

**LE SYSTEME D'INFORMATION SUR L'ENVIRONNEMENT AU MEXIQUE
THE ENVIRONMENTAL INFORMATION SYSTEM OF MEXICO**

**ORGANISATION DE COOPERATION ET DE DEVELOPPEMENT ECONOMIQUES
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RÉSUMÉ

Ce rapport a été établi sous les auspices du Groupe sur l'état de l'environnement du Comité des Politiques d'Environnement de l'OCDE. Il examine les systèmes d'information sur l'environnement du Mexique en mettant l'accent sur le rôle de l'information dans les prises de décision et dans l'information du public. L'évaluation est placée dans le contexte du développement durable et dans celui des réformes économiques et sociales en cours au Mexique.

Le rapport présente les progrès importants déjà réalisés par le Mexique dans la mise en place de systèmes d'information sur l'environnement répondant aux différentes préoccupations de gestion de l'environnement. Tout d'abord, doivent être mentionnés le rapport sur l'état de l'environnement préparé régulièrement par le ministère de l'Environnement et des ressources naturelles (SEMARNAP), le Compendium de statistiques environnementales publié par l'Institut national des statistiques, de la géographie et de l'informatique (INEGI) et les publications régulières d'autres administrations. L'élaboration d'un système de comptes économiques et environnementaux et d'un système d' indicateurs d'environnement fondés sur le cadre Pressions - État - Réponses de l'OCDE est très avancée. Ensuite, le Mexique dispose d'une base législative solide pour développer son information en matière d'environnement grâce à la loi générale sur l'équilibre écologique et la protection de l'environnement. Enfin, les changements récents dans le dispositif institutionnel, attribuant au SEMARNAP un rôle central, sont une étape importante et permettent des orientations politiques claires et des demandes d'information précises. Nombre de carences et de défaillances des systèmes d'information existants sont identifiées par les autorités mexicaines, de même que la variété d'instruments devant être utilisés.

Toutefois, le rapport conclut que l'information environnementale existante ne suffit pas à soutenir le Mexique dans ses orientations politiques adoptées en faveur du développement durable. Actuellement, plusieurs systèmes, reflétant encore les anciennes structures administratives, se côtoient ; ils ont tous été conçus indépendamment les uns des autres pour répondre à des objectifs et des besoins différents d'institutions, d'agences et d'utilisateurs divers. L'information du public et l'accès à l'information peuvent être considérablement améliorés. Le rapport coût-efficacité de la production et de l'utilisation de l'information environnementale peut lui aussi être optimisé : les informations sont souvent cloisonnées, dispersées et mal connues ; des duplications persistent dans la collecte des données et leur qualité n'est pas suffisamment contrôlée ; l'accès à l'information reste difficile ou coûteux et les investissements en matière d'information font rarement l'objet d'analyses économiques.

Il est donc nécessaire d'adapter les systèmes d'information sur l'environnement afin qu'ils répondent mieux aux objectifs nationaux et internationaux de développement durable, et plus particulièrement qu'ils aident à : i) élaborer et appliquer des lois et politiques d'environnement ; ii) améliorer la cohérence des politiques sectorielles et environnementales ; iii) informer le public, le secteur privé et les ONG sur l'état et l'évolution de l'environnement.

Pour cela, des approches coopératives et efficaces par rapport à leur coût doivent être envisagées et des dispositifs institutionnels appropriés mis en place. Les recommandations spécifiques du présent rapport portent davantage sur :

- la collecte, la qualité et le traitement des données;
- la surveillance de l'environnement;
- les indicateurs d'environnement;
- les dispositifs institutionnels;
- le financement et le rapport coût-efficacité;
- la coopération internationale;
- l'accès à l'information et la diffusion auprès du public.

ENVIRONMENTAL INFORMATION SYSTEM IN MEXICO
AN OECD ASSESSMENT

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CONCLUSIONS AND RECOMMENDATIONS

This report reviews the environmental information system (EIS) in Mexico. Environmental information is viewed here as responding to decision making and public information needs in the transition of Mexico towards sustainable development. This transition is marked by economic and social reforms undertaken to consolidate an open-market economy and democracy.

