

Policy options

This section aims to identify feasible policy options that target key components identified in the Causal chain analysis in order to minimise future impacts on the transboundary aquatic environment. Recommended policy options were identified through a pragmatic process that evaluated a wide range of potential policy options proposed by regional experts and key political actors according to a number of criteria that were appropriate for the institutional context, such as political and social acceptability, costs and benefits, and capacity for implementation. The policy options presented in the report require additional detailed analysis that is beyond the scope of the GIWA and, as a consequence, they are not formal recommendations to governments but rather contributions to broader policy processes in the region.

Recommendations made by the GIWA regional experts of the Eastern Equatorial Pacific region during the two preparatory meetings coincide with those developed by international forums on water management (UNEP/GPA 2001) and those recommended in the Environmental Plan of Central America (PARCA). The latter established a set of principles to strengthen environmental management and harmonise the approaches, policies and management instruments of the member states of Central America. Box 1 shows the immediate actions recommended by the Latin American Workshop on Wastewater Management (2001).

Southwest Mexico

Problem definition

Pollution has been identified as the priority concern of the Southwest Mexico sub-system due to the high levels of microbiological pollution recorded in inland and coastal waters and biota. This is attributed to the

Box 1 Immediate actions recommended by the Latin American Workshop on Wastewater Management. Mexico 10-12th September, 2001.

- 1. Technological:**
 - Implement re-use practices; and
 - Optimise water use.
- 2. Financing**
 - Establish financial strategies based on regional, national and river basin priorities;
 - Devise self-funding sources; and
 - Rating systems that include subsidies aimed at promoting higher coverage of water and sanitation services in deprived areas.
- 3. Technical training**
 - Training to improve supervision, management and assessment capabilities;
 - Personnel training and institutional strengthening in different geographic areas of the sub-system; and
 - Develop an emergency response capacity in preparation for potential natural hazards.
- 4. Environmental education/dissemination/awareness-raising**
 - Promote transparency in public information, such as service quality indicators and environmental quality indicators; and
 - Encourage the active participation of the media, civil society and the ministries of education in awareness-raising activities.
- 5. Research**
 - Develop water and sanitation services and environmental quality indicators;
 - Formulate regulations for water supply and waste management based on local knowledge and stakeholder participation;
 - Carry out a Latin American diagnosis of management priorities, taking into consideration each country's capacity;
 - Undertake case studies in tropical and dry areas;
 - Promote the adoption of new management instruments; and
 - Evaluate the contribution of diffuse pollution in comparison with isolated pollution.
- 6. Legislation/rules**
 - Promote land-use planning as an instrument;
 - Up-date the laws on water; and
 - Promote the spreading and overlapping of administrative roles with regard to water as a resource.
- 7. Other**
 - Planning (basin-wide); and
 - Formulation of public policies at the state level which recognise water as a strategic resource.

discharge of untreated wastewater in the river basins of the sub-system. The tourism industry is being adversely affected by polluted beaches and the health risks of microbiological pollution.

Only 26% of Southwest Mexico's population is connected to wastewater treatment (OECD 2003). 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 further increasing the pressure on sewer infrastructure. Regulatory agencies have achieved increasing success in controlling large volume industrial polluters whose wastes flow into federal waterways. However, pollution levels are still high due to a lack of direct control over municipal pollution sources and weak enforcement power which prevents the collection of fines from municipalities who exceed federal pollution limits. Local municipal governments lack technical expertise and financial capacity to create and maintain wastewater treatment networks.

A variety of options to improve the quality of coastal waters along Mexico's tourist beaches were considered. The policy options aim to address the root causes of microbiological pollution in the Southwest Mexico sub-system and are therefore grouped under the various types of root cause.

