Executive summary

Regional Definition

The GIWA Eastern Equatorial Pacific region extends along the west coast of Central America from the Colombian-Ecuador border in the south to northern Central Mexico. It includes El Salvador and the Pacific coastal areas of seven other countries – Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, Panama and Colombia. The region was divided into three sub-systems – Southwest Mexico, Central Equatorial Pacific and Pacific Colombian. The GIWA assessment focuses predominantly on the Central Equatorial Pacific sub-system as it includes most of the significant and reported transboundary issues.

The Southwest Mexico sub-system extends along 1 800 km of Mexico's Pacific coast from the border between the states of Nayarit and Sinaloa in the north to the border with Guatemala in the south. The Central Equatorial Pacific sub-system includes the western part of the Central American isthmus and extends along 3 870 km of Pacific coast from the Guatemala-Mexico border in the north to the Panama-Colombia border in the south. The Pacific Colombian sub-system's coast extends for 1 300 km from Colombia's border with Panama in the north to its border with Ecuador.

The climate of the Southwest Mexico sub-system ranges from tropical (in the lower-lying coastal areas) to warm temperate. The climate of the Central Equatorial Pacific sub-system is tropical to temperate with a winter dry period, when drought conditions occur in a corridor extending from Guatemala to the northern part of Costa Rica; also affecting parts of Panama. Drought conditions are intensified during El Niño events. The Pacific Colombian sub-system is wet tropical, influenced by the Intertropical Convergence Zone, its proximity to the ocean, and the El Niño climatic events.

The region's marine area is influenced by three major current systems – the California Current from the north, the Humboldt Current from the south and the Equatorial Counter-current from the west. The interactions of these currents result in zones of upwelling with productive fisheries. There are extensive lakes in the region, notably in Nicaragua. Two Guatemalean rivers discharge through neighbouring countries – the Suchiate in Mexico and the Paz in El Salvador. In El Salvador, transboundary rivers include the Paz, shared with Guatemala, and the Gosgocaran, shared with Honduras. Honduras also shares Nicaragua's Negro River.

Agriculture is the main economic activity in the region, providing employment for around half of the economically active population. Coastal and artisanal fisheries have a high socio-economic significance, employing around 500 000 fishermen and processing plant operators. Aquaculture, particularly of shrimps, is growing in the region, with 70% of Central America's total production coming from Honduras and Panama. Tourism is also growing, accounting for some 30% of GDP, making it the region's second most important economic activity. Except in Colombia and Mexico, industry is underdeveloped, contributing only 15% to the regional GDP. There is intensive shipping throughout the region including an intercontinental maritime route and, notably, the Panama Canal. Mining of the region's rich mineral resources produces significant proportions of the world's totals, especially silver, lead and zinc.

Assessment of the Southwest Mexico sub-system

Pollution was considered to be the priority concern of this sub-system. The enormous amount of untreated wastewater entering the aquatic environment is deteriorating the environmental quality of the sub-system's water bodies. In Mexico, two thirds of wastewater is discharged into the Pacific Ocean. Microbiological pollution on Mexican beaches has been identified as a priority by Mexican authorities due to the potential effects on human health and tourism. Fertiliser use in Mexico has increased considerably, causing eutrophication in many water bodies, notably Lake Chapala where there is a proliferation of

algae and invasive aquatic weeds. Closed seasons during HAB events have resulted in economic losses of 200 million USD to the fisheries industry. Mexico uses more pesticides than any other country in the GIWA Eastern Equatorial Pacific region. However, DDT application has decreased considerably since the 1960s. Heavy metal contamination is particularly high in the Lerma River basin and Lake Chapala, causing toxicological induced mutations in some fish species. The water bodies of the sub-system carry large amounts of suspended solids which are causing severe sedimentation in lakes and coastal wetlands.

Freshwater shortage was considered to be the second priority concern of the Southwest Mexico sub-system. Although the rivers are highly dynamic and characterised by significant inter-annual fluctuations, discharges have shown a decreasing trend over the past 40 years, largely due to increased abstraction. The availability of water suitable for human consumption has declined due to contamination by the discharge of untreated wastewater. The aquifers in the Lerma-Santiago-Pacifico basin have been overabstracted mainly to supply water for agriculture. The depletion of groundwater supplies is concerning given that 70% of the basin's population obtain their water supply from aquifers.