The report concludes that Mexico has already made considerable progress in developing an EIS responding to various environmental management concerns. First, commendable achievements are the state of the environment report regularly published by the Ministry of Environment and Natural Resources (SEMARNAP), the compendium of environmental statistics published by the National Institute of Statistics, Geography and Informatics (INEGI) and other regular publications produced by various administrative units. A system of economic and environmental accounts (including stock and flow accounts) and a system of environmental indicators based on the OECD pressure-state-response framework are in an advanced stage of development. Second, there is a sound legislative basis for the development of environmental information in the General Law of Ecological Balance and Environmental Protection (LGEEPA). Third, the recent changes to the institutional framework represent an important step towards the achievement of sustainable development. SEMARNAP has been given a central role in that respect. This leads to clear policy directions and information needs. Mexican authorities are aware of the full range of environmental information tools to be used, and they have identified many of the gaps and deficiencies in the present EIS.

However, the report also concludes that present environmental information does not sufficiently support the sustainable development policy directions adopted by Mexico. First, there are several systems, which were independently designed to respond to layers of different objectives from various institutions, agencies and users. This situation reflects the former administrative structures and policies in Mexico. Second, much can be done to improve public information and access to information. Third, cost-effectiveness in producing and using environmental information could be greatly improved given the current degree of dispersion of information, insufficient knowledge of available information, insufficient exchange of information, redundancy in data collection, insufficient quality control and harmonisation, difficult or costly access to available information and scarcity of economic analysis of information investments.

It is therefore important to adapt the Mexican EIS to support progress towards national and international goals of sustainable development, and, more specifically, to: i) assist in developing and enforcing environmental legislation and policies; ii) help in improving the coherence of sectoral and environmental policies; iii) inform the public, the private sector and NGOs on environmental conditions and trends. Consideration needs to be given to using co-operative and cost-effective approaches for collecting, treating and analysing the quality of environmental data, as well as to establishing supporting institutional arrangements.

It is recommended that consideration be given to the following proposals:

1. Data collection, quality and treatment

- Reassess the quality of data with respect to statistical and technical standards as well as their adequacy for decision making and other uses.

- Consider in particular the following projects:
 - identifying gaps on priority issues;
 - enhancing the environmental sensitivity of monthly or annual statistical surveys (concerning industry, services and trade);
 - evaluating the cost-effectiveness of the development and use of the many geographic information systems (GIS);
 - using environmental information in cross-sectoral studies;
 - collecting and estimating data on pollution abatement and control expenditure and, more broadly, environmental expenditure;
 - reinforcing the scientific and environmental database for the estimation of sustainable yields of forest resources and fish stocks;
 - developing mapping of soil erosion and erosion risks.
 - continuing and reinforcing the development of inventories of biological and ecosystem diversity.

2. Environmental monitoring

- Carry out a general reappraisal of all monitoring systems and agree on a co-ordinated and integrated monitoring programme, taking into account needs, priorities and available resources. Particular emphasis should be given to measuring and supporting sustainable development.
- Consider in particular the following projects:
 - continuing to equip cities that suffer from the worst air pollution with modern monitoring systems;
 - improving river water quality monitoring by installing up to date monitoring equipment at representative sites and potential “hot spots”, with reference to river quality objectives;
 - implementing a system of coastal water quality monitoring using baseline sample surveys and sampling of coastal waters at potential “hot spots”, particularly with reference to tourism and fisheries concerns; including, for fisheries, measurement of both physical and chemical parameters and biological monitoring of fish and shellfish;
 - implementing, as planned, a hazardous waste inventory;
 - continuing to equip the national laboratory for environmental analysis at INE to be used as reference laboratory.

3. Indicators

- Continue work to develop and produce environmental indicators focusing on sustainability and environment-economy linkages; this could be based on the OECD framework with adaptation to suit Mexico’s particular circumstances.
- Continue work on environmental accounting with more emphasis on improving input data, using sensitivity analysis and applying the accounts in developing indicators and in modelling environment-economy interactions.
- Consider in particular the following projects:
 - developing technical and administrative means (e.g. standardised questionnaires, ready-to-complete tables) to improve the efficiency of the production of these indicators;
 - in the short term, developing indicators of environmental conditions, pressures and responses; in particular, using available but unexploited data (e.g. water quality data on a watershed basis), giving attention to priority issues and areas, and promoting emission inventories;

- in the medium term, developing sectoral indicators to integrate environmental concerns in the agricultural, health, transport and energy sectors.

