blanca Estuary

This region is characterized by a wide range geomorphological, physical and socioeconomical conditions that make it unique in the Argentinean coast. Accordingly we will divide our study area into three different zones: Bahía Blanca, which includes General Daniel Cerri and Ingeniero White (zones for which our analysis is limited); Pehuén Co and Villa del Mar (included within the Municipality of Coronel Rosales) and Monte Hermoso.

The fact of the diversity population conditions as well as how the oceanographic and climatic situations can seriously modify the living conditions of its habitants is a very good scenario for the analysis of any methodology that could be tested. Artisanal fishery and tourism, directly related to the coast and beaches, are two of the most important economic activities of this region. Therefore, coastal and ocean natural resources are crucial for people living in this region, both for their economy and their daily life. However, inhabitants show neither a common nor a sustainable use of these resources as a whole region. Moreover, the joint effect of climate variability and overexploitation of natural resources seem to be having important negative effects on some of them. It is clear from this brief description, which will be amplified later, that there are several socioeconomic-environmental conflicts in this territory, which need to be addressed.

In order to organize the work to be performed during the three years, the working group has decided to divide the activities in three levels. The first level implies a first approximation to the field and mapping of key stakeholders and decision makers, using exclusively participative workshops to picture their perceptions about the problems and their solutions. During the second stage, socioeconomic and ecological attributes of the zone will be deeply analyzed by using surveys and participative techniques. Finally during the third phase, scientific and local knowledge gathered will be matched and discussed on global forums with both stakeholders and decision makers.

Conforming this activities plan, during the first semester of 2012 we have tried to map the most representative stakeholders and decision makers of the community and

gather their perceptions on ecological problems and socioeconomic consequences. Therefore, we performed separate workshops in each one of the cities: one with stakeholders, the other one with decision makers. The main reason to use this methodology is that we consider that, in a first step, it is important to separate the different levels of decisions. This is also due to a key characteristic of the Argentinean case, which also makes very complex the existence of a community management of natural resources: stakeholders and decision makers do not often coincide and in some cases decisions about the allocation and use of the resources are taken in a broader territory than the local one. Hence, social conformation, governance system and the extension of the areas under study usually results in strong conflicts of interest.

The different groups of stakeholders which have been participating on workshops at this first stage are:

Estuary of Bahía Blanca:

- Local government stakeholders:
 - Technical Executive Committee (CTE)
 - Councilors of Municipality of Bahía Blanca
 - Argentina Coast Guard
- National, regional and local Environmental institutions:
 - Regional Council of Water Sports (CODENAR)
 - Association of Artisanal Fishermen of Bahía Blanca
 - Chamber of Owners and Shipowners Fisheries of Bahía Blanca Estuary
 - Fishery Club of Gral. D. Cerri
 - Provincial Nature Reserve “Bahía Blanca, Bahía Falsa y Bahía Verde”
- Academic and education institutions:
 - Professional Council of Bahía Blanca
 - Primary School of Villa del Mar
- NGOs:
 - Young Leadership Network on Conservation
 - Marine Life Health and Rehabilitation Center (FRAAM)
- Others:
 - Neighbor Forum “Cerri de Pie”
 - Popular Library “José Hernández” of Gral. D. Cerri
 - Neighbor Society of Ing. White
 - Neighbor Association of “Saladero”
 - Volunteer fire brigade of Ing. White and Gral. D. Cerri
 - Chemical Industrial Association of Bahía Blanca (AIQBB)

Coronel Rosales:

- Local government stakeholders:
 - Town Councilors of Municipality of Coronel Rosales
 - Government Secretary and Public Works and Environment Secretary
 - Municipality Commissioner of Pehuén Co
- National, regional and local Environmental institutions:
 - Artisanal Fishermen of Pehuén Co

Provincial Nature Reserve Pehuén Co - Monte Hermoso

- Academic and education institutions:
Primary School of Pehuén Co
Technical High School of Pehuén Co
- NGOs:
Rotary Club of Pehuén Co
Lions Clubs International of Pehuén Co
- Others:
Volunteer fire brigade of Pehuén Co
Chambers of Commerce and Industry of Pehuén Co
Chambers of Commerce and Tourism development of Pehuén Co
Residents Association “Amigos de Pehuén Co”

Monte Hermoso:

- Local government stakeholders:
Lord Mayor of Municipality of Monte Hermoso
Secretariat of Government
Secretariat of Tourism
Secretariat of Development
Town Councilors of Municipality of Monte Hermoso
Association of Tourism Production (ADEPROTUR)
- National, regional and local Environmental institutions:
Regional Council of Nautic Sports (CODENAR)
Association of Artisanal Fisheries of Pehuén Co – Monte Hermoso
- Others:
Chambers of Commerce and Industry of Monte Hermoso
Volunteer fire brigade of Monte Hermoso
Lifeguards
Yatch Club Monte Hermoso

With respect to prescriptions about work methodologies in the COMET-LA project document, participative methodological approaches have been used to capture the key characteristics of these social-ecological systems in the area of study and the impact of climate change.

As one of our weaknesses is the lack of a community history on participative actions and meetings, we decided to begin the group discussion with some “trigger questions” using the **brainstorming technique**.

The brainstorming technique is a method of eliciting ideas without judgement or filtering, often used in the early stages of futures workshops and in many other contexts, which involves encouraging wild and unconstrained suggestions and listing ideas as they emerge (Slaughter, 1997). As stated by Geilfus (2002) one of the advantages of brainstorming is that it allows to collect ideas and perceptions in a broad group of people, and it is very appropriate to be used when firstly inquiring about living characteristics of a community or when trying to catch people’s perceptions and reaction on some proposals and events. Usually brainstorming consists of four steps: First, introducing a question, problem, or topic both orally and in writing on chart paper; second, inviting participants to

respond; third, writing the responses on chart paper; and finally, prioritizing, analyzing, or using the list to generate discussion or problem solving.

So as to have responses on the same direction, we used the same triggering questions in the first workshops performed with stakeholders and decision makers in each one of the communities. These queries asked to differentiate the perceived changes in their socioeconomic conditions, related to ecological changes or to human made changes, and to highlight the main consequences of these changes. During the second meeting, the main responses to the questions (which have been previously systematized) were presented to the attenders and deeply discussed.

This D4.1 provides information about the Argentinean case study. This description is mainly based on primary information gathered from the field work through the participatory workshops carried out between March and August 2012. As previously mentioned, this constitutes the “first approximation to the communities”, in which the core objective was to identify the main stakeholders of the communities (community members, community leaders, local non-governmental organizations and governmental organizations) and their main perceptions about socio-economic and ecological problems. As this working group is in a very initial step of work, some parts of this document (economic activities, productivity of the system, recent historical background, among others) has been complemented with information from official data sources from governmental institutions (INDEC, ETC), academic papers and doctoral researches on the field of study. It is expected that the future development of the projected activities, complemented with new participative methodologies, will provide enough information to complement the field work in order to address the remaining objectives of the COMET-LA project.

As follows the document first presents a characterization of the system. Then, the main perceptions of the stakeholders on socio-ecological systems and their governance (resulting from the participative workshops) are presented. This information has been used to perform a preliminary SWOT analysis for the case study which is presented on third place. Then, some conclusions are presented.

Finally it is important to highlight that the basic structure carried out in the present case study follows the criteria and concepts proposed by the COMET-LA project with some adaptations required by the idiosyncrasies and cultural aspects proper of the whole region but also taking into consideration the local perspectives under the climate change scenarios. Furthermore, the field work done by the Argentine team to observe both the Mexican and Colombian study cases, allowed a much better integration of the whole COMET-LA Team, on one hand, but also has been very useful to compare and exchange methodologies and ways to approach the stakeholders.

2. STUDY AREA DESCRIPTION

2.1. Resource System

2.1.1. Ecological components and natural resources available

The **Bahia Blanca Estuary** is the second largest estuary of the country with a total area of 2300 km² and it can be described by a series of NW-SE major tidal channels separated by extensive tidal flats, salt marshes and islands. A large portion of the estuary corresponds to a provincial natural reserve (see 2.3.1.3.) and it is inhabited. However, the northern coast of the largest and northernmost channel, the “Canal Principal”, hosts the largest deep water harbor system of Argentina from which a large portion of the exportation of grains and goods of the country are made. Actually there is a set of 5 different ports along the 60 km of the channel.

A municipal natural reserve only 3 km² in area (see 2.3.1.3.) contains an ecological system that is worldwide unique (Perillo and Iribarne, 2003). The estuary is the northern portion of the Late Pleistocene-Early Holocene delta of the Colorado River which now flows to the ocean about 100 km south of the estuary. A couple of small rivers provide the only sources of freshwater to the system. Due to the lack sediment input from the continent and from the adjacent inner shelf, the estuary is in a strong erosion condition. Perillo (1997) forecasted that an increase of 1.5 m in the mean sea level, the whole estuary could be permanently covered by the sea with the lost of the largest coastal wetland in the country and important stop for many migratory birds as well as the local birds. The estuary host also a rich fauna and inner portion of the estuary is the place a unique winter phytoplankton bloom which initiates the trophic chain that later provides food to many commercial species including several species of fishes and shrimps and prawns. The latter are the basis for the local artisan fishery. The estuary also includes several species of sharks, sea lions and the endangered franciscana dolphin. Whales and killer whales are also common in the estuary mouth which are often seen in other areas of the estuary as well.

The value of estuarine waters as a nursery and breeding habitat for near-shore fisheries is considered as the most affected by the dredging process. Zilio et al. (in press) has calculated the damage in a cost-benefit analysis. For an estimation of the richness of estuary, they estimated the loss of nursery service through the added value of the fishery sector at producer prices for Bahía Blanca County. The social cost for loss of nursery service was valued in € 807,565.5 per year, whereas the total cost for loss of nursery service and loss of employment sources was calculated in € 3,343,487 (in an intermediate scenario). These results indicate that social benefits derived from the dredging process, which will concentrate during the building period, will be clearly outweighed by their negative effects.

The wetland of **Villa del Mar** is influenced by the dynamics of the Bahía Blanca Estuary and is home to species of native wildlife and some endangered. The bird watching is very different consisting mostly on flamingos, herons, gulls and cook crab, oystercatchers, lapwings and migratory birds like ducks to plovers and sandpipers. The fauna is completed with franciscana dolphins, sea lions and sea turtles. The intertidal area of this wetland is characterized by the presence of marsh with Jumes, spartinas and characteristic crabs.

Monte Hermoso and Pehuén Co are coastal, mostly touristic towns located outside the estuary. Both have sandy beaches but their development along the years has been rather different. While Monte Hermoso became a city of about 6000 habitants with many front beach buildings which completely modified and covered the coastline dune system, Pehuén Co is known as "a forest beside the sea". This small town of 650 permanent habitants has fully preserved the original, although artificially forested design, with unpaved street.