Policy options

Technology and economy

Rehabilitate existing, and construct new, wastewater treatment facilities

The government of Mexico must recognise wastewater treatment as a priority issue and allocate greater funds for building new and maintaining existing wastewater treatment facilities. In many cases, facilities need to be rehabilitated in order to operate at their designed capacity levels. Investment in sewer systems and wastewater treatment facilities is currently co-funded by federal, state, and local sources. Further funding is often received as loans from various development banks. Since the federal government does not have the legal power to earmark funds for specific purposes, a simple increase in grant funding from the federal level to municipalities is unlikely to leverage funds for the operation and maintenance of treatment facilities. One option would be for the Federal government to match investment made by local governments in treatment facilities with a grant.

Local circumstances define the most appropriate technology and implementation strategy. The financial and technical limitations of local communities must be considered so that the facilities can be operated and maintained locally. There are a wide variety of conventional and

less-conventional municipal wastewater treatment technologies available. Large treatment facilities consume a lot of energy, generate large quantities of excess sludge that must be disposed of or used, and require relatively sophisticated equipment that requires highly skilled personnel. Alternatively, technologies such as lagoons, treatment wetlands, anaerobic treatment, and reuse schemes are more sustainable and cost-effective wastewater treatment options. Lagoons and stabilisation ponds are biological treatment options with low operational costs (UNEP 2000). Educating municipal decision makers regarding the various conventional and non-conventional wastewater treatment options will enable them to choose the most appropriate facility for their community.

Introduce a fee-and-rebate system for municipal wastewater

Mexico's current difficulties in enforcing fines on municipalities are an obstacle to developing a system of rebates and fees. A comprehensive study of the feasibility of implementing such a scheme in Mexico is necessary. Box 2 outlines the methodology of a fee-and-rebate system.

Box 2 Fee-and-rebate system

In a fee-and-rebate system, the government sets a threshold pollution level for a municipality or industrial plant. Municipalities receive a rebate for each unit below the threshold or a fee (replacing the fine) for each unit above the threshold. The fees can be used to pay for the rebates. In essence, municipalities choosing to pollute forego the rebate opportunity, and thus face higher costs for polluting. Annex IV gives further details of the proposed fee-and-rebate system.

Demography

Reduce excess water use

Consumers tend pay water rates that are far below the true cost of water extraction and delivery, and, as a result, tend to overuse water. In addition, urbanisation is tending to increase water use, requiring the expansion of wastewater treatment infrastructure (Veenstra et al. 1997). Several strategies can be employed to reduce water consumption. The two main methods are education programmes and a fee-and-rebate system applied to the end-users of water.

By reducing water consumption, less water drains into the sewage system and is needed to be treated, thus reducing costs and the pressure on existing treatment facilities (UNEP 2000). However, the waste becomes more concentrated as domestic waste production per capita remains fairly constant but the concentration of contaminants varies with the amount of water consumed (Veenstra et al. 1997). The effectiveness of this policy option varies according to the local water supplier and only applies to municipalities with existing wastewater treatment infrastructure.

Knowledge

Formulate and implement education and information strategies

Education and information strategies inform the public and government officials about the problems caused by pollution. Increased technical assistance is required for municipalities in the development, operation and maintenance of wastewater treatment infrastructure. The following groups could be targeted by education campaigns:

- *Public officials:* Educating public officials about the costs of water pollution allows them to make more informed and effective decisions related to the control of water pollution.
- *The public:* The coastal population should be aware of the impact of water pollution on the tourism industry, their health and livelihood.
- *Small businesses:* The waste discharged by larger industries has been reduced considerably in response to Federal initiatives. Smaller businesses, which discharge pollutants directly into municipal sewer systems, need to be targeted by education campaigns in order to reduce their contribution.

Publicly rate municipalities for their level of compliance with wastewater treatment standards

Decision makers will be more likely to take action to improve wastewater management if there is lobbying by the public. Grading municipalities according to their level of compliance with water pollution standards and publicising this information will engage the public and allow them to identify which municipalities are failing to maintain adequate water standards. This will foster competition among municipalities which will ultimately improve standards. Introducing a public rating system that applies to all Mexico's larger municipalities will reduce opposition to the current beach pollution rating system. Rating upstream communities allows coastal municipalities to identify the sources of pollution and apply political pressure on polluters.