4. Institutional arrangements

- Give priority to the production of cost-effective and policy relevant environmental information on the basis of existing environmental and statistical legislation, and establish environmental information units in the various environmental institutions. Give attention to the potential decentralisation of some elements of the EIS.
- Establish a committee on national environmental information to support progress towards sustainable development, environmental management and public information, to guide the development of the EIS, to co-ordinate the handling of environmental information and to influence new information initiatives; specify the mandate of the committee. This committee should be co-chaired by the environment ministry and the national statistics office and should establish working groups to deal with specific areas of a more technical or detailed nature, such as: statistical information and methodologies (possibly chaired by a top statistical official); scientific information; administrative and economic issues; access to environmental information (possibly chaired by a representative of environmental NGOs); and technological issues (e.g. metrology, information technology).
- Ensure proper co-operation in the elaboration and/or dissemination of a number of products of the EIS:
 - an electronic environmental meta-database accessible by all ministries, agencies, regions and the public;
 - a database of key environmental information and related environmental and sustainability indicators; this could cover information essential for policy and monitoring purposes as well as meeting international obligations and commitments;
 - state of the environment reports and related products;
 - a statistical database and a GIS;
 - the main information products of the information units of each component of the environmental administration;
 - local area networks within each ministry/agency and wide area networks connecting ministries.

5. Financing and cost-effectiveness

- Move towards a better balance in financing the collection, treatment and distribution of environmental information among various levels of government, the private sector and international funding sources.
- Set clear priorities for the use of resources on the basis of an assessment of the cost-effectiveness of specific programmes, giving particular attention to using data already available and to responding to decision making needs.
- Give particular attention to human resources: beyond transfers and reallocation of duties (in areas such as systems maintenance, data collection, data treatment, synthesis and publication of information), a training programme will be needed and a core staff of career civil servants will have to be created to ensure continuity and cost-effectiveness.

6. International co-operation

- Continue to implement international agreements and declarations concerning environmental information, including Agenda 21 and the OECD Recommendations; in particular contribute to the harmonisation of environmental data at international level by using international classifications and standards, responding to international data collection efforts such as that of the OECD.
- Develop specific international co-operation concerning environmental information. For instance, strengthen efforts concerning:
 - co-operative work with the United States on information to support Mexican commitments on the Mexican-United States border area (such as the La Paz agreement and the Integrated Border Environmental Plan);
 - other specific co-operative work under the NAFTA environmental side agreement (e.g. shared information system on hazardous waste);
 - environmental information to support co-operation and shared “leadership” within the Americas and Latin America.

7. Access to environmental information and dissemination to the public

- Work together, under the scope of the INEGI-SEMARNAP Agreement (Bases del Convenio de Colaboración INEGI-SEMARNAP, signed by the heads of both agencies on 5 July 1995), on the periodic publication of the national state of the environment reports using the pressure-state-response framework and environmental indicators and on the publication of an environmental statistics compendium as a technical complement and companion product to the state of the environment reports. Broaden the distribution of the report itself, as well as of its conclusions and of a summary of them for the general public. Derive from the national state of the environment reports short thematic brochures covering environmental issues (air, water, waste, etc.) or sustainability issues for economic sectors such as transport and energy. Consider related documents at state and regional levels.
- Target specific publications for specific groups, covering subjects such as information technology for industry, or use of natural resources for rural populations (e.g. concerning bacteriological contamination of wells, overharvesting of forests, unsustainable farming methods, use of pesticides).
- Consider the following projects to support transparency of environmental information:
 - preparing in a simple brochure (with organisational charts, address lists, etc.) a kind of “who’s who” in the environment field in Mexico at national, state and municipal levels, to encourage and facilitate public requests for environmental information, clearly explaining citizens’ rights to environmental information;
 - compiling and regularly updating a list of publications on the environment and ensuring that these publications are easily available to the interested public, including at an information centre at the environment ministry;
 - using appropriate films, radio and television programmes to support this effort;
 - continuing the development of an internationally accessible server on environmental information for Mexico; developing standardised access to computerised data; and continuing to make information available on paper (e.g. maps, tables and figures), as the number of potential users with access to a computer is not yet large enough in Mexico for electronic distribution to be favoured;
 - continuing the development of a Mexican Pollutant Release and Transfer Register (PRTR) to ensure that the general public has access to pollution data on a substance by substance and on a facility by facility basis;

- considering the creation of a resource centre for impact studies, starting with establishment of an annual collection of the most interesting impact studies, classified by type of project and accessible to all;
- developing specific environmental databases and information to support “place-based” environmental management.