The beach sector that starts about 17 km W of Pehuén Co to the eastern border of Monte Hermoso has been established a Geological, Paleontological and Archeological Provincial Reserve (see 2.3.1.3) because of its unique features. On the Pleistocene cliffs W of Pehuén Co, Charles Darwin discovered in 1832-35 the first megatherium fauna which, as the proper Darwin indicated in his travel log, started the idea of his famous Evolution Theory. Between 3 and 6 km E of Pehuén Co there are outcrops of Early Holocene (about 12000 years BP) of a shallow lake which presents the best preserved steps (ichnites) of the typical fauna of the period, mostly extinct, including excellent paths of megatherium steps (Fig. 2) and other animals. This sector of the beach right now is in the last stages to be declared a World Heritage by UNESCO. Finally, near Monte Hermoso there is one of the first examples of preserved human steps (about 6500 years BP). Both ichnite areas are in

the beach subject directly to the sea action. In the case of even the minimum predicted msl rise (about 30 cm by 2100, Solomon et al., 2007) the potential of full erosion of these outcrops will be most likely with the consequent loss of very important representations of Earth near past. Although it has not been confirmed yet, there is a recent discovery of human steps in the Pehuén Co sector that could be dated as old as 12000 yrs BP. If this is true, they could be one of the oldest proofs of human activities in Argentina.

As there are similar coastal zones, they confront the same problem: the erosion of their coasts. Coastal erosion in Monte Hermoso is related to the presence of anthropic elements, as two of the three sectors studied in the beach have an urban influence. The first sector showed a slow recovery of sediment volume of $4.7 \text{ m}^3 \text{ m}^{-1} \text{ year}^{-1}$; the second one had a considerable loss of sediment of $-4.4 \text{ m}^3 \text{ m}^{-1} \text{ year}^{-1}$; and this last one, located in a point of the coast, receives the impact of storms from the South that damage the nearest constructions to the beach and represent a financial loss for its inhabitants. In this region the first line of dunes was replaced by buildings facilitating erosion process. After the occurrence of extreme meteorological events, the natural contribution of sediment over this sector is not enough to recover all the sediment that is being lost.

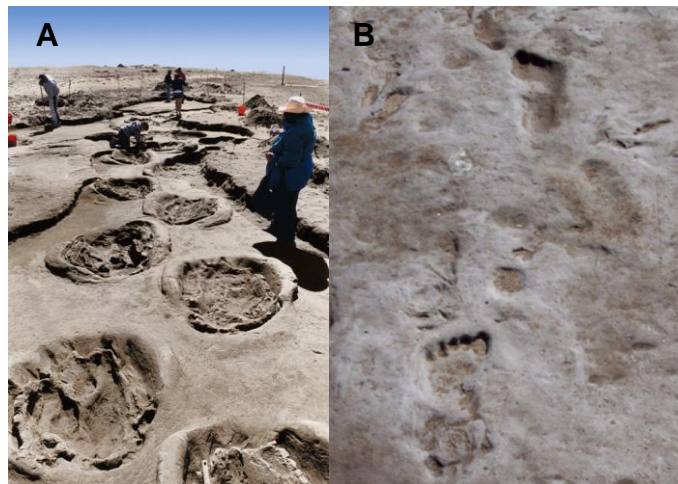


Figure 2: a) Megatherium and b) human footprints,
Geological, Paleontological and Archeological Provincial
Reserve.

The coastal resort of Pehuén Co has natural erosion by being on a ledge of the coast. This erosion adds to the anthropic pressure of urbanization itself. West and Central zones of the town have infrastructure on vegetated front dune. These affect the free exchange of sediment between the dune and the sea which causes, during extreme climatic events, dune erosion and damage to coastal homes and roads occur. Southwestern events are more frequent and are the ones that most affect these areas causing annual losses of sediment from 20 to $30 \text{ m}^3 \text{ year}^{-1}$. But the East zone has a vegetated front dune but with less infrastructure and the coastal road behind the dune. This is reflected in an annual gain of $23 \text{ m}^3 \text{ year}^{-1}$ sediments.

On the other hand, during the spring and summer estuarine waters reach temperatures of the order of $28 \text{ }^\circ\text{C}$. Outflow of this very high temperature waters follows the northern coast of the estuary which is continued by the open coasts occupied by Pehuén Co and Monte Hermoso. This situation produce that the waters in both towns during the summer is of the order of $21\text{-}22 \text{ }^\circ\text{C}$ which constitute them as two of the

warmest water beach resorts in Argentina. If the estuary was not present, the typical temperature of the inner shelf waters in summer seldom could be larger than 17 °C. Therefore, this condition was a major reason for the high touristic development, with different criteria, of both towns.

2.1.2. Location and system boundaries

As we stated above, the Monte Hermoso-Bahia Blanca Estuary region (Fig. 1) is located on the southwestern coast of the Buenos Aires Province (Argentina) along an E-W stretch about 100 km in length. The administrative division defines three different municipalities in the area (Fig. 3). From west to east along the coast and considering only the cities under study, the Bahía Blanca is the largest one and includes the local communities of General Daniel Cerri and Ingeniero White. Villa del Mar and Pehuén Co belong to the municipality of Coronel Rosales, whose capital is Punta Alta. Although Punta Alta is not a coastal city, there is a near port named Rosales Port which is part of the port system of the estuary. On the other hand and continuing along the coastline to the east, it is found Monte Hermoso, city which constitutes a municipality by itself.



Figure 3: Administrative division of the area

2.1.3. Quantification of resources and size of resource system

2.1.3.1. Economic activities, production systems and sources of income

The entire Monte Hermoso-Bahia Blanca Estuary region is highly dependent on the coast, as the main economic activities are directly related to this resource. The geographical distribution of economic activities on the localities under study exhibit a strong concentration of **petrochemical industry and fishery** around the port facilities located in **Ingeniero White**, a higher concentration of **livestock** (mainly slaughterhouses) and **fruit and horticultural activities** besides **fishery** in **General Daniel Cerri**; and a marked dominance of **tourism** activities followed by **fishery** in the cases of **Villa del Mar, Pehuén Co and Monte Hermoso**.

According to the Under-Secretary for Economic Coordination of the Province of Buenos Aires, in 2003, the main economic activities in General Cerri and Ingeniero White were the petrochemical industry representing 32.1% of the product, followed by horticulture and fishing (1.2%). In Pehuén Co and Villa del Mar, there was a high participation of property business (22 % output of the total product of Coronel Rosales), with tourism and fishery representing 3.2 and 0.1% , respectively. Similarly to the case of Pehuén Co, property business related to tourism and tourism are the most important economic activities in Monte Hermoso (51.8 and 6.1 % , respectively), while fishery represents only 0.3 % of the product. Despite fishery seems to have a low participation in the total product of towns, it is important to note that people who depended on such activity *live* in coastal areas under study. However, many of people employed in industries and tourism are from Bahía Blanca or others cities.

Bahia Blanca is located in a strategic position due to the combination of several factors among which the commodities availability, the vast transport system, the condition of energy supply node and the abundance of qualified human resources¹ may be pointed out. Its powerful territory occupancy matrix arose from the development of railways and port facilities, converting the city in a node of integration between the sea and the Pampa Húmeda and Patagonia regions. Its geographical condition, as well as the availability of inputs and raw materials, converts the area in an optimal settlement for several companies related to agricultural and livestock activities and the petrochemical sector.

The **industrial sector** of Bahia Blanca, located precisely **between the towns of General Daniel Cerri and Ingeniero White**, is characterized by the existence of a set of large companies mainly related to farming activities, petrochemical and oil refineries. This small number of firms plays a crucial role into the economic structure, since shares 65% of total local industrial production. Moreover, this is the group of companies with a higher dynamism, registering a noticeable growth in production, sales and exports during last years. According to the AIQBB (see 2.2.1.1.), these industries employ 1100 and 1600, direct and indirect jobs, respectively. Much of these employments are occupied by Bahía Blanca citizens and not by people living in Ingeniero White and Cerri.

Small and medium firms are in the region mainly related to food, metal mechanical and wood processing industries. Small firms (1 to 5 employees) have a large presence in the area, sharing 86% of total number of firms (a share much higher than such reached by small firms at national level, which is 72%).

The exports composition coming out the Ingeniero White Port is biased to primary products. A noticeable increase in the trade of grains converts it in one of the most relevant grains port in the country. This situation could be attributable to the efficient performance of all four private terminals currently operating. On the other side, general merchandise as fertilizers, polyethylene and fish, have a very small share on total exports, reflecting the scarce share of products with high value added on traded flows from the hinterland to the external markets.

Road transport is another outstanding sector on Bahía Blanca and its area of influence. There are several firms devoted to this activity, as well as a huge number of fleet owners. The sector exhibits a high degree of concentration, since around twelve firms own a great portion of total fleet and storage installations, gathering together the gross movement from and to the city.

Fishery and related activities are also important for the case of Ingeniero White and Cerri (Fig. 4). There are different forms of organization of production coexisting in all

¹ It is important to note that Bahía Blanca relies on two national universities, one provincial university and many tertiary institutions.

the communities. Large fishing ships and medium fish processing plant, legally constituted, share the market with small artisanal fishermen, as well as families employed as peelers of shrimp and prawn. The economy of nearly 1000 families is based on artisanal fishery in the area **between Cerri and Villa del Mar**.

Usually, the later two activities above mentioned belong to the informal sector of the economy, with the consequent repercussions over social conditions. In particular, harvesting of shrimps and prawns constitutes the core of the informal labor market and involves, directly or indirectly, a lot of women and children working in related activities.



Figure 4: Artisanal Fishery and Petrochemical economic activities coexisting in the Ingeniero White Port

As artisanal fishery is highly dependent on the resources availability; fishermen use to go fishing every day except when weather conditions are not appropriated. Nevertheless, in times of peak of resources they are used to stay embarked by several hours or even several days. With respect to the level of specialization, artisanal fishery is a traditional activity, which techniques are translated between generations.

Sales are produced individually alongside ship to local consumers or to local cold-storages or fishes processing plant. A second source of demand is fishes processing plants from Mar del Plata.

On the other hand, the use of the coast has an alternative (highly important) use: **tourism**. Nearly the entire economy of **Pehuén Co** and **Monte Hermoso** is based on tourist affluence, the main source of income. Directly related to the use of beach and the forest (in the case of Pehuén Co), as will be seen later, for both of these communities erosion is the key environmental problem. Pehuén Co and Monte Hermoso share a common characteristic: there are no (at least up to the moment) large touristic entrepreneurship. Most of the tourist entrepreneurships in both cases are family based projects coordinated with municipal activities, especially in Pehuén Co, even though in Monte Hermoso there are some medium hotels and restaurants. The owners of many of the commerces in Monte Hermoso and Pehuén Co live out of the cities (particularly in Bahía Blanca) and posses seasonal commerces. Stakeholders have remarked that in last years the level of specialization by the touristic sector has improved due to the creation of bachelor degrees in Tourism at the Universidad Nacional del Sur in Bahía Blanca and the presence of the Universidad Provincial del Sudoeste Bonaerense, an institution of tertiary education, in Monte Hermoso.



Figure 5. Touristic activities in Monte Hermoso and Pehuén Co beaches

Nevertheless, some differences between both localities in the exploitation of tourism can be stressed (Fig. 5). The profile of **Monte Hermoso** has been changing during the last year; following the pattern of large touristic cities (they are currently increasing the leisure supply for tourists). However, Contrarily, **Pehuén Co** still remains as a familiar, near rustic and short time touristic place. Thus, as expressed in surveys conducted by the Office of Tourism of Coronel Rosales (see 2.2.1.1) the main motivation of people choosing this destination is pursuing peace and nature, away from the noise and cement. Furthermore, people who choose Pehuén Co as a destination for rest mostly attend only by the day, usually Saturday or Sunday coming from the close city of Bahia Blanca. Predominantly visitors of this town are people between 26 and 40 years old, with medium to high level of education, traveling in couples or family groups (4 and 8 people).