Legal/Institutional

Create autonomous water districts

This policy option involves the creation of independent wastewater districts consisting of representatives from the relevant municipalities. Despite the involvement of municipal governments, the water district itself should be a separate legal and political entity, with the exclusive responsibility of managing water treatment operations. By removing decisions regarding water treatment from the normal political structures of local municipal governments, federal funding can be targeted at developing treatment infrastructure.

Reform the pollution-related legal framework

Some reform of the Mexican legal framework could provide additional power to regulatory agencies to more effectively control water pollution

and guarantee municipal investment in waste treatment infrastructure and operations. These legal reforms fall into two general categories: those designed to make current regulations more effective; and those designed to increase stakeholder participation in waste management.

While the direct regulation of polluters and municipalities is an important control instrument, it creates a dynamic in which polluters are opposed only by federal bureaucrats, not by those harmed by pollution. The victims of pollution can be empowered by being able to take legal action against non-complying industries or municipalities, i.e. to create a system of class-action civil law suits (Zilberman pers. comm.).

Central Equatorial Pacific sub-system

Definition of the problem – Freshwater shortage

Freshwater shortage was considered as the priority aquatic concern of the Central Equatorial Pacific sub-system. Although the sub-system has abundant water resources, they are unevenly distributed and seasonal droughts affect extensive areas, especially during El Niño years. The discharges of several rivers have reduced (Vörösmarty et al. 1998). The high rate of deforestation is increasing erosion and the quantity of suspended sediment in freshwater systems, thus modifying stream flow in several areas of the sub-system. Human activities are polluting both surface- and groundwater supplies in many of the sub-system's river basins. Because groundwater is the main source of freshwater supply, many aquifers are overexploited in the sub-system.

Population growth and urbanisation have led to increasing demand for freshwater resources and the concentration of demand in areas that have limited freshwater availability. Because water supply and sanitation services are subsidised, insufficient revenues are generated to maintain current and invest in new technologies, and the population has no incentive to save water.

Most countries in the sub-system have a weak and outmoded legal framework for water management which does not provide for the incorporation of new criterion and approaches. Institutions weakly implement current legislation, are vulnerable to political pressures, lack trained personnel and have limited budgets. There is a lack of an integrated river basin approach to water management. Traditionally, local stakeholders were not consulted in the management of water resources. Countries in the sub-system lack water monitoring programmes and public awareness of water issues is limited. The

indirect benefits that water provides through ecosystem goods and services are rarely valued.

Countries of the region agreed during the Central American Dialogue about Water, Food and Environmental Sustainability (San Jose, Costa Rica, 2001) to adopt specific policies related to water management (see Annex III). The policy options developed by the regional team of the Central Equatorial Pacific sub-system, presented below, directly address some of the priority root causes identified during the Causal chain analysis.

Policy options

Demographic

Integrate territorial planning with water management

Urban planning regulations are not always enforced in the countries of the sub-system. Even if they are enforced, these regulations usually concentrate on territorial planning rather than addressing freshwater shortage issues. This option would support the countries of the sub-system, using economic and technological instruments, in developing their own policies, legislation and regulations regarding urban planning, which integrate territorial issues (i.e. migration, urban sprawl) with water management.

Promote new development centres in rural areas

Urban water supply services are unable to provide for the increasing numbers of migrants from rural areas. The promotion of new development centres in rural areas, which take into consideration existing activities, may reduce migration to cities. This can be achieved by decentralising productive activities in order to create employment and by improving social security in rural areas, particularly medical care, education, appropriated family planning, water supply and other basic services.

