

# Executive summary

The Humboldt Current region is located along western South America, stretching from the Ecuadorian-Colombian border (1° N) to the south of Chile (55° S). A feature of the continental area is the Andean Mountain range that extends along the entire region defining the catchment of the Humboldt Current region. The countries in the region include parts of Ecuador, Peru, Bolivia, Argentina and the whole of Chile. The impacts of the areas in Bolivia and Argentina on the Humboldt Current region are negligible and therefore these countries are excluded from the report. The region contains a variety of coastal ecosystems, including rainforests, reefs and mangroves within its tropical and subtropical zones, deserts along most of the coast of Peru and in the north of Chile, and extended coniferous woods, fjords and glaciers in the south of Chile. The marine area is characterised by a high productivity (>300 gC/m<sup>2</sup>/year) and supports one of the most important fisheries of the world.

The total population in Chile, Ecuador and Peru reached 53.5 million in 2000, of which 74% is urban. In the Humboldt Current region the total population is estimated at 42 million (Landsat 2001). Drinking water and sanitation services vary from a moderate level of coverage in Ecuador and Peru to high levels in Chile. The most important socio-economic activities in the region are agriculture, fishing, aquaculture and mining, with the most industrialised areas located in Chile. An important feature of the regional economy is petroleum extraction.

The GIWA regional Task team selected Pollution and Unsustainable exploitation of fish and other living resources as the priority environmental concerns affecting the transboundary waters of the region. This decision was justified on account of their impacts on economic, social and health issues both at present and in the future. Therefore, the Causal chain analysis focused on these two problems. There is severe microbiological pollution of waters around the largest coastal cities of Ecuador and Peru. Chemical pollution from pesticides is

evident in areas of intensive agriculture throughout the region, whereas high concentrations of heavy metals are found in the south of Peru and north of Chile where mining is a major industry. To a lesser degree, the environment of the region is also affected by other sources of pollution such as solid wastes, eutrophication and recurrent operational spills of hydrocarbons. Pollution is considered to affect the productivity of coastal areas, causing significant social and economic losses as well as affecting the health of both humans and ecosystems.

Overexploitation of fishing resources in the Humboldt Current ecosystem is the result of an over-dimensioned fishing effort. Both industrial and artisanal fleets have increased in size and have put the sustainability of fishing at risk. Most industrial fishing is directed towards small schooling fish such as anchovy, sardine and mackerel to supply fishmeal and cannery plants. Some of these species are considered highly or overexploited by the FAO. Although the fishing of these species is a major source of employment, final products are of low value. Other important fisheries such as tuna and shrimp occur in the more tropical parts of Ecuador and the north of Peru. Around 150 000 artisanal fishermen target mainly highly priced coastal resources such as shrimp, lobster, scallops, rock barnacle, and mussels. Some of these fisheries produce a high rate of by-catch and discards or cause habitat modification as a result of using destructive fishing practices. Aquaculture production has increased, although there are problems, for example in the case of shrimp farms in Ecuador and Peru where mortalities and low productivity have been results of pollution and poor management. Impacts of overfishing include the reduction of income and/or employment, reduction of economic returns, loss of fish resources, depletion of key species and changes in habitat and community structure.

The immediate causes of Pollution are microbiological and chemical pollution from untreated municipal and industrial wastewater.

Sectors associated with this pollution include urbanisation, industry and agriculture. The root causes identified include: 1) Demographic: concentration of population in coastal areas, migration and the development of informal settlements; 2) Technological: inappropriate treatment of wastewater; 3) Economic: lack of resources to increase the sanitation coverage and to maintain treatment systems, lack of mechanisms to promote private investments to reduce the pollution charge, and lack of resources for supervision and control; 4) Legal and institutional: overlapping responsibilities in institutions in charge of supervision and control, and limited promotion of the implementation of quality systems; and 5) Knowledge: inadequate understanding of the region's natural systems preventing an accurate determination of the carrying capacity of aquatic environments.

The most important immediate cause for Unsustainable exploitation of fish and other living resources is overexploitation and the increase in fishing effort. To a lesser degree the reduction in recruitment levels, changes in the distribution of the population and the reduction of fisheries habitat and nursery grounds are also of concern. Root causes include: 1) Economic: the increasing global demand for fisheries products, demand for key species to satisfy exigent markets, limited exigent markets for fisheries employing environmentally friendly methods, high profitability, and politics to foment exportable products; 2) Socio-cultural: demand for fisheries products to satisfy selective markets, and change in consumption habits; 3) Legal: insufficient application of the responsible fishing approach, lack of regional fisheries management, and insufficient application of modern management approaches; 4) Technological: insufficient use of technological advancements to assure sustainable fishing development; 5) Knowledge: limited application of the ecosystem approach, low investment in research, training, education and the dissemination of information, lack of sustainability indicators at the regional level and dispersed and fragmented information at the regional level concerning population characteristics; 6) Natural causes: increased effects of the El Niño Southern Oscillation (ENSO); 7)

Governance: lack of incorporation of the regional ecosystem approach in government strategies, conflict among sectors, weak institutions responsible for enforcement of fisheries regulations, and insufficient adaptation to new criteria, concepts and trends in marine ecosystem management.

To mitigate pollution problems in the Humboldt Current region, two policy options were proposed: 1) Decentralise environmental management; and 2) Harmonise criteria and environmental quality standards and develop common indicator systems for environmental management. These two options were assessed considering their convenience, feasibility and acceptability. In the first case, a change in the national strategies of each country to face pollution from a centralised to a decentralised model is proposed, in which major responsibilities are assigned to local governments (i.e. municipalities). This will simplify the identification and selection of priorities at an early stage in project development leading to an ecosystem approach that includes the participation of local stakeholders. In the second case, it is intended that similar regulations and quality standards be set up at the regional level, taking advantage of existing regional cooperation mechanisms such as the Plan of Action for the Protection of the Marine Environment and Coastal Areas of the South Pacific, through which several agreements and protocols have already been developed.

Regarding the unsustainable exploitation of fish, three policy options were considered: 1) Rationalisation of fisheries; 2) Development of knowledge and indicators; and 3) Regulation of fishing effort. The aim of these measures is to develop a fisheries management system, especially for the region's migratory species, implementing the principles and practices of the "FAO Code of Conduct for Responsible Fisheries". For the sustainability of the fisheries in the region it is vital to develop research and indicators of regional change of the highly dynamic fish populations that are currently exploited. This will allow a better understanding of the ecological and physical variables driving the Humboldt Current fisheries.