Moreover, in **Monte Hermoso** fishing and building (related to tourism activities) are secondary sources of income. During winter time, commerce exclusively depends on the income of permanent population. During summer, contrarily, tourists' affluence plays a crucial role into commercial performance. Retirement subsidies have a great relevance in **Pehuén Co**, mainly because of the average age of stable population. In this case, 80% of commercial activity comes from tourism.

Regarding **fishery**, around 400 to 500 families depend on that activity in **Pehuén Co** and **Monte Hermoso**. Captures crucially depends on the selected technique. For the current fishery fleet of Pehuén Co and Monte Hermoso (around of 100 boats), fishing with line allows to catching up around 10 boxes daily, while trawling allows to capture between 150 and 200 boxes daily (3.000-4.000 kg of product). During the last years, trawling has been widely extended in the area at the expense of fishing with line, increasing overexploitation.

Both Monte Hermoso and Pehuén Co have small number of fishermen, who work under similar conditions than those described for the case of Ingeniero White, Cerri and Villa del Mar. The product of fishery is traded either on retail market for private consumption through two cold-storage placed on Monte Hermoso, or sold to other processing plants usually based in the city of Mar del Plata (about 450 km to the northeast). In any case, fishery is sold without being processed and with no added value, which is clearly reflected on prices.

Nevertheless, this situation is next to change. Recently the First Ecological Artisanal Fishing Terminal of Monte Hermoso and Pehuén Co has been built and it is supposed to be operational by the end of this year. This project has been developed financed by a national subsidy given to the Artisanal Fishery Chamber of both towns, with the purpose of increasing the added value of the production. Although the property of the terminal will remain under the municipality government, it will be administrated by a tripartite

organization formed by: agents from municipality, artisanal fishermen and a technical manager.

The plant of approximately 534 m² will have three cold-storage chambers, utility rooms to clean up fish and boxes, filleting rooms, packaging rooms, a room for managing and gas distribution, and a loading and dispatching zone. According to the project, it will allow fishermen to produce fish flour and canned fish, with the purpose of exporting these products to the European Union directly throughout the Port of Bahía Blanca. It is considered by stakeholders to be an important economic alternative for the more than 200 families related to fishery. However, the distinctive aspect of this project is its ecological side: it will include a biodigester to process solid and liquid wastes producing biogas and organic fertilizers.

2.1.3.2. Access to inputs and investments

Regarding resource management, it is remarkable that no common property system is developed on the area. Furthermore, the private management of natural resources has a clear negative effect in some of the localities. This is the case of **Ingeniero White**, where people are not allowed to reach the shore in the whole extension of the coast because of the existence of private control mechanisms which avoid the access of the public to the port zone.

With respect to fishing activities and although the access to inputs is usually privately determined, Ingeniero White has received some government assistance in order to access to capital improvements. During 2011 an official plan to modernize the fishing fleet was carried out. In its frame, province authorities handed over some new boats to fishermen. However, the implementation of such measure faces some difficulties related to the size of the new boats (sensibly larger than ones which were put out of order due to this policy) and the higher costs related with its operation and maintenance.

On the other side, and due to the significant decrease of registered captures during last years, local authorities have offered a monetary subsidy for each boat leaving the activity and renouncing their fishing license. In the frame of this program, local authorities have informed arrangements with twenty active fishermen, ten boats and three ship owners.

The access to capital of fishing sector is being encouraged also in the cases of **Monte Hermoso and Pehuén Co.** Funds from province and municipality governments are currently contributing in building a modern processing plant which will be able to be used by local fishermen (see 2.1.3.1.). Although there is no certainty on the date in which the plant will begin to work, it will undoubtedly contribute to improve working conditions of local labor force as well as commercialization mechanisms.

Tourism activities have also received a big push coming from public initiatives. In the case of Monte Hermoso, new recreational alternatives as theatre, cinemas and new open spaces have been encouraged and funded by municipal and provincial authorities

2.1.3.3. Infrastructure: local and connection with region main centres

Regarding accessibility conditions and the transport network, Bahía Blanca houses the convergence of the port, the railways and five main roads: National Highway 3 (RN 3, for its Spanish acronym), RN 22, RN 35, RN 33 and Provincial Highway 51 (or RP 51 for its Spanish acronym). As a result of this high degree of connection, an area of influence can be clearly determined around Bahía Blanca due to the concentration of health services and agricultural and livestock activities and to the existence of two national universities in the

city. Moreover, Bahía Blanca has an airport with daily flights to Buenos Aires and frequently flights to the south of country (Trelew and Comodoro Rivadavia).

The main interest areas of our study can be linked by road. Villa del Mar is in the RN 229 near Punta Alta. The distance between Bahía Blanca and Pehuén Co is about 80 km, and about 65 km from Punta Alta (the capital of Municipality of Coronel Rosales) to Pehuén Co. Both itineraries can be covered in almost one hour, from Bahía Blanca and Punta Alta to the east by RN 3 and RP 113. The latest has been recently asphalted, making easy the acces to the town. Along the RN 3 and RP 78, it can be linking Bahía Blanca and Monte Hermoso in a way of 110 km (in almost one hour). Also RP 113, RN 3 and RP 78 run between Pehuén Co and Monte Hermoso in a route of 80 km. Although the distance in line by the coast is about 30 km, there is only one other alternative way between both cities based on unpaved road named La Soberana (see Fig. 3) which implies a distance of 50 km between both twons.

Regarding port facilities and, as we stated before, the Canal Principal of the Bahía Blanca Estuary houses the largest and deeper harbor system in Argentina. This system includes oil transfer buoys, the trading dock of Rosales Port and the largest navy base (Puerto Belgrano). Moreover, the inner estuary houses the port of Ingeniero White, which has two differenced areas: one devoted to grains and the other to general merchandise. In 1989-1991, the navigation channel was dredged to a depth of 13.5 m (45 ft) and its development has promoted the settlement of several industries that have conformed one of the most important petrochemical poles of Argentina, as we mentioned in 2.1.3.3. At this time the outer navigation channel is being dredged to 15 m (50 ft) which greatly improve the commercial activity of the harbor in the near future.

2.1.4. Observed changes in resource use

Due to the enlargement of the harbour system, major dredging activities in **Ingeniero White** and **Cerri** zone have been occurring since 1989. In that year, the harbour authorities dredged the navigation channel from the original 10 m to a depth of 13.5 m. Most of the dredged sediments were deposited along the channel on top of the tidal flats then existent there. Since then, there was a major change in the outer wetlands which moved from bare tidal flats to *Spartina* salt marshes due to the sudden increase in the wetland level. The *Spartina* marshes extended considerably during the following 20 years, but in the present time, because the lack of sediment input, there are clear signs that many of these marshes are being heavily eroded again (Pratolongo et al., 2010). At the present time, harbour authorities are doing a deeper dredging (15 m) of the navigational channel; however, due to the recommendations given by IADO researchers, the dredged material will be deposited in adequate filling areas of the estuary, deeper than 20 m, from which sediment transport will be minimum.

Nevertheless, the federal government associated to the national oil company is planning a major Liquid Natural Gas (LNG) plant in the inner portion of the estuary. The plant will receive imported LNG from very large ships which require specific navigation conditions. Therefore, a major dredging project was designed to work in the most sensitive sector of the estuary where the very first steps in the food chain of the system occur. There is a significant opposition from the population and the scientists, which included legal actions. The dredging could affect more than 1500 families that live directly or indirectly of the artisanal fisheries resulting in a lost of over 5 million dollars within the first 10 years after the dredging (Zilio et al., in press). However, according to recent news²,

² See <http://www.frenteacano.com.ar/verNoticia.php?k=124677>

the project would be rejected by the protection agency of the province and alternative locations would be under consideration.

The stakeholders of the three communities remark different changes in the resource use patterns, sometimes as a result of alterations in the environmental characteristics of their productive resources. These changes could be associated either to climate variability or to human activity.

In **Monte Hermoso**, stakeholders state that the touristic season (which used to be during the December-March period) seems to have enlarged (October-April) as a result of increases of the “summer months”. Moreover, because of increases in daily temperatures, tourists stay longer in the beach. Therefore, there is a more intensive and extended use of the beach. Something similar happens in **Pehuén Co**, where tourism has grown, thus there is more stable population devoted to these activities.

On the other hand, there is a better performance in the management of forests and grazing land. This seems to be due to a better awareness of the citizens of the place. This is also remarked in Pehuén Co, where the population has become more conscious of the fire problems after a big forest fire in 2011. From then on the press has gained a lot of relevance in promoting a rational and responsible use of forest (See for example the educational role of the TV program “Hola Pehuen!”³).

In the zone of **Villa del Mar**, the loss of the beach and the reductions in fishery resources, as well as the new local recognition of the biological relevance of the wetland, is resulting in the construction of a new identity for the town. The wetland is now part of an ecological reserve with educational and conservational purposes. Some of the population who emigrated during the eighties and nineties is coming back to the zone.

Finally, the reduction in the quantities of fishes, as well as the change in the species, have made fishermen to change their fishing practices, they have to travel farther away, which also made the activity more dangerous. This is also observed in **Pehuén Co** and **Ingeniero White**. In the later, stakeholders also remark that changes in the availability of fishing resources are mainly due to the overfishing of big ships, the creeping fleets and the dredging, which changed the morphology of the coast and the behavior of fishes. Therefore, the fishermen had to readapt, traveling to different (and more dangerous) areas and fishing different species. In order to reduce the risk of the activity and to have a more clear planning of the activities, fishermen have get used to use forecasts, either from local or international weather stations up to three days before of embarking.

The expected changes in the resource use patterns in two of the cities (**Monte Hermoso and Pehuén Co**) are related to community or governmental initiatives, in reaction to the loss of fish stocks and the erosion of the coast and the dunes. In this sense, in Monte Hermoso, stakeholders highlight the extension of the fishing closing season, which seems to be resulting in an increase in the stock of the corvina. In Pehuén Co, decision makers mention that recently there has been a clear intention to reduce the building in the dunes as well as the forestation with non indigenous species. In **Ingeniero White**, a priori, there is no evidence of an expected change. (This point is extended in 3.2.)

³ See <http://holapehuenweb.com.ar/>

2.2. Governance System

2.2.1. Formal and informal rules regarding the organization of local stakeholders

2.2.1.1. Structure of formal and informal governance systems

In Argentina the political power is exercised through a representative democracy in all the territory indirectly, through elected representatives. Therefore, there is no general assembly with public decision power over the use of resources or land destination. In particular, the communities here treated are lacking of clear or community based informal rules governing their behaviour. On the contrary, there exist a group of legislation rules which regulate actions and resources performance. These regulations emanate from the three levels of political jurisdictions that coexist: local, provincial and national. A brief description of the most important institutions or decision makers related to use and management of natural resources are shown below. The system is very complicated as there are different institutional organisms and regulations, coexisting.