Assessment of the Central Equatorial Pacific sub-system

Freshwater shortage was considered to be the priority aquatic concern. Although water resources are abundant they are unevenly distributed, some areas suffering shortages during the dry season. Pollution, deforestation and inappropriate soil management are adversely affecting downstream transboundary aquatic ecosystems by changing the dynamics of accretion and erosion, the supply of nutrients and the patterns of flooding, as well as by reducing the availability and quality of water resources. Areas deficient in water are generally the more densely populated with the greatest concentration of economic activity. Continuing population growth and economic development will increase the demand for water, increasing the extent and severity of water shortages. Excessive groundwater abstraction is threatening aquifers and resulting in acute water shortages for populations dependent on groundwater. Global climate change will affect the future availability of freshwater in the sub-system. Rainfall is expected to become more intense during the rainy season and droughts more severe during the dry season

Pollution was identified as the second priority concern. In 2000, approximately 22% of the population had no access to safe freshwater; in rural areas half the population obtained water from polluted natural water bodies. Wastewater discharged without treatment is the most widespread pollution issue. Excepting Costa Rica, there is a low level of sanitation coverage. In general, coverage of sanitation and drinking water services has not matched population growth and urban development. As a consequence, water-related diseases are increasingly prevalent. Acute diarrheic disease is the main cause of morbidity and infant mortality. Pesticides and fertilisers are used intensively in agriculture. They are responsible, together with domestic wastewater, for causing eutrophication in coastal areas, which is impacting the food security of the coastal population. Pollution of groundwater, a major source of water for coastal communities, is increasing; higher demand has led to increased abstraction, leading to saline intrusion. Groundwater is also being polluted by urban and agricultural run-off.

Assessment of the Pacific Colombian sub-system

The unsustainable exploitation of fish and other living resources was the principal concern of the sub-system. Despite most of the fisheries in Colombia being small scale and/or subsistence, the current level of exploitation is unsustainable; catches of some traditionally targeted species such as mackerel and sharks have declined. Similarly, stocks of freshwater commercial species are significantly depleted. Although there have been no studies of the level of by-catch in the Pacific Colombian, based on studies in territories within close proximity of the sub-system, it is believed that large quantities of fish are caught as by-catch in the shrimp trawling industry and the majority are discarded.

Pollution was considered by the regional team to be the second priority concern. The Pacific Colombian sub-system has the highest rate of fertiliser consumption on the Pacific coast of South America resulting in some areas, such as Tumaco and Buenaventura, having eutrophic conditions. Variable concentrations of pesticides have been found in water, sediment and organisms at different sites in Colombia. Concentrations of DDTs in surface sediments exceed international and national standards. Extensive deforestation has exacerbated erosion, increasing the amount of sediments entering the rivers. Unplanned urban development has resulted in wastes being disposed of inappropriately. Localised oil spills from exploitation, refining and transport activities have been reported.

Causal chain analysis

In the Southwest Mexico sub-system, only a quarter of the population is connected to wastewater treatment facilities. The sewage infrastructure that does exist is commonly non-operational, with most wastewater discharged directly into the ocean or inland waterways without treatment. Coastal tourism development is increasing further the pressure on sewer infrastructure. Regulatory agencies have achieved increasing success in controlling large-volume industrial polluters whose wastes flow into federal waterways. Pollution levels are still high, however, due to a lack of direct control over municipal pollution sources

and weak enforcement power to collect fines from municipalities who exceed federal pollution limits. Local municipal governments lack technical expertise and financial capacity to create and maintain wastewater treatment networks.

In the Central Equatorial Pacific sub-system, freshwater shortage is being caused by the modification of stream flow, pollution and excessive abstraction of groundwater from aquifers. The demographic trends of the last four decades have led to increasing demand for freshwater resources for drinking water, agricultural production and industrial processes. Urbanisation has intensified and concentrated demand in areas that have limited freshwater availability. The current water distribution systems are obsolete and highly inefficient, but countries lack the economic resources needed to adopt water-efficient technologies. The development of freshwater supply and sanitation coverage is not keeping pace with population growth, posing a growing risk for human health. Low tariff rates for water and underinvestment in sanitation infrastructure are the principal causes of the lack of basic sanitation services. Most countries have weak legal and institutional frameworks for water management and there is a lack of a transboundary approach to shared basins. Other shortcomings are a lack of a multidisciplinary approach resulting in inter-institutional conflicts and a lack of monitoring, control and surveillance for the implementation of existing regulations. There is a dearth of knowledge regarding water quality and the effects of pollutants on ecosystems and their biota. There is also a lack of public awareness of water issues and there is no culture of water conservation. Other than the consumptive benefits of water, there is little recognition or valuation of the indirect benefits that water provides through ecosystem goods and services.

On the Pacific Colombian coast, non-selective and destructive fishing gear is used to increase short-term profits at the detriment of fish stocks and marine ecosystems. As the distribution of fish species has changed and stocks of traditionally exploited species have declined, the fishing industry has began to exploit stocks which are further offshore using new technologies. The fisheries sector concentrates on certain valuable species to supply the export, rather than domestic, fish market. Existing laws related to the fisheries are weakly enforced allowing domestic and foreign fishing fleets to avoid legislation. There is lack of institutional cooperation, fisheries statistics and stakeholder participation to aid and improve the effectiveness of decision making processes.

Policy options

Recommendations made by the GIWA regional experts of the Eastern Equatorial Pacific region coincide with those of international fora on water management and the Environmental Plan of Central America (PARCA). The policy options discussed address a range of root causes identified during the Causal chain analysis:

Policy options for addressing microbiological pollution in the Southwest Mexico sub-system:

- Rehabilitate existing, and construct new, wastewater treatment facilities;
- Introduce a fee-and-rebate system for municipal wastewater;
- Reduce excess water use;
- Formulate and implement education and information strategies;
- Publicly rate municipalities for their level of compliance with wastewater treatment standards;
- Create autonomous water districts; and
- Reform the pollution-related legal framework.

Policy options for addressing freshwater shortage in the Central Equatorial Pacific sub-system

- Integrate territorial planning with water management;
- Promote new development centres in rural areas;
- Strengthen and establish further monitoring programmes;
- Develop and implement environmental awareness programmes;
- Reorganise the water sector; and
- Finance the maintenance and expansion of water services by introducing water rates.

Policy options for addressing microbiological pollution in the Central Equatorial Pacific sub-system:

- Invest in treatment infrastructure;
- Adopt the polluter pays-principle;
- Review and reform regional and national legal frameworks;
- Strengthen the capacity of the agencies responsible for water management;
- Develop and implement environmental awareness programmes; and
- Strengthen information management.

Policy options for addressing overexploitation of the fisheries in the Pacific Colombian sub-system:

- Transfer of sustainable technologies;
- Enhance information management and education programmes;
- Further implement integrated coastal zone management (ICZM); and
- Strengthen the self-regulation of coastal communities.

The countries of the Eastern Equatorial Pacific region are inextricably linked by hydrological processes. Water is a vector transporting not

only a wide variety of valuable resources but also problems from one country to another. In the Southwest Mexico sub-system, increased understanding of pollution issues, the establishment of communication networks between the stakeholders of a river basin, the creation of incentives as well as penalties for polluters, and greater civil legal powers will shift the political situation in favour of environmental protection. In order to address transboundary pollution and freshwater scarcity in the Central Equatorial Pacific sub-system, a first step would be the implementation of regional instruments of cooperation such as the Plan of Action for the Protection of the Marine Environment and Coastal Areas of the North East Pacific. The regional experts recognise that the institutional inadequacies of water management need to be addressed, and recommended the development of environmental awareness programmes and the reorganisation of the water sector. To address the overexploitation of the fisheries in the Pacific Colombian sub-system, the regional experts recommended that the most feasible option would be to enhance information management and education programmes and to strengthen the self-regulations of local communities.