INTRODUCTION

Mexico became the 25th member of the OECD in 1994. It is the fourth largest OECD country, with a total area close to 2 million km², and the third most populous with around 90 million inhabitants. The United Mexican States form a federal republic operating under a centralised government. The republic is divided into 31 states (estados) and one federal district encompassing Mexico City, the capital.

After a severe economic recession in 1995, Mexico is undertaking wide-ranging economic and social reforms to achieve a healthy and growing economy and to consolidate democracy. The Mexican Government has given prominence to the environment in line with its international commitments, its objectives of social welfare and equity and the need to promote development that preserves the environment and uses natural resources rationally, taking into account the interests both of today's Mexicans and of future generations.

Concern for environmental issues in Mexico has increased in recent years. Together with the commitments of the Mexican Government to the principle of sustainable development and to international co-operation on environmental protection, this concern has resulted in broadened and strengthened environmental policies. This in turn increases and modifies the demand for information.

PART I

GENERAL ASSESSMENT

1. DEMAND FOR ENVIRONMENTAL INFORMATION

In the current political, economic and social context, reliable environmental information is needed in Mexico to support sustainable development and particularly to: i) integrate environmental and economic decisions; ii) track environmental progress and manage the environment, and iii) inform the private sector, NGOs and interest groups, and the public at large.

To achieve sustainable development, SEMARNAP has established five strategic principles to guide government actions that may have an effect on the environment and natural resources. These are to:

- combine protection of the environment and natural resources with their sustainable and diversified use;
- develop programmes and actions to ensure equity in the use of resources and to help eradicate poverty;
- place priority within environmental legislation on the development of preventive norms and actions to induce changes in producers' and consumers' behaviour;
- foster partnership and social participation;
- further develop active participation by Mexico in international forums and agreements on the basis of defined national policies and priorities.

The implementation of these five strategic principles needs to be supported by an effective EIS, which includes information on: the state of the environment and of natural resources; pressures from human activities on the environment and its resources; and the responses of society and institutions to these pressures.

1.1 Integrating environmental and economic decisions

The integration of environmental and economic decisions can be fostered by institutional integration as well as by use of appropriate market mechanisms. This can support not only sustainable development but also cost-effectiveness in implementing related policies.

The need to integrate environmental and economic decisions has a number of implications for the collection, treatment and use of information, including the necessity of synthesising and presenting scientific and technical information in readable, usable form, and of displaying the link between environmental issues and economic issues.

The result should be better integration of environmental concerns into decisions that can affect the environment in such major economic sectors as energy, industry, transport, agriculture and tourism. Such decisions are taken by administrations, enterprises and households.

1.2 Tracking environmental progress and managing the environment and natural resources

To track environmental progress and manage the environment and natural resources, appropriate environmental information is required so as to: i) better understand environmental trends and conditions; ii) develop policies, including strategies, plans and actions, and the use of environmental forecasting; iii) implement policies, with appropriate monitoring of compliance and enforcement; and iv) evaluate policies and environmental performance, taking into account both short- and long-term environmental responses, as well as private actions, local management and alert systems.

1.3 Improving public access to environmental information

The law of 1988, LGEEPA, recognises the people's right to environmental information and the need to increase access to information. The Government has set up several programmes to disseminate environmental information (e.g. through state of the environment reporting). Although the public's awareness and understanding of environmental problems are still generally limited, there is strong demand from the private sector, environmental NGOs and other interest groups, the scientific community and the public at large for better information on a number of environmental issues of international, national or local scope. Thus, readable, available environmental information becomes a goal in itself to enable such groups to shape their views and decisions and influence policy making.

2. DESIGN OF ENVIRONMENTAL INFORMATION SYSTEM

2.1 Institutional arrangements

The first attempt to formalise environmental concerns at an institutional level took place in 1972 when the Under-Ministry of Environmental Improvement was created in the Ministry of Health and Public Aid. Its main goal was to incorporate environmental concerns into health policy. Ten years later the Ministry of Urban Development and Ecology (SEDUE) was created. It was the first institution to have environmental protection as one of its main purposes. To improve water management the National Water Commission (CNA) was established in 1989. SEDUE was then transformed into the Ministry of Social Development (SEDESOL), supported by two other new bodies, the National Institute of Ecology (INