



West Africa Coastal Areas  
Management Program

**CASE STUDY 05**

# Integrated Coastal Zone Management in Mar de Plata, Argentina as part of the WaterClima LAC Program

**D**ata analysis and mathematical simulations are crucial to generate predictions considering climate change scenarios and to propose alternatives for sustainable ecosystems



Mar del Plata Ecosystem, Argentina / El Clarin

a marine-coastal zone. Each of these units, with their interactions, shapes the coastline and offers a series of specific services: such as providing livelihoods (coastal fishing and agriculture), supply of geological materials (sands and rocks) and provision of water (aquifers). The increased consumption patterns of the aforementioned environmental services has intensified exponentially over the past 50 years, causing the coastal ecosystem to be among the most degraded and threatened systems in the country<sup>2</sup>.

The fisheries sector, for example, has seen an increase in the number of catches by 20% in the past 20 years, to now exceed 400 thousand tons of catch per year<sup>3</sup>. The ecosystem has been overexploited by the increase of shipping fleets with new technologies and the incorporation of more aggressive fishing gear. As a consequence, the Mar del Plata port has become the main fishing port in Argentina.

## Context and Main Challenges

Mar del Plata is a tourist, coastal city of Argentina with 700,000 inhabitants that receives more than 1,500,000 tourists per year<sup>1</sup> during the summer months. The coastal ecosystem of the city consists of a series of natural assets, such as beaches, cliffs, dunes, lagoons, wetlands and

<sup>1</sup> Ente Municipal de Turismo de Mar del Plata (<http://www.turismomardelplata.gov.ar/>)

<sup>2</sup> Scagliola, M; \*, Comino, A; Haeften, G; Gonzalez, R (2011). Integrated Coastal Management Strategy of Mar del Plata city and the Sewage outfall project. International Symposium on Outfall Systems.

<sup>3</sup> National Directorate of Fisheries Planning (2017). Informe de coyuntura de la Subsecretaría de Pesca y Agricultura.

Intensive agriculture in Mar del Plata presents a challenge in relation to the coastal ecosystem. This is an activity that, for diverse reasons such as water availability, the overall good climate and the proximity to human settlements, benefits from being located on the coastal plains. Agricultural activity has intensified in the last 30 years, in particular, through the incorporation of greenhouse crops. Agricultural areas and yield of oilseeds and cereals have increased in the last seasons by around 50-60%<sup>4</sup>. The coastal area is intensely used to grow vegetables with production exceeding 190 thousand tons outdoors and around 50 thousand tons in greenhouses<sup>5</sup>. In total, the cultivated area increased approximately 40% from the end of the 20th century to present, which has brought about significant negative consequences on the environmental quality of the soil, water and air of the surrounding area.

The removal of sand and rock for the construction sector has also suffered from unsustainable consumption and production patterns. Both products have been intensely exploited since the 1960s and specifically through the beginning of the 21st century, with certain cycles of deceleration but always in an upwards trend, due to the construction sector's increased need for the real estate boom and the acceleration of mortgages and credit services supply. Material processing has increased by 30% between these periods<sup>6</sup>.

Furthermore, the city is provided with treated groundwater for domestic, agriculture and industrial consumption. The network system consists of 274 supply wells that provide drinking water to 95% of the city. The consumption of water has increased from 88 million litres in 1997 to 100 million litres in 2010<sup>7</sup>. Due to the growing demand for water from economic activities and local population, as Mar del Plata is the main coastal tourist city in the country, an additional volume of water is needed to meet the needs of the 1.5 million tourists during summer months. This overexploitation has caused serious problems of saltwater intrusion into the underground aquifers, abandonment of wells and the rise of groundwater levels in previously drained areas.

## Objective Of The Waterclima-Lac Program In Mar Del Plata

The initiative WATERCLIMA-LAC (Regional Program for the Management of Watersheds and Coastal Areas in the Context of Climate Change in Latin America and the Caribbean) is a project funded by the European Union with the overall objective of contributing to the fight against poverty and social inequalities in the region. Its aim is to improve the integrated management of coastal areas, enhance resilience and promote a shared vision and coordination among the main stakeholders of the ecosystem.

The WaterClima-LAC program ([http://www.waterlac.eu/es\\_CL/](http://www.waterlac.eu/es_CL/)) covers the period 2014-2018 and amounts to 7 million euros, taking into account the factors that impact water resources management in coastal areas and the relation to climate change. The Pilot Project in Mar del Plata, Argentina is one of the four pilot project initiatives promoted under WaterClima-LAC (the other three are La Paz in Baja California, Bajo Lempa in El Salvador and Manglar in Haiti), which is further described below.