Knowledge

Strengthen and establish further monitoring programmes

The sub-system lacks a monitoring system for the control and surveillance of water quality. This is important for assessing the extent of freshwater shortages and defining the current and potential supply capacity required for urban development. This option would establish financing mechanisms for governmental institutions to develop programmes that monitor the factors determining land occupancy and its affect on water availability and quality, as well as the impact on aquatic ecosystems. The countries of the region need international support in order to initiate urban development programmes which include provisions for regulating water quality and availability. Studies are also required to establish the carrying capacity of the ecosystems at

the sub-system level. Databases should be created for decision makers to access policy relevant and current information so that they can develop and adopt appropriate policies.

Develop and implement environmental awareness programmes

The public lack an awareness of water issues and the associated socio-economic impacts, and there is no culture of water conservation. There is a need to recognise the value of water for economic development, particularly when formulating development strategies. There is insufficient information and guidance regarding available techniques for reducing water pollution and treating water. By establishing, promoting and implementing environmental awareness training programmes at the regional level this option aims to develop a culture of water conservation. Awareness programmes should increase environmental consciousness of the importance of a healthy environment and the impact of humans on water resources. This supports the implementation of integrated management plans. To create a water conservation culture in the long-term, formal education programmes should include key environmental issues in their curricula, including those related to water.

Governance, legal and institutional

Reorganise the water sector

Most countries in the sub-system have a weak legal and institutional framework for water management with overlapping responsibilities and a duplication of effort. Some regulations are obsolete or incomplete as they omit provisions for new approaches and administration procedures. The legislation considers water quantity separately from water quality, and river basin and coastal management are not integrated (Escobar 2002).

The water sector needs to be reorganised in the short-term (OPS/OMS 2001a). The modernisation of the water sector should include the separation of operational and oversight powers, based on an appropriate strengthening of the legal and institutional framework. Several countries in the sub-system have policies and a legal framework for water management; others are in the process of developing them and require support. The following options should be considered within an ecosystem-based management approach:

- Promote the exchange of successful and unsuccessful experiences regarding water policies, laws and regulations among the countries of the sub-system.
- Apply common water standards and quality criteria in the countries sharing an international river basin.
- The review of national and regional legal frameworks for water management by a multitude of stakeholders.
- Strengthen the current legal framework based on this review and international recommendations, with an aim of improving the

efficiency and effectiveness of institutions responsible for water management. The reform of the legal framework is necessary in order to improve institutional governance in the region.

- Integrate coastal area and river basin management.
- Implement integrated river basin management to reduce the negative effects on freshwater quantity and quality caused by various water users in different countries sharing a river basin.
- Strengthen the agencies responsible for water management in order to improve water use efficiency and water quality in the long-term.

Technology and economy

Finance the maintenance and expansion of water services by introducing water rates

Currently, insufficient revenues are received to up-date technologies because the governments of the sub-system subsidise water supply and sanitation services. Overuse and waste of water is indirectly promoted by subsidies for water supply services. Privatisation agreements do not stipulate that the company purchasing the public service has to strive for greater water efficiencies, adopt cleaner technology or control leaks and other water losses from the distribution network.

The introduction of realistic water rates that reflect the costs of maintenance and the expansion of water services will promote the efficient use of the sub-system's limited water resources. This will provide greater revenues to invest in new appropriated technologies and to develop a water monitoring programme. To improve the acceptability of the increased charges, public awareness of the importance of water conservation needs to be raised. Water users should be charged for the costs of environmental remediation and river basin management according to the quantity of water used, the impact of its activities on the environment, and the mitigation measures it has adopted to minimise this impact. Incentive frameworks are required to encourage the private and public sector to adopt sustainable practices.

Definition of the problem – Pollution

Pollution was considered as the second priority concern of the Central Equatorial Pacific sub-system. Due to the low level of wastewater treatment, pathogenic microorganisms, solid wastes and heavy metals are present along the coasts and in the water bodies of the entire sub-system (PNUMA 2001). Low tariff rates for water and underinvestment in sanitation infrastructure have resulted in a lack of basic sanitation services for the rapidly expanding urban population. At least 12 different diseases have been linked to polluted water in the sub-system (PNUMA 2001).