In the first place, **the national executive level** (National Government) is made up of 15 ministries since 2010. For *the fishery activities*, the Under-Secretary for Fisheries and Aquiculture (SSPyA), among others, depends on the Secretariat of Agriculture, Livestock and Fisheries, one of the 6 organisms under the Ministry of Agriculture, Livestock and Fisheries. The SSPyA in conjunction with the CFP (Fisheries Federal Council) establish formal norms, coordination rules, catch limitations, research and development priority areas, etc. The Ministry of Agriculture, Livestock and Fisheries has a regional office in Bahía Blanca whose actions reaches Puerto Rosales. Nevertheless, the Municipality of Monte Hermoso is in the area of influence of Tres Arroyos' regional office, enlarging the complexity of the governance system.

Also, that Ministry has five decentralized organizations. The most relevant for this project are INIDEP and SENASA. The objective of INIDEP (National Institute of Research and Development of Fisheries) is to advise SSPyA and CFP on the rational use of available resources for preserving the marine ecosystem for future generations. SENASA (National Service of Health and Food Quality) executes national policies on health and food quality and verifies compliance with current regulations.

Others ministries like the Ministry of Economy and Public Finances, Ministry of Federal Planning, Public Investment and Services, the Ministry of Social Development and the Ministry of Science, Technology and Innovation, make decisions about public investment, land uses for building and uses of some resources as mineral ones and water as well science and technology, respectively.

The Ministry of Tourism was created recently in 2010 to impulse the activity. If some reserve becomes a national park or UNESCO World Heritage site (it could be possible for the Natural Reserve Pehuén Co – Monte Hermoso case) jurisdiction depends on that ministry⁴.

In a second place, in the **executive provincial level** exhibits 10 ministries, 10 secretariats, 1 office and a decentralized organism, all situated in the city of La Plata⁵. For example, the Provincial Office for Fisheries (depending on the Ministry of Land Affairs) declares fishing ban and regulates fishery activities through provincial law N°11,477, among other things⁶. On the other hand, under the Ministry of Infrastructure⁷ is the

⁴ All organizational charts can be seen in each of the 15 official sites of ministries.

⁵ See <http://www.gba.gov.ar/gobierno/ministerios.php>

⁶ A complete organizational chart of the Ministry of Land Affairs is available at official site <http://www.maa.gba.gov.ar/2010/institucional/organigrama2011.jpg>

Under-secretary for Public Works and the Provincial Office for Hydraulic. The latter has a regional office in Bahía Blanca which has an influence on all the municipalities under study and it which is on charge of analyzing possible solutions for water and coastal erosion problems.

There also exists a Provincial Office for Mining (depending on the Under-secretary of Industry, Trade and Mining and the Ministry of Production, Science and Technology). That Office has regional influence along Bahía Blanca and Coronel Rosales and should monitor the use of sand in coastal zones.

A very important organism is the OPDS (Provincial Organism for Sustainable Development), which is the provincial authority in environmental policy. Its mean goal is to guarantee the sustainable and correct management of the environment, the preservation of biodiversity and the implementation of sustainable development planning.

The Secretariat of Tourism should promote, supervise and execute planning destined for developing sustainable tourism. The form in which that governance structure is decentralized differs from others secretariats above mentioned. In this case, every municipality has a secretariat or office of tourism at municipal level in contact with the provincial level. In this sense, the management of tourism seems to be nearer to the local population than the management of resources like fisheries, use of land for housing and infrastructure or water for consume.

In the third place, **at the local level**, there are the municipalities of Bahía Blanca, Coronel Rosales and Monte Hermoso which are divided into several interest areas⁸.

In Bahía Blanca, the environmental area presents four governance organisms: Sanitation, Epidemiology, CTE (Technical Executive Committee) and APELL Process. The CTE has an office in Ingeniero White, close to the industrial park to monitor emissions of industries. The APELL Process⁹ is a community experience of self-protection (maybe the only community-based experience in the zone), which requires the action of three stakeholders' groups: industries, community and decision-makers.

A decentralized and very important organism is the Consortium of Management of Bahía Blanca Port¹⁰ (CGPBB), which is on charge of the operation and management of the port since 1993. Although the CGPBB is integrated by 9 stakeholders from different groups, only 2 of them represent labour associations (but none of them are fishermen). Most of the decision-makers involved in the Consortium represent political power and large business.

Another important non-governmental organism related to the industrial activity in Ingeniero White is AIQBB (Chemical Industrial Association of Bahía Blanca). It draws together Mega, Dow Argentina, Profertil and Solvay Indupa petrochemical industries. Its mission is to work towards the integration of the industry and the community, as well as to contribute to the improvement of the quality of life of people. Nonetheless, sometimes society perceives AIQBB as a pool of the largest industries of the Petrochemical Pole, whose lobbying power is turned to their own advantage.

⁷ A complete organizational chart of the Ministry of Infrastructure is available at official site <http://www.mosp.gba.gov.ar/institucional/organigrama.php>

⁸ The organizational chart of Municipality of Bahía Blanca, Coronel Rosales and Monte Hermoso are at <http://bahiaablanca.gov.ar/gobierno/organigrama-municipal.php>; <http://www.muncrosales.gov.ar> / and http://montehermoso.gov.ar/lonkotech/ver_pagina.php?id_pagina=1 , respectively.

⁹ APELL is a programme developed by the United Nations Environment Programme and its overall goal “(...) is to prevent loss of life and property, and to ensure environmental safety in the community” (UNEP, 1988, p. 7)

¹⁰ See http://www.puertobahiaablanca.com/institucional_consortio.asp

Besides the tourism area, in Monte Hermoso and Coronel Rosales the secretariat for Works and Services is also important for the management of natural resources, as long as it is involved in urbanization planning and the control of public services. Moreover, productive activities and the economic actors are grouped in local organizations, such as chambers of commerce or fisheries.

In the zone of Ingeniero White, there are three organizations related to the fishery activity: the Chamber of Owners and Shipowners Fisheries of Bahía Blanca Estuary, the Association of Artisanal Fishermen of Bahía Blanca Estuary and the Chamber of Artisanal and Commercial Fishermen of Ingeniero White, Puerto Rosales and Bahía Unión. While the first one represents the interest of shipowners and largest businessmen, the other two organizations reflect the interest of fishermen and they divided into two institution after a conflict in 2009 (see section 2.4.3). On the other hand, people working in commerce and industries are, when it happens, included in particular labour unions whose influence is not completely local.

There are also two informal neighbor associations of certain relevance: the Residents Association of Ingeniero White and the Neighbor Forum of “Cerri de Pie” particularly interested in environmental care.

Being the tourism industry so important in Monte Hermoso and Pehuén Co, commerce, hotels and gastronomy are united in the Chamber of Commerce and Industry of Monte Hermoso and in the Chamber of Commerce and Tourism Development of Pehuén Co. Stakeholders also grouped in an informal manner are lifeguards, volunteer fire brigade, rangers, Rotary Club of Pehuén Co, Residents Association “Amigos de Pehuén Co”, among others.

2.2.1.2. Functioning of different decision authorities and formal and informal rules governing their behaviour

The functioning of the formal and modern rules is many times inefficient. With such a complex governance system, it becomes often difficult to make decision and to act because modern institutions do not generate the levels of face-to-face interactions that old institutions (for us, community-based institutions) showed (Putman, 2001).

For instance, neighbors of Pehuén Co have demanded the treatment of the coastal erosion of the Secretariat for Works and Services of Coronel Rosales. Besides they argue that political power do not know the real problem in Pehuén Co, because decision-makers live in Punta Alta and do not go to Pehuén Co frequently to observe the coastal behavior. On his side, the Secretariat for Works and Services of Corneal Rosales says it is not the appropriate organism to give a response to neighbors. Hence, the Secretariat has claimed for assistance to the Provincial Office for Hydraulic (see 2.2.1.1) for more than two years getting no answer.

In that case, the establishment of some informal institutions is very useful to make agreements on some common performance rules and to conduct personal initiatives to the different levels of governance (Bowles and Gintis, 2002). Moreover, the inexistence of informal rules of enforcement or the absence of community organization inhibits the attainment of what could be a social goal (take care of the coast, for example).

On the other hand, the existence of a governance body has given stakeholders the perception that “the government has to do everything”, a phrase many times mentioned during our visits to communities. It is a bi-directional problem: the structure of government seems to discourage the formation of social coalitions while the social action seems to be ineffective against the government.

2.2.2. Natural resources property rights, management system, conservation schemes and policies

As it has been already mentioned, there is no a clear community-based management of natural resources in none of the three towns within the area of study. Natural resources, as any other economic resources, are privately managed and entirely regulated by governmental institutions. Besides, the concept of community management appears somewhat strange to the sociological and cultural structure of the Argentinean society.

This lack of a communal administration of resources may be directly related to the existence of private property rights for all the natural resources, instead of common ones, that could be pointed out as a conflict in itself (see 2.2.1.2) but which also constitutes a major challenge for the COMET-LA project in Argentina.

Indeed, for both land and capital resources, there are private property rights, legally established according to the national legislation. Although some natural resources, as fishery are clearly public resources (according to the economic definition of a public good), there is no any community based approach to manage its exploitation. The same applies to the forest in the case of Pehuén Co, or to the sand in Pehuén Cop and Monte Hermoso.

As stated on section 2.2.1.2 in these communities there are not important informal rules and the majority of the activity is regulated by formal regulations. The monitoring, enforcing and sanctioning activities are performed by the public legally established agents and institutions, within the different jurisdictions mentioned in section 2.2.1.1. Furthermore, except for some non-governmental initiatives, most of the conservation schemes and policies are developed and implemented by legal regulations. There are no social sanctioning methods for these communities.

The set of rules are huge, similarly to the governance sector previously described. Apart from national and provincial laws, each organism shows a high number of decrees, resolutions, regulations and agreements¹¹.

Firstly, to regulate fishery activity and to establish fisheries resources conservation, there exists formal norms at national and provincial level¹², as well as the Federal Law N° 24922 (scope and enforcement authority, conservation policies, Fishing Registry and penalties regime – Law 25470). For instance, the regulation 82 of the Ministry of Land Affairs (through the Provincial Office for Fisheries) declares every year the fishing ban for trawling and active techniques from the 00:00hs of October 1st to the 24:00hs of March 31st in “El Rincón”¹³. The extension of 6 month of fishing ban (before from January to March) was an achievement of chambers of artisanal fisheries of the region¹⁴.

Secondly, for the management of ports, the CGPBB has established a set of rules to operate in Bahía Blanca and Coronel Rosales. The CGPBB also has the police power to control the vessel traffic. Two radars located in Pehuén Co and Coronel Rosales Port help CGPBB to monitor the access to the estuary. However, the CPGBB has recently decided to change the whole monitoring system and both radars are not currently operating and

¹¹ For instance, the OPDS rules can be analyse in <http://www.opds.gba.gov.ar/index.php/leyes/resumen>

¹² See http://www.maa.gba.gov.ar/pesca/index.php?option=com_content&view=frontpage&Itemid=5

¹³ “El Rincón” is the maritime zone extended between Claromecó and Bahía San Blas.

¹⁴ A project of law for a fishing ban for 3 years in this zone is been currently treated at provincial level of governance. The project was introduced by the ex-governor of Monte Hermoso and now legislator in the province state.

their towers will be dismantled in short time. Additionally, the Law N° 11499 proposes the collaboration of Prefecture as auxiliary police to control fisheries and ecological changes.