## Major Activities

The major activities promoted through the implementation of the Mar del Plata pilot project are the following:

### Activity 1: A cost-benefit study and technical feasibility analysis on proposals for new areas of water abstraction.

An analysis of suitable alternatives and predictions for evaluating water abstraction situations and impact factors with the effects of climate change.

**Activity 2: Social characterization of the region:** Ecosystem stakeholder mapping showed a total of 48 key stakeholders for water management in Mar del Plata. Those representing civil society (40%), together with the public sector (37%) account for two-thirds of the total while private sector (13%) and academia (10%) complete the remaining third. The mapping was undertaken in order to identify the interrelation between perceived problems (such as, the absence of hydraulic works; problems in access to water; water pollution; untreated waste water; water shortage during the summer seasons; barriers due to public management

<sup>4</sup> [www.mardelplata.gob.ar](http://www.mardelplata.gob.ar)

<sup>5</sup> Witkin, G; Bó, M. J.2; Giampietri, L. 1; del Río, J.L. 2, Vorano, C (2004). Diseño de un SIG como herramienta para la gestión ambiental de la minería en el partido del General Pueyrredón.

<sup>6</sup> Oliverio, G (2010). Fundación Producir Conservando.

<sup>7</sup> Añon, M.C. (2016). Análisis tecnológicos y prospectivos sectoriales complejo oleaginoso soja-girasol.

and shortcomings in territorial planning), actors involved and impact generated. The mapping identified activities of the social groups for the areas with access to water, assessed their potential involvement, considering potential conflicts and addressing implementable measures for their resolution. Thus, by bringing the stakeholders together, new agreements could be achieved to manage scarce water resources in a holistic manner.

**Activity 3: Economic feasibility of establishing new groundwater catchment areas.** An analysis of the economic costs of

the different alternatives and evaluation of the possibilities of co-financing of the proposed projects.

**Activity 4: Risk analysis on climate change and the impact of the upper parts of the basin.** Analysis of scenarios and their impact at the local level, as well as the analysis of seawater intrusion, with the identification of the cumulative flows derived from the operation of the basin, upstream (including sediment, water flow, currents and chemical contaminates). Finally, events such as droughts, floods, pollution, marine intrusion and soil salinity were analyzed.

## MAR DE PLATA AREA

The four specific activities that frame the Mar del Plata project are the following:

1. Promote an Integrated Water Resource Management;
2. Perform an analysis of Climate Change Risks;
3. Identify and enhance ecosystem services benefits and local strengthening;
4. Promote Capacity Development, Outreach and Networking among local stakeholders

The project included the following strategic steps: (i) conducting surveys and bibliographic background analysis; (ii) establishing agreements with NGOs, local farmers, the local water treatment company and the local university to encourage inter-sectoral cooperation for the integrated management of water resources and (iii) providing capacity building to

NGOs offering training and workshops to enhance institutional strengthening.

The pilot project of Mar del Plata has been inspired and articulated through synergies with the Inter-American Development Bank's Initiative for Emerging and Sustainable Cities (IDB, 2015) and the Argentinian Third National Communication to the United Nations Framework Convention on Climate Change (Ministry of Environment and Sustainable Development, Argentina, MAdS, 2015).

One of the key contributions of the Mar del Plata pilot project is the design of a mathematical model of aquifer flow to promote integrated water resource management, which will serve as the basis for a financial economic analysis using the net present value method of three scenario alternatives for aquifer exploitation (the current one without changes; the current plus a new set of wells in the northwest region; and the current one with a new set of wells in the western region).