The intensification of agricultural production to feed the growing population is leading to more agro-chemical pollution. Political will and economic incentives to force or encourage industries and agriculture to adopt more environmentally friendly technologies/practices are lacking. Polluters are not taxed appropriately for the environmental damage that their activities cause.

Legislation and environmental management instruments are often not implemented due to an inappropriate institutional framework and a lack of coordination among the different governmental sectors. River basin management focuses predominantly on water distribution and consumption and stakeholder participation in the decision making process is rarely encouraged. There is a lack of accurate and timely information.

Countries of the sub-system have developed different legal mechanisms to address pollution problems. Annex III outlines some of the regional agreements that include provisions for addressing pollution, such as the Central American Ecological Summit of 1994 and the Convention for Cooperation in the Protection and Sustainable Development of the Marine and Coastal Environment of the North-East Pacific (Antigua Convention) adopted in Guatemala, 2002 (see Annex III).

Policy options

Economy

Invest in treatment infrastructure

Substantial investment is required to rehabilitate treatment systems and increase the level of sanitation coverage. The countries of the sub-system do not have sufficient economic resources to develop such facilities. Economic and technological support is required from donors to rehabilitate existing treatment systems and/or to construct new facilities in the countries of the sub-system.

Adopt the polluter pays-principle

Polluters are not charged for the environmental costs their activities cause. Economic sectors are, therefore, given little incentive to adopt cleaner technologies or to treat their wastes in order to reduce the pollutant loads they contribute. Instead, governments subsidise wastewater treatment and agro-chemicals resulting in limited investment in sanitation and more pesticide contamination, respectively.

This option would identify the sectors responsible for pollution and impose load-based charges. The polluter pays-principle can be adopted by implementing realistic tariff rates for wastewater discharges. The principle should be developed based on environmental goals and

objectives agreed upon by multiple stakeholders.

Legal/institutional

Review and reform national and regional legal frameworks

There are weak, and in some cases obsolete, legal frameworks and a lack of coordination between the different sectors and institutions responsible for environmental management, many of which have overlapping mandates. International best practice is not considered in national regulations, nor are new approaches related to the use of water. There is little or no coordination between river basin and coastal-marine institutions, limiting the possibility of integrated river basin and coastal area management.

This option proposes the review of national and international legal frameworks for water management in order to reform institutional frameworks at the national level. Based on this review, a regional legal framework should be developed to apply in each country according to their particularities, and water quality regulations should be standardised. National regulations should be based on those inspired by the Antigua Convention (2002).

Strengthen the capacity of the agencies responsible for water management

Existing regulations are ineffectively implemented and enforced. Management instruments and institutional capacity are insufficiently evaluated using, for example, environmental impact assessments and environmental management programmes. Institutional weaknesses, the failure to implement legislation and limited monitoring are the main root causes of pollution in the sub-system. Therefore, institutional strengthening is a priority issue at the regional level.

This option proposes strengthening the agencies responsible for water management by creating mechanisms and opportunities for institutional cooperation in order to adopt a holistic approach to water management, in which the particularities of both coastal and marine areas are considered. The strengthened capacity of the institutions will allow them to implement programmes aimed at controlling and monitoring pollution in coastal and marine areas. In particular, the Network of National Institutions should be established, and coordinated by the Central American Commission for Maritime Transportation in collaboration with UNEP.

Knowledge

Develop and implement environmental awareness programmes

This option would establish, promote and implement environmental training programmes at the regional level. Educational programmes

increase the environmental awareness of the population about the importance of waste management. Environmental issues should be included in formal education curricula.