Thirdly, despite the private property of land, there exists some regulations to protect the dunes and the coast against the erosion, most of which are subjected to the provincial jurisdiction. The main regulation falls into the OPDS and the laws of Territorial Order and Use of Land. The Provincial Law N° 8912 (for Territorial Order and Use of Land, sanctioned in 1977 and modified in 1983) names some dunes as “recovery dune zones” those areas with not fixed sand formations due to erosion or normal wearing, and that then urbanization cannot be extended on them. According to this norm, no building is permitted behind 100 m from the tide line. In 1999, the Water Code (Law 12257) was sanctioned, and from then on plots and buildings are not permitted in a line of 150 m from the ocean. In 2006 the provincial decree 3202 was established. It defined a defense band for the coast from the foot of the dune to the 250 or 300 m, limiting the increase of towns over the beach. This decree invited all municipalities from Punta Rasa to Coronel Rosales to adhere. Only Pinamar and General Pueyrredón have not signed.

Additionally, Monte Hermoso reinforces provincial norm with a municipal regulation by which no building next to the beach can exceed the 6th floor, and from 2006 the vehicular access and traffic along the beaches zone were locally prohibited by regulation N° 1505. On the contrary, in Pehuén Co the traffic is allowed, except in the area of the archeological reserve.

In Coronel Rosales there exists a regulation (1668/86) to prohibit the extraction of fossils and archeological elements and any type of land as well as the constructions with power shovel. According to that regulation, sand extractions resulting from the balancing of private plots must be taken to the waterfront.

It is clear that two of the most important ecological problems of the region (reduction in the fishery resources and coastal erosion) are exclusively regulated by legal rules, there are no informal rules, and the absence of social sanctioning methods is somewhat related to the absence of a local identity.

Besides, during the participative workshops stakeholders remarked that people had low level of observance of the rules. In particular, they mentioned two clear examples. The case of artisanal fishermen, who in spite of the existence of regulation they still do trawling fishery affecting their own activities; and the case of the erosion of the dunes in Pehuén Co, where people extracts arena for building purposes breaking the regulation.

It could be also said that in some of the places, there is also an educational ecological policy. For instance, in Pehuén Co, where stakeholders remark the role of the local press in educating children and young people, particularly after the forest disaster in 2011.

2.3. Users

2.3.1. Social components of the study area

2.3.1.1. Population and characterization of users

Table 1 shows the **population** in areas under study in accordance with the last two census.

Table 1. Population in the main urban centres under study

Cities	Census (population)	
	2001	2010
Ingeniero White	10486	11115 (*)
General Daniel Cerri	8716	13946 (*)
Pehuén Co	-	674
Villa del Mar	-	353
Monte Hermoso	5602	6494

Source: INDEC (National Institute of Statistics and Census). (*) Provisional data.

Data for Ingeniero White and Cerri has been extrapolated according to intercensal growth rate for the total Municipality of Bahía Blanca (final data is not yet available). Probably, data could be overestimated.

The number of residents in Monte Hermoso has been growing considerably since 1983 when obtained its autonomy as municipality. According to the latest census, Monte Hermoso has a permanent population of 6494 people, with a total of 10127 homes. Nevertheless, during the peak season, population increases up to 60000 persons. The 74% of dwellings are second homes, being the number of houses much higher than residents. The growth of the municipality seems to be directed by a strong and sustained demand of residential tourists. Intercensal growth population from 2001 to 2010 has been about 16%, whereas the increasing of houses has been hovering around 23.3% (Vaquero et al., 2011). That could be showing an increment in the second home tourism.

Official data on **income inequality** is only available for Bahía Blanca, due to the existence of the Regional Centre for Economic Studies (CREEBBA). According to the information of the National Institution of Statistics and Census (INDEC) in 2009, 3.3 % out of the total urban population was under poverty line, and income inequality regarding the Kuznets ratio 1:10 reached 18.9 in the same year¹⁵. Unfortunately, this information does exist neither for Monte Hermoso nor for Pehuén Co and the rest of the towns under study.

With respect to **education** and socio economic conditions, even though there is still no information on access, staying and ending elementary and high school for each town, it is important to mention that they have the possibility to access to all educational levels. Tertiary and graduate educational centres are located in the city of Bahía Blanca, which is at most 110 km away from the communities. Moreover, the educational community appears to be very involved in local and regional problems. In the second place, they do have good access to **sanity** on different levels of complexity. There is a full hospital in Monte Hermoso, while Pehuén Co and Ingeniero White have well equipped medical wards.

¹⁵ In order to have some point to compare the situation of the region, the total urban population under the poverty line was 3.5% whereas the average national Kuznets 1:10 index was around 23.6% for the 2009 according to official sources.

Also, as in the education case, they have the advantage of being located near to Bahía Blanca which is a sanity nodal point within the southern region of the country.

Finally, the **access to drinking water and sewer** is very unequal along the region. While Ingeniero White and Cerri have access to these service, in Pehuén Co and many parts of Monte Hermoso there is no public net of water and, even in the cases in which there are water treatment plants, their quality and functioning is not good enough. Moreover, the quality of water in Ingeniero White and Cerri is also questioned because of pollution and overexploitation (see 3.1).

As informed by the Under-Secretary for Economic Coordination of the Province of Buenos Aires¹⁶, the Gross Domestic Product (GDP) for each municipality, measured in thousands of Euros was, in 2003 (last data available): in Bahía Blanca, € 79862; Coronel Rosales, € 56412; and Monte Hermoso, € 10793. Those numbers represented in 2003, in per cápita and per year terms, about € 280 in Bahía Blanca, € 926 in Coronel Rosales and € 1927 in the case of Monte Hermoso.

2.3.1.2. Cultural and environmental areas under the management of different agencies

The area under study houses several natural areas of special interest. In particular, there are three protected areas working as natural reserves and an additional one is being built.

The Provincial Nature Reserve “Bahía Blanca, Falsa y Verde” (depending on OPDS) was created on 1991 by Law 11.074 (afterwards ratified by Law 12.101 in 1998) and constitutes a multiple use area of around ca. 30000 Ha of inland and ca. 180000 Ha of watershed. The area covers part of the municipalities of Bahía Blanca, Coronel Rosales and Villarino and it is connected with main national roads through RN 3.

The Nature Reserve has an important endowment of natural resources which play a crucial role into the regional economic and social performance.

In general terms, the area is mainly a estuarine marsh with coastline, salt marshes and islands. From a geological point of view, the area is an old delta of the Colorado River, whose sedimentary deposits gave rise to an intricate system of tidal channels. The major channels (Principal, Bermejo, Bahía Falsa, Bahía Verde and Caleta Brightman) are oriented NW-SE and are connected by a meander net of secondary and other minor channels (Cabeza de Buey, La Lista, Tres Brazas, Embudo, among others).

Regarding climate conditions, the nature reserve register average annual precipitation amount of 541 mm and an mean annual temperature of 23 °C in the warm season and 8 °C in the coldest one.

Due to their richness of native flora and fauna, the sector is used as a nursery area for several species, among which the Olrog’s gull *Larus atlanticus* can be highlighted.

Regarding Nature Reserve management, municipalities and local entities are working on promoting educational and artistic activities, as well as defining a development strategy based on sustainable principles. Other activities, as scientific research, bird watching, photographic safaris and guided walks in the area are allowed with prior authorization request.

In the outer zone of the estuary, the coastal area houses the Geological, Paleontological and Archeological Provincial Reserve Pehuén Co-Monte Hermoso (depending on OPDS), a natural area with defined objectives created in 2005 through Law

¹⁶ Available at: <http://www.ec.gba.gov.ar/Estadistica/pbg/pbg3.html>

13394. The reserve covers land areas belonging to the municipalities of Coronel Rosales and Monte Hermoso and, as we stated before, it is connected to other urban centers of the zone through RN 3 and RP 78.

The Reserve brings an excellent scenario in order to study coastal ecosystems, becoming highly useful for scientific research and educational and cultural activities. The reserve protects a series of outcrops along over 40 km of beaches from the mouth of the estuary and Monte Hermoso. This reserve includes the places where Charles Darwin made his first discovery of the megatherium fauna in 1832 and started to think in his theory of evolution. In other areas of the reserve there are footprints in a 12000 yrs old shallow lake of the typical fauna of the period, most of which has disappeared. Furthermore, there are also examples of human footprints dated 6500-7000 yrs BP which some of oldest examples of human evidences in Argentina. Although still to be confirmed, there are also human footprint recently discovered that maybe dated also in 12000 yrs BP. if the later is true, they could be the oldest example of humans in South America.

The Municipality of Bahía Blanca with the Bylaw 707/06 established the Municipal Coastal Reserve “Reserva Costera Municipal de Objetivos Definidos” in 2006. By covering 3 km², it protects a unique interaction between the burrowing crab *Neolice granulata* and the upper marsh plant *Saccocornia perenis*. This interaction generates rings that are worldwide unique (Perillo and Iribarne, 2003).

In May 2011, the Provincial Government created 10 new Protected Natural Areas as the Municipal Natural Reserve Bahía Blanca Coastal, placed in the a former dump site of Bahía Blanca. OPDS and CGPBB agreed on the relocation of the sediment to be dredged in the Canal Principal of the estuary. The objective is to improve the habitat of certain endangered species like the “gaviota cangrejera”. After doing the cleaning of the land, people could have a direct landlocked and a coastal walk. The recreational site will be 3 km long in front of the estuary. The project also implies to build new harbor places and industrial areas in Cerri and White. The original project was approved by municipal regulation 13892, but is not reglamented yet.

Besides the protected areas, there are other two places of interest in which the community has an important role. Firstly, besides the wetland of Villa del Mar there is an unprotected area, where an interpretative path is used by local community. A non-governmental organization (FRAAM) has been just created in August 2012 as part of a programme of animal recovery and of education. The foundation organizes natural walks along the marshlands for biodiversity analysis and bird watching, especially during periods of bird migration

Secondly, the Neighbor Forum “Cerri de Pie” has submitted a project for consideration by the Consejo Deliberante of Bahia Blanca in order to save the old train station “Aguará”. The goal of the project is to create a science museum and a space for art and cultural expression. The museum could also complement the project known as “La Trochita” which will try to link two ancient places of the zone: “El fortín” (the old fort) and “La Pulpería” (an old local store) by a local train with narrow width (the meaning of the name). The project is backed by AquaMarina.

2.4. Interactions

2.4.1. Conflict among users

The main conflicts among perceived throughout the entire community is related to the fishery problem that fishermen attribute to creeping floats, pollution and sewage, but they do not consider that the problem may also be the result of their own overexploitation. Therefore, there are multiple conflicts of interest within different actors: industries,

government, fishermen, etc. Otherwise, there is a clearer opinion surrounding tourism, at least among stakeholders, who insist that the main problems are related to the lack of a concrete and integral tourism plan (see 3.1.2 and 3.1.4).

Conflicts among users are frequent in **Ingeniero White** because of the pollution and its effects on fishery resources, as well as for the access to the coast and the sea. In the first case, the problems are between local population and fishermen with the large industries placed in the petrochemical pole. In the second place, the conflict relates to the lack of a “public port”. Stakeholders remark that, since the last decade, they have been fighting for a public access to the sea, which they used to have for years and that they have lost after the installation of the industries. Currently they claim that they have no access to the sea and, therefore, they cannot go fishing, which used to be a familiar tradition.