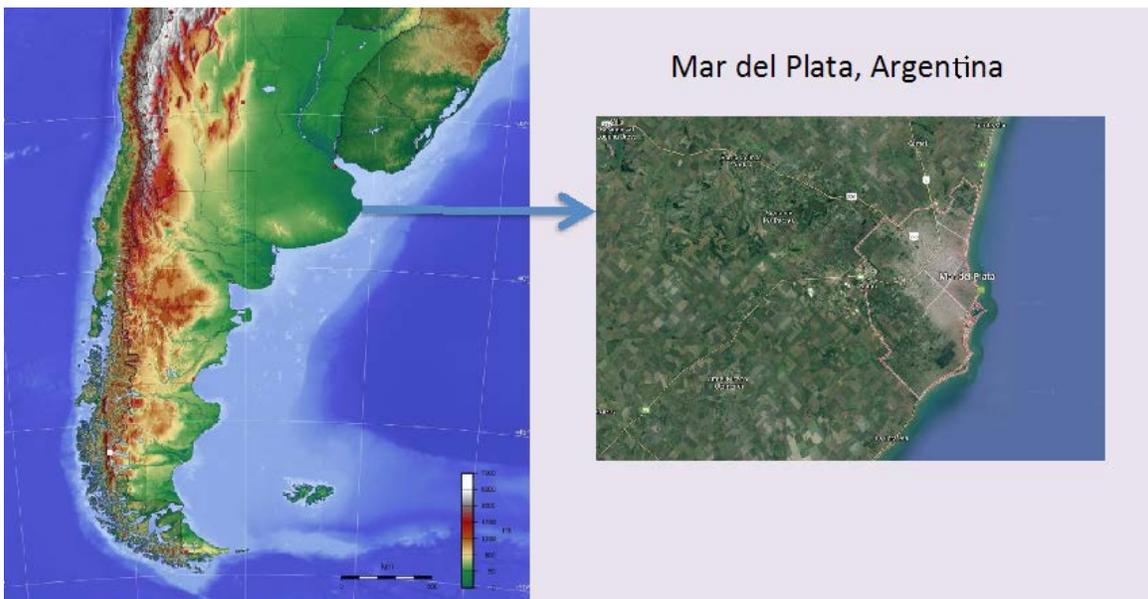


Photo showing the Mar del Plata area (Figure credit: GeoAdaptive)

## Results

- A detailed report of the ecosystem services and their value chain analysis, considering the economic, environmental and social dimensions
- Identification of a list of options for the establishment of new groundwater catchment areas
- A numerical model of predictive value and predictions of the functioning of the hydrological system and the impact generated for the ecosystem under different climate change scenarios
- Citizen participation strategy oriented to strengthen the interrelation of the main actors in order to guarantee the implementation of new areas of groundwater abstraction. Workshops were held at local neighbourhoods to diagnose the local problems with selected actors. Subsequently, a Geographic Information System software was developed for the local neighbourhoods together with training for potential users to improve access to reliable environmental information, an updated mapping of drainage channels and an inventory-location of greenhouses. With the fruit and vegetable producers, a detailed map of the drainage network of the main fruit and vegetable production area was made, since floods in torrential rain episodes increasingly affect them.
- The public water company “*Empresa Obras Sanitarias*” signed an agreement to undertake a project on mathematical modelling of the aquifer to improve its management and the commitment of participation together with the local university for further research. Agreements and an additional Act were also signed to carry out activities with the local Farmers Association to manage jointly the water resources in an integrated manner, in order to share information, new research findings and experiences.

- Economic Analysis undertaken on alternatives to implementing new areas of groundwater abstraction including the treatment and injection of treated wastewater into the aquifer to create a buffer to the salt water intrusion.

## Lessons Learned

- Data analysis and mathematical simulations are crucial to be able to generate predictions considering climate change scenarios that enable proposing alternatives for sustainable ecosystems.
- The complexity associated with promoting the interaction among organizations is not to be underestimated. Aligning individual priorities with integrating joint action plans tends to generate conflicts that have no easy process of reconciliation. Each stakeholder has a different priority for water use. The university “Mar del Plata” was a trusted source of information. Therefore, in this case the University acted as an intermediary between all the stakeholders (neighbourhoods, government and the water treatment company), which allowed agreements to be forged. Therefore the lesson learnt is to find the key stakeholder that can link all stakeholders together.
- Creating a common language that enhances the interaction of multidisciplinary expertise among crucial sectors is a must to develop sustainable ecosystem management, such as geologists for hydrology, engineers for hydraulics; economists developing economic models or social scientists for community development. A systems management approach of integrating social, economic and biophysical models for environmental management will be implemented. Software programmes on environmental management and engaging a key stakeholder such as the local university allowed for all stakeholders to be implemented into the decision making process.

The West Africa Coastal Areas Management Program (WACA) is a convening platform that aims to assist West African countries to sustainably manage their coastal areas and enhance socio-economic resilience to the effects of climate change. The program also seeks to facilitate access to technical expertise and financial resources for participating countries.