Strengthen information management

Information about water quality is dispersed, not up-to-date and used within specific sectors, thus impeding a holistic understanding of the overall status of water resources. This option proposes the improvement of information exchange mechanisms in the sub-system by strengthening and updating the Regional Network for Resources Monitoring and other initiatives related to water management and surveillance in the sub-system. The countries need to cooperate and share data regarding the water regime of the sub-system. To support the implementation of the Plan of Action for the Protection of the Marine and Coastal Environment of the North East Pacific, there needs to be monitoring and surveillance of pollution from land-based sources. The knowledge base would be improved by monitoring the pollution load of coastal waters.

Pacific Colombian sub-system

Definition of the problem

During the environmental and socio-economic impact assessment of the Pacific Colombian sub-system, it was established that the unsustainable exploitation of fish and other living resources was the principal concern. 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 have declined (INVEMAR 2003c, FAO 2004c). Stocks of freshwater commercial species are also significantly depleted (IIAP 2001b).

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 fleet has begun 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.

Colombia has developed several programmes aimed at addressing

the environmental problems affecting its Pacific coast, such as Pacific Agenda 21 and the Project Biopacífico. The policy options proposed in this document should be considered as complementary actions to those recommended in these initiatives. In a broader scope, Colombia has signed several protocols and agreements with other countries of the South East Pacific to address transboundary pollution problems, notably the Convention for the Protection of the Marine Environment and Coastal Areas in the South East Pacific, and the Plan of Action for the Protection of the Marine Environment and Coastal Areas of the South Pacific, which are briefly described in Annex III. The Policy options analysis focuses on mitigating the root causes identified in the CCA, including technology, knowledge, economic and governance drivers.

Policy options

Technology

Transfer of sustainable technologies

The fisheries industry in the sub-system has poor access to modern technologies. The transfer of sustainable technologies can be accomplished through cooperation among national agencies and between municipalities and other regional and local administration institutions.

Knowledge

Enhanced information management and education programmes

There is a need to widely disseminate key, policy relevant scientific findings to individuals and institutions responsible for fisheries management. This requires the active participation of, and cooperation between, the scientific community and local stakeholders. Education campaigns and training courses for local authorities can improve their understanding of scientific findings. Local authorities need access to up-to-date fisheries statistics.

Training courses for community and fishing association leaders may improve the adoption rate of sustainable fishing practices. They are often responsible for the implementation and oversight of appropriated practices and have the power to change the behaviour of fishers. Since education is the responsibility of the government, this approach requires the strengthening of the formal education sector so that it considers environmental issues, including those related to the fisheries.

This option would initiate ethno-education focused towards sustainable development and the rational exploitation of living resources (clean production and eco-efficiency). Education should be directed at local communities rather than productive sectors since the current legal framework regulates the activities of the latter.

Governance

Further implement integrated coastal zone management (ICZM)

Coordinate institutional systems by adopting integrated coastal zone management. Colombia has made significant progress regarding this approach including the establishment of the Integrated Management Unit of Guapi Iscuande. Local authorities need to be monitored by regional and national agencies to ensure governmental fisheries strategies are implemented. In parallel to this, the capacity of local authorities needs strengthening regarding the management of fisheries resources.

Strengthen the self-regulation of coastal communities

Strengthen the self-regulation processes of coastal communities so that they receive greater responsibilities which are currently exclusive to the government. For this purpose, responsibilities must be assigned independently of the current political-administrative framework, as geographic boundaries of coastal communities often do not correspond with political boundaries. It is expected that self-regulation will lead to the increased participation of local communities, especially those of Afro-Colombian and indigenous origin, in decision making and implementation. This will legitimise their administrative structures. This proposal follows the results obtained by Ostrom (2000) and is in accordance with the community participation mechanisms stipulated in the National Constitution. The option may prove difficult to implement as local leaders may be unwilling to participate in the process and there may be resistance to change by the authorities. Fishing associations should also be strengthened so the interests of the industry are considered.