There is also a clear conflict between artisanal near shore fishermen and the prefecture regarding the control over the catch. This is highly related to institutional and governance problems discussed later on (section 3.1.2), because, according to the fishermen, there is a regulatory decree establishing that prefecture is the governmental organization on charge of monitoring the activity (which is true, see 2.2.2.), while according to the prefecture agents, it is not under their responsibilities.

Even more relevant is the conflict within the artisanal fishermen themselves, which ended in the disaggregation of the Chamber of Artisanal and Commercial Fishermen of Ingeniero White, Puerto Rosales and Bahía Unión. In 2009 a small group of nearly 60 fishermen left the chamber and formed the Association of Artisanal Fishermen of Bahía Blanca. The main conflict began when the later group accused the head of the former of lobbying activities either with politicians or with pollutant industries of the petrochemical pole. Since its legal creation in 2011, the association has had an active participation. During 2012 the fishermen grouped in the Association developed several strikes in the access to the Port of Ingeniero White claiming for economic compensation, as they attribute reductions in fishery resources to the dredging and industrial pollution.

Monte Hermoso and Pehuén Co share two conflicts between users: the claim for a road and a conflict between fishermen and the whole community. In the first place, there is a clear inquire for building a straight road linking both towns, which would be very important to ease fish commerce and the access to the fish processing plant in Monte Hermoso. Even though the community has formally made this query, the petition was stopped for three reasons. On one hand, the road would imply the expropriation of several private lands; on the other, shopkeepers from Pehuén Co are against this initiative as they believe that it could have negative impact on tourism in days with bad weather because Monte Hermoso has a higher infrastructure. Finally, the road is on clear conflict with the paleontological reserve. Moreover, the additional building of a coastal road may increase both erosion and urbanization (and, therefore, more erosion) along the beach. In the second place, the conflict between fishermen and the whole community is because the formers use tractors to bring their boats to the sea, which are very pollutant and they also clean the fishes on the beach leaving the place in a dirty situation and disturbing tourists.

2.4.2. Information problems and lobbying activities

In the frame of the governance systems and the functioning of different decision authorities described on sections 2.2.1, it is straightforward that there is a lack of a clear and successful system of information shared. This is even more accentuated in the case of fishery, and between the different towns, which do not share information about the levels of catch, as well as any other important information. This is also in relation to the lobbying capacity of the stakeholders (2.4.4.), because the lower information they share, the smaller their lobbying capacity against other interest groups. For tourism activities, provincial

governmental organizations are in charge of controlling, homogenizing and spreading all the relevant information.

According to the stakeholders from **Ingeniero White**, every local initiative promoted in order to restrict industrial activity, or in order to recover the sea access for population has been avoided by the lobby of the industries and the lack of political will to perform these policies. The later has been also remarked as a cause of the lack of local stakeholders lobbying capacities. Furthermore, this problem is also noted by fishermen from **Monte Hermoso**. They argue that the absence of proper controls and legislation to limit excessive captures in the zone of “El Rincon” is mainly because governmental employees are also fishery businessman from Mar del Plata, the neighbor zone from where illegal trawling comes.

Finally, as it has been mentioned in the previous section, the serious problem of division between both fishermen groups (the Chamber and the Association) has weakened their lobbying capacity as a global institution. Moreover, one of the main reasons for this dismantling was the supposed lobby of the leaders of the Chamber of Fishermen with industries and politicians

3. STAKEHOLDERS VIEW ON THE PROBLEMS EXISTENT AT THE STUDY AREA

3.1. Main perceived problems

3.1.1. Social problems

The social problems of this area can be divided into two different categories: the ones perceived by **Ingeniero White and General Daniel Cerri**, mainly based on the expansion of the port, the access to the coast and pollution; and those perceived by stakeholders in Monte Hermoso and Pehuén Co, related to increases in dangerousness of the main economic activities.

In the first case, in Ingeniero White and Cerri the problem is due to a global economic development strategy based on petrochemical industry and other activities related to the port, which does not take into consideration the needing of the local population. As it has been previously remarked, from the beginnings of the eighties this region has been subjected to different changes in its socioeconomic structure. These changes begun with the construction of the industrial pole, which implied the installation of highly pollutant industries with a negative impact on socio conditions, but which also, demanded more labor.

Lately, the expansion of this port implied, on the one side a loss of recreational places and the access of local population to the water; on the other side, according to stakeholders this expanding process increased the insecurity and crimes in the town. The increase of economic activity and labor demand during the building process resulted in a major affluence of internal immigration for temporal jobs. Once the expansion of the pole was finished, these new people become unemployed but they, however, stayed in the region increasing (in the stakeholders view) the insecurity problems.

More recently, local conflicts related to the port augmented, due to the controversial dredging process planned in the frame of a major project related to gas provision in the inner zone of the estuary with potential impact in artisanal near shore fishery. Once again, the local inhabitants remark the impact on their daily lives of this new project. They do argue of the dangers associated to the building of a large LNG plant, so next to their homes, particularly for the case of people from Cerri. This concern has been particularly

expressed for firemen of the town, who seem to be clearly worried about the real impact of a potential accident in the re-gasification plant, the consequent linking effect, and their capacity of action related to a huge event (see section 3.1.5).

Finally, people from these two towns express their dissatisfaction about the loss of the quality of the seaside resort “Maldonado”, which is one of the most popular recreational places of the surroundings; with an average concurrence of 500/700 persons a day during summer seasons (Piccolo et al., 2009). Piccolo et al. (2009) highlight that during the 2005-2006 and 2007-2008 seasons, there were several days not suitable for the recreational use of the place, because of the high bacteriological levels. This problem is related not only to the pollution and effluents from the industrial pole, but to the increase in household effluents without a correct treatment. According to official information¹⁷ the water treatment plant (“Planta depuradora de la Tercera Cuenca”) is running from 2008, but still discharges the sewage without any treatment and without any separation process to the estuary¹⁸.

In **Monte Hermoso and Pehuén Co**, social problems are highly related to the increase in dangers as a result of economic and ecological changes. Even though both aspects will be addressed later (see sections 3.1.3 and 3.1.5), it is important to mention here that stakeholders perceive as an important problem the fact that the beaches have become more dangerous as a result of the ecological changes (increases in the rip currents, bars, etc.) increasing the chances of drowned people, and also the fisherman economic activity is more dangerous as they have to go further to take the same product (as a result of the dredging activities). Moreover, in Pehuén Co, there is a serious problem of pollution in the first layer of the groundwater. The authorities of the town argue that this problem is the result of the overexploitation of the resource with irrigation purposes because inhabitants do not enforce the current regulation (see section 2.2).

3.1.2. Institutional and governance problems

One of the main particularities of the Argentinean case is that stakeholders and decision makers differ, resulting in two different groups of agents whose actions and interests are (sometimes) opposite. This can also be attributed to the characteristic of the governance of the system, which is not a community based one, but a modern democracy with different agents and institutions coexisting together (see section 2.2 for a full description of governance system). Therefore, the key institutional and governance problem of this case of study can be said to be the existence of a clear conflict of interests between stakeholders and decision makers, and sometimes between different sub groups of stakeholders.

In **Ingeniero White**, for instance, important decisions, such as the dredging or the expansion of the port has been supported by politicians, but they are (most of the times) rejected by local stakeholders, especially fishermen. As stated before, the dredging for the installation of the LNG plant is part of a broader (national) energy policy, and no local considerations have been made. Therefore most of the people from General Daniel Cerri are against of the project, or at least of the proposed localization. This situation has led to a deep debate and the consequent emergence of different local organizations against this project. However, stakeholders remark that one of their institutional and governance

¹⁷ See for instance the act 157 (04/09/2009) or the expedient HCD-1409/2011 of the Honorable **Concejo Deliberante de Bahía Blanca**, available at: <http://www.hcdbahiablanca.gov.ar>.

¹⁸ This problem resulted in several formal and informal complaints from the Non-Governmental local Organization TELLUS which have also reported different visits to report the bad functioning of the plant. More information on the NGO web page and blog: <http://www.tellus.org.ar/>; <http://tellusianas.blogspot.com.ar/>.

weaknesses is that this actions and groups surge in times of peak conflict but that latterly they reduce their social participation and disappear.

Furthermore, in two of the cases there is also a high level of conflict between stakeholders of the same group. Both in **Pehuén Co** and in **Ingeniero White**, the storekeepers and fishermen, respectively, are grouped into two commercial associations instead of one; weaken their negotiation power against the decision makers.

Pehuén Co has an additional governance problem related to the exploitation of the paleontological, geological and archeological reserve. On the other hand, the residents of **Pehuén Co** and **Monte Hermoso** are interested in building an alternative route linking both towns in order to increase touristic affluence between them. The conflict is due to diverse facts. Firstly, that the route should pass near the paleontological zone assuming a high erosion risk, as the real extension of this area is still unknown by the scientists. Secondly, a new coastal route could promote the formation urban areas increasing the pollution and erosion. Finally, it could constitute an additional factor of modification of the coastline dune system deepening the erosion problem.

There is also a clear enforcement problem, particularly in those communities where fishing is an important activity: **Ingeniero White** and **Monte Hermoso**. Stakeholders from both places remark that there is no a consistent fishery policy, as well as no achievement of the current legislation. As it has been clearly described previously, there is a provincial regulation forbidding the trawling. However, there is no effective control and there are several fishing boats within de five nautical miles, coming mainly from the zone of Mar del Plata. The absence of adequate controls over the capture is due to the reasons mentioned in section 2.4. The same lack of a consistent policy (in this case a tourism policy) is mentioned in Monte Hermoso, where stakeholders claim for a project defining the tourists profile and the main strategies.

Finally, it is important to remark that some of these conflicts are the result of the existence of different levels of governance and different geographical locations addressed in section 2.2. For example, decision makers in Coronel Rosales argue that coastal erosion has been indicated to the Direccion de Saneamiento y Obra Pública of the Province of Buenos Aires many years ago without any kind of response, and that it is impossible and very costly for the municipal government to address this problem. Also, the delegate of the mining police is on Coronel Rosales, while the sand extraction problems are sited on **Pehuén Co**; therefore, anytime a formal complaint is made in the municipality of Pehuén Co, they do call to the mining policy, but due to the distance they usually cannot get to the place on time. Therefore, there is a clear problem in which decisions about the use of local natural resources are taken in a different place (and most of the times far away) and then decision makers do not know about the main problems of the community.

3.1.3 *Ecological problems*

The first point to highlight is that there are short (5 years), medium (5 to 15 years) and long (more than 20 years) term perceptions of environmental changes which necessarily derive in ecological problems. The second point to be remarked is that they are thought to be originated mainly on climate change and the pattern of use of natural resources (mostly overexploitation) as well as the high pollution in the area. Even though the perceptions of these ecological problems differ for each community, there are at least two changes that persist in the three places: changes in the wildlife and deeper droughts.

Within the former, people remark the absence of mollusks, changes in the behavior of jellyfishes, and the more frequent presence of some Antarctic species such as turtles, penguins, sea lions, among others. These are mainly due to changes in temperature and

winds directions, as well as the feeding needs of the fauna. In the specific case of birds, changes in temperature impact over feeding and nesting. Within the later, the droughts, the main ecological problems are higher soil salinization affecting the marshlands in Coronel Rosales region, increases in sand storms (also due to the forest cutting in the Southwest of the Province of Buenos Aires, related to the expansion of the agricultural frontier), and reductions in fishing resources (also attributable to the man hand).

In **Monte Hermoso**, stakeholders perceive daily changes in wind direction (sometimes winds from the four cardinal points can be observed). They also note a higher share of the southern winds causing an elevated number of storms locally known as “sudestadas” (strong southern winds and large waves that usually cause several damages), which are nevertheless less intensive. A very important ecological change (regarding its impact on economic activity) is the extension of the “summer season” as increases in temperature lead to longer tourist times. It is important to highlight that currently the first frosts start in May instead of April.

People observed high variations in the behaviour of the flora in **Pehuén Co**: different flowering period, high mortality of some species (i.e. eucalyptus), and a higher humidity of sand. However, all these changes are attributed to human activity which through increases in artificial irrigation has changed the microclimate.

Both in **Monte Hermoso** and **Pehuén Co** there seem to have been several changes in the main characteristics of the beach: the sea has advanced on the coast, leading to an important reduction on the beach, particularly relevant in the case of Pehuén Co (related to the erosion of the dune). In these two places, stakeholders mentioned that sea growths and southern storms are more frequent but less intensive, there are several perpendicular channels in the beach, as well as more sandbanks, and there is also an increase in the rip currents. All these ecological changes are directly related to the previously mentioned social problem, because ecological changes resulted in the increase in dangerousness of the beach.

In **Ingeniero White** the most important changes are associated to changes in the wind patterns and to variability in the fishing resources. Fishermen highlight that wind has changed off-shore, in the fishing zone (instead of this, in urban zones the wind seem to maintain its usual characteristics coming from the north-western) changing the behaviour of the species. They also observe increases in the average minimum water temperature of the estuary. Both aspects resulted in seasonal, yearly or decadal variability of the species. Furthermore, stakeholders stress that during the last years there has been a reduction in the spawning and, therefore, a reduction in the quantity of fishes. However, when asked about the origin of this ecological problem, people argue that they are mainly the result of anthropogenic activities such as: overfishing within and outside the estuary, industrial effluents and sewage reducing the quality of water and, finally the increase in the sediment barrier in the beginning of the principal channel hindering the spawning of the shrimp and the prawn.

Similar ecological problems are remarked by stakeholders from **Villa del Mar** but, in this case, problems are more concentrated on the bad quality of water, which is highly polluted. The seabed has become oozy, full of fuels and sewage disposal, and the days following the dredging it is usual to trap wastes on the nets during the fishing process. This seems to be due to the fact that, in its current situation, the tide is not strong enough to “clean” the estuary in this area: the flood tide is stronger than the ebb tide and, therefore, it is not possible to evacuate wastes. They also observe a higher rate of salinity on water and, therefore, they argue that increases in fishing resources after rainy days are due to the lowering effect of rain over the salinity of ocean.

3.1.4. Economic problems

Opposite to the ecological case, economic problems are different in the three communities as they depend on the main economic activities of the people. Nevertheless there are similar problems in **Monte Hermoso** and **Pehuén Co** as in both communities tourism is the most important source of income.

The reduction in the fishing incomes seems to be the most important economic problem in **Ingeniero White**. The main sources of this problem are: the declination in the fishery resources, stabilization of local fishes' prices in a context of growing costs, increases in prawn imports coming from Ecuador and commercialization problems mentioned in section 2.1 (this commercialization problem has also been remarked by stakeholders from Pehuén Co).

In the cases of **Monte Hermoso** and **Pehuén Co**, the key economic problems are related to the lack of a strategic touristic plan and the seasonality of tourism revenues. In the two cases, people emphasize that most of their economy is based on seasonal tourism (see point 2.1.5). Nonetheless, this pattern appears to be changing in Monte Hermoso: stakeholders assure they are receiving tourists along whole the year, but the average stay has reduced to 2-3 days in the long weekends or in peak season (the average historical vacation time was around 15 days in summer time). This is due to both the national economic situation as well as the emergence of several “long weekends” throughout the year.

Finally, while in Monte Hermoso shopkeepers point out that one of the problems is that the localization of tourists on the beach is not concentrated around the commerce zone, in Pehuén Co they remark that domestic market is too small and that the revenues of coastal commerce have reduced as a consequence of closing the coastal roads (this has been done in reaction to the dune erosion mentioned in section 2.1.1)

3.1.5. Problems originated by the interaction among stakeholders

It is straightforward from the previous sections that most of the ecological, social and economic problems are directly (or indirectly) related. It is particularly clear that there are economic problems derived from changes in the resources availability (especially fishery resources), which sources are both ecological (changes in the ocean temperatures, wind directions, storms), and economic (overexploitation, trawling, industrial and residential wastes).

It is also clear the relation between institutional, economic and ecological problems. In **Pehuén Co**, for instance, there is a clear problem of enforcement of the existing regulation related to the extraction and reallocation of sand (see 2.2), that results in problems based on ecological (erosion of the dune), economic (potential capital losses), social (loss of homes near to the beach and the necessity of closing beach roads)¹⁹.

There is a lack of urbanization program in **Monte Hermoso** and **Pehuén Co** (institutional problem) with socio economic consequences, as the coastal zone has been completely occupied (with the ecological erosion impacts). In Monte Hermoso people remark that there is legislation with the purpose of avoiding the buildings shadow on the beach, but not to prevent the coastal erosion. However, more recently the local authorities decided to change the wall esplanade by a wood one, which they consider reduces the erosion problems.

¹⁹ All these problems related to the dune have been extensively mentioned in section 2.1.5.

For people in **Ingeniero White** and **Cerri** the main problems are related to the expansion of the port and the dredging, which they consider has not taken into account the local repercussions, neither economic nor ecological. In the first place, artisanal fishermen argue that one of the consequences of the dredging is that currently the anchorage of the boats is more complicated as the seabed is muddy, which makes their activity more difficult and dangerous. In the second place, residents claim that the expansion of the industrial (petrochemical) pole has not led to local social progress, even though they do recognize its regional and national relevance, according to their perceptions there are regular emanations of sulfur pollutants, and some releases of very dangerous substances (such as chlorine, ammoniac) which may be the origin of the increasing allergies and breathing problems.

Moreover, governance and social conflicts are particularly clearer in Cerri, with the LNG plant “Puerto Cuatrerros”. Inhabitants complain about the localization of the plant, which would enclose the town and may bring some security problems (explosions, accidents, etc). This social (insecurity of local people) is directly related to the economic problems, as firemen from Cerri highlight that they do not have the proper infrastructure to face a potential accident of such dimensions. Nevertheless, since some years ago firemen from Ingeniero White participate in the Awareness and Preparedness for Emergencies at Local Level (APELL) program from the United Nations Environmental Programme (UNEP), from which they receive economic subsidies to improve the infrastructure. A small part of this money goes to Cerri and Cabildo.

Finally, the availability of drinking water is a multidisciplinary problem. On the one hand, the reduction of potable water is related to the increase in the drought (ecological problem). On the other hand, there is a clear conflict for the use of water between industrial purposes and residential one (economic and governance conflict). The lack of sufficient accessibility to water does reduce the quantity and quality of horticultural activities in Cerri. Even though producers have asked for political support to the Citizen Deliberative Council, they have not still had a response.

3.2. Stakeholder vision on possible solutions

At the same time that stakeholders have their own perceptions of the socio economic and ecological problems, they also have different ideas on possible solutions. Some of these ideas have been, or are currently, expressed on projects presented to different governmental levels. Others are on a very initial level.

As one of the main perceived problems in **Ingeniero White** is related to the decrease in fishery resources, they propose a deeper control over fishery activities which could be done by the prefecture, which should control the trawling boats when they are coming back. The same control could also be done by radar when large ships are fishing near to the coast.

Another proposal made by the inhabitants of this region has been to increase the coordination between the OPDS and Provincial Office for Fisheries in order to enhance the controls on the effluents thrown in the principal basin.

Monte Hermoso seems to be the town with more potential solutions to the identified problems. In order to address the reduction and variability of fishery resources they are monitoring the population of gatuzo in order to follow the development of this specie and there is a project of a Law for a close season of three years in the zone of “El Rincón”. They also have a project on Certification of Artisanal Fishery (this project also includes fishermen from Pehuén Co) in order to increase the value added to the production, and there is an artisanal fisheries terminal (to be inaugurated soon) which will

include a biodigester for the joint objective of processing wastes and power generating. They also have an educative project developed in the schools with the purpose of waste separation according to their origins.

As previously remarked the most important problem for stakeholders in **Pehuén Co** relates to the erosion of the dune, therefore they advise to obstruct the tides using quarries, rocks, or stones from the neighboring town of Tornquist. Regarding the archeological reserve, they recommend developing an alternative path for tourists and they are, jointly with the community of Monte Hermoso, processing the declaration of the reserve as UNESCO World Heritage, which would increase the protection and control over the footprints.

4. A SWOT ANALYSIS FOR THE ARGENTINEAN CASE

The strengths, weaknesses, opportunities and threats analysis about the socio economic system of the Monte Hermoso – Bahía Blanca Estuary presented here resulted, to some extent, from the stakeholders and decision maker’s perceptions presented on section 3. As it has been mentioned before, these are preliminary results based on participative workshops performed during the first semester of 2012. We do hope to complete this study with the information coming from more participative meetings and opinion polls.

4.1. Strengths

Community activities: Even though none of the towns are currently showing community based initiatives to manage their natural resources, it comes out from the recent history that when confronting important problems they grouped with a shared objective and work together. The more recent examples of this situation are: the close season extension for fishery in Monte Hermoso from 3 to 6 months and the action of the inhabitants from Cerri against the localization of the LNG plant in the town.

Geographical and paleontological characteristics: The region is located the zone of one of the most important ports of Argentina, which may constitute and advantage for the development of any industrial activity, including the fishery one. For a touristic standpoint, the Monte Hermoso beaches are well-known for their extension, and because both the daybreak and the sunset can be seen from the same place. Furthermore, stakeholders remark the high potential of archeological and paleontological reserves for tourism and especially for scientific research.

Academic and education institutions: The proximity of high academic institutions is one of the main strengths of this region. Population can access to different graduate alternatives. In the first place in Bahía Blanca, at a distance of at most 150 km, is an educative nodal point. In this city there is one of the most important national universities, Universidad Nacional del Sur, as well as several tertiary educative institutions (Juan XXIII, etc). From 2004 there is another university in Bahía Blanca, the Universidad Provincial del Sudoeste Bonaerense (UPSOD) with high relevance for the region under influence.

Adaptation capacity and local knowledge: Especially fishermen have shown a clear capacity to adapt to changes induced by ecological and economic forces. They have developed alternative catching techniques and they have adapted to the use of new information technologies (internet forecasts for instance) to reduce the uncertainty of their work. The adaptation capacity is associated to the high traditional knowledge about ecosystems, which has been translated across generations.

4.2. Weaknesses

Lack of fund for economic investments: Some of the activities may require more investments in order to enhance the economic welfare of stakeholders. However, due to the institutional weakness of the country, most of the times there is a lack of funds to invest, at least privately, which leads to some performance problems. This can be seen from the case of artisanal fishermen, who are not able to modernize their float by their own (the last modernization of the floats was due to a subsidy provided by the local governmental). Another example of the problems arising with the lack of financial support can be noted on the case of the owners of buildings located on the dune of Pehuén Co.

Institutional articulation and governance: To some extent, the above mentioned absence is also related to the lack of institutional articulation among organizations, which is even more clear in those places (Pehuén Co and Ingeniero White) where there are more than one organization representing the interests of a same group (Chamber of Commerce and Chamber of Fishery respectively).

Non coincidence of stakeholders and decision makers: Existence of a clear conflict of interests between stakeholders and decision makers, which do not coincide. It is clear from the workshops that sometimes stakeholders' perceptions on some problems (or solutions) differ from the decision makers' view. Therefore, some of the policies are not perceived by local stakeholders as the best solution to their daily problems.

Absence of integrated natural resources management plan: It is straightforward from the meetings that stakeholders consider the global management of their natural resources as the main problem. This has been clear in the cases of Monte Hermoso and Pehuén Co (the extension of the touristic towns confronting with the coastal erosion and dune reduction), as well as in the case of Ingeniero White, where people remarked that both the dredging and the extension of the port does not take into account the impact on fishery resources.

Low community organization activities: stakeholders remark that actions and groups surge in times of peak conflict but that latterly they reduce their social participation and disappear.

Local Identity: Usually the absence of a clear and strong local identity reinforces the problems related to the institutional and governance characteristics, as well as a bad management of natural resources. In Ingeniero White, stakeholders remarked that the immigration process initiated with the industrialization of the port brought a lot of new people to the town that is not committed to the development process of the town. A similar situation can be seen in Pehuén Co and Monte Hermoso, where during the last decade the number of foreign habitants has increased.

Commitment with the natural ecosystem: During the workshops the stakeholders have stressed that in some cases they observe some attitudes non-ecologically friendly. Some of the examples mentioned have been the extraction of sand and the cut down of some trees. Somewhat they relate this problem to the lack of a local identity and the absence of community management rules.

Lack of statistic information: The lack of statistical information is perceived as a problem by stakeholders and decision makers. Indeed, in Coronel Rosales, they complain about the lack of statistical information which they consider very important.

Non ecotourism plans: Attending to the natural characteristics and the ecological problems faced by the touristic towns of Monte Hermoso and Pehuén-Co, it would be important to promote a more ecologically friendly tourism. However, from the preliminary diagnostic, and from some of the declarations of stakeholders, there seem not to be an

Eco-touristic consciousness. This is clear both by the large amounts of wastes found on the beaches, as well as for the existences of events as the ENDURO in Monte Hermoso, which may increase the coastal erosion.

4.3. Opportunities

Extension of the touristic season: During the workshops stakeholders from Monte Hermoso remarked that as a consequence of the climate change the touristic summer season has extended (October-April). Furthermore, they mentioned that the touristic pattern of the city had changed. Nowadays people use to visit the city for long weekends along the year instead of travelling there only in summer and staying for long stays.

Increases in the touristic affluence along the beach: Tourist do not concentrate anymore in the center of the beach, but they disseminate in different places. This is seen by stakeholders as both an opportunity and a threat depending on the adaptation capacity of different commerce. It can either reduce the level of sell from the mid-beach or increase the activity of retired ones.

New marine species: The boost of new marine species, due to changes in ocean temperatures and marine currents, could be a new opportunity for fishermen who are confronting a reduction in the resource quantities.

4.4. Threats

Pollution: The increase in industrial pollution and household wastes is one of the most important threats perceived by the three communities. The relevance of the problem lies on the impact of pollution over living conditions of the inhabitants of the places as well as over the natural resources in which their economies are based.

Shrimp and prawn imports: This threat was very stressed by fishermen from Ingeniero White. As it has been mentioned in section 3.1.4, one of the main threats that artisanal fishermen are facing is the bad competitiveness of their products in relation with the shrimp and prawn coming from Ecuador, which are cheaper. However, in a context of increasing costs (directly related to the Argentinean economic context, and reduction in the fishery productivity, they cannot compete.

Jellyfishes: The boost of jellyfishes is a particular problem for the beaches of Monte Hermoso, and in a lower degree for Pehuén-Co, as sometimes they act as a negative signal for tourist who chose these places as vacation destination. This problem enhances in the warmest days of summer, and they use to reduce the touristic affluence to the beach.

Coastal Erosion: This is an important threat for the touristic places, particularly for Pehuén Co, because the erosion of the dune reduces the beach and increases the riskiness of collapse of different houses and touristic buildings near the coast.

Sea dangerousness: As a result of different changes in the sea conditions (both for ecological or human made changes) the sea has become more dangerous for fishery and tourism. This has resulted in social and economic problems mentioned in section 3.

5. CONCLUSIONS

The relevance of studying the management of ocean and coastal zones is straightforward. This importance might be even higher in a country as Argentina, which has one of the most extensive coastlines in Latin America and where preliminary studies

show that beaches are subjected to erosion, with coastal retreats of the order of 3-5 m per year (Pratolongo et al., 2006; Bustos et al., 2009).

For this reason, following the objective of *identifying sustainable community-based governance models for the management of natural resources in different socio-ecological systems*, the COMET-LA proposal includes the case of the marine and coastal areas in Argentina to complement the study of water and biodiversity systems in Colombia and forest systems in Mexico.

The main purpose of the Argentinean group during the COMET-LA three years research period is *to propose community-based sustainable management and governance models in marine and coastal systems by analyzing its application in the Argentina case study, and up-scaling the results to higher geographical levels*. The sub objectives to be fulfilled are: the characterization of the social-ecological system; the identification of the role played by the different variables in the current and potential functioning of the ecosystem according to the perceptions of the local communities; the identification of community-based sustainable management and governance models in marine and coastal systems; and the inclusion of community and local stakeholder's knowledge and views in the process to develop the learning arena and to match scientific and local knowledge about the problems and their solutions. All these objectives will be addressed through the field work performed jointly between researches and the community stakeholders in a participative dynamic process, in the “learning arena” proposed by the project.

Therefore, and regarding the relevance of the context of climate change and increasing competition for the use of natural resources, the first step of the Argentinean research was to inquire and to understand the perceptions of both local stakeholders and decision makers on socio-economic problems related to the environmental context in a particular zone of the country.

The study area is the Monte Hermoso - Bahia Blanca Estuary region, located on the southwestern coast of the Buenos Aires Province. The zone has been chosen by the Instituto Argentino de Oceanografía (IADO) and Aquamarina (AQM) experts on marine and coastal areas, and socio-economic researchers from the Universidad Nacional del Sur (UNS), considering its relevance for the COMET-LA objectives.

This region is characterized by a wide range geomorphological, physical and socioeconomical conditions that make it unique in the Argentinean coast. Accordingly we will divide our study area into three different zones: Bahia Blanca, which includes General Daniel Cerri and Ingeniero White (zones for which our analysis is limited); Pehuen-Có and Villa del Mar (including in the Municipality of Coronel Rosales) and Monte Hermoso.

Conforming this activities plan, during the first semester of 2012 we have tried to map the most representative stakeholders and decision makers of the community and gather their perceptions on ecological problems and socioeconomic consequences. Therefore we performed separate workshops in each one of the cities: one with stakeholders, the other one with decision makers. The main reason to use this methodology is that we consider that, in a first step, it is important to separate the different levels of decisions. This is also due to a key characteristic of the Argentinean case, which also makes very complex the existence of a community management of natural resources: stakeholders and decision makers do not often coincide and in some cases decisions about the allocation and use of the resources are taken in a broader territory than the local one. Hence, social conformation, governance system and the extension of the areas under study usually results in clear conflicts of interest.

With respect to prescriptions about work methodologies in the COMET-LA project document, participative methodological approaches have been used to capture the key

characteristics of these social-ecological systems in the area of study and the impact of climate change.

As one of our weaknesses is the lack of a community history on participative actions and meetings, we decided to begin the group discussion with some “trigger questions” using the **brainstorming technique**.

This D4.1 provides information about the Argentinean case study. This description is mainly based on primary information gathered from the field work through the participatory workshops carried out between March and August 2012. As previously mentioned, this constitutes the “first approximation to the communities”, in which the core objective was to identify the main stakeholders of the communities (community members, community leaders, local non-governmental organizations and governmental organizations) and their main perceptions about socio-economic and ecological problems. As this working group is in a very initial step of work, some parts of this document (economic activities, productivity of the system, recent historical background, among others) has been complemented with information from official data sources from governmental institutions (INDEC, ETC), academic papers and doctoral researches on the field of study. It is expected that the future development of the projected activities, complemented with new participative methodologies, will provide enough information to complement the field work in order to address the remaining objectives of the COMET-LA project.

The results of the analysis of the information gathered from previous studies of the Argentine team, but mostly from the input provided by stakeholders and decision makers clearly show that Argentine case differs from the Colombia and Mexico cases from the governance system. Where in the other countries community based governance is a major issue and define the conditions for the environmental management and the definition of strategies towards future climatic changes, in Argentina stakeholders and decision makers appear somewhat separated and, many times differ, in their appreciation of the realities, problems and potential solutions.

Although the three sectors in which the study area was subdivided may be considered as, first appearance, to be rather different, they are strongly connected and the conditions in ecological conditions in one place are dependent of what happens in the others. Similarly occurs with the fishery situation. The problems with the fisheries within the estuary are affected by both the changes in the environmental and pollution situation but mostly because of the overfishing happening outside the estuary produced by both the artisanal fishermen of Pehuén Co and Monte Hermoso and those larger boats coming from other places of the Argentina coast. However, overfishing reduces the entrance of the fishes to the estuary which are needed to reproduce and nursery. Therefore, there is an obvious need for strong integration and cooperation among the various fishermen organizations to find a way to manage the resources. Since the decision makers that must understand in this issue pertain to different government levels, to achieve an adequate management plan of the resources appears complex but not impossible.

The other issue that mostly affects Pehuén Co and Monte Hermoso is coastal erosion which itself is directly related to the tourism from which the livelihood of both towns depends. Although both decision makers and stakeholders understand the problem and consider that the situation is grave, solutions are difficult to implement as they require large investments or decisions that may be strongly unpopular. Nevertheless, in this regard, the potential to attain common agreed strategies towards mitigation appear to be attainable with relatively low complexity.

An important aspect that must be considered further is the degree of interest that the project COMET-LA has attained in the community is the large number of press interventions in all the meetings as well as various press, radio and TV interviews and articles independent of the press releases made by the Argentine Team. But most important is the reaction of the decision makers of Coronel Rosales and Monte Hermoso since both municipalities through their executive government and the councillors have declared the project of Municipal Interest. This declaration is the maximum level of support that a municipality can provide and this insures that all municipal personnel and agencies must provide their highest effort to help the project.

The main conclusion of the present deliverable is that for the first time in the region there was the possibility to integrate stakeholders and decision makers to reach possible common strategies. The experience gathered from the visit of the Argentine team to analyze both the Colombia and Mexico cases, allowed also to understand how other governance and communities work but also to learn from the other teams the specific methodologies. Both are important learning arenas for the all the teams involved in COMET-LA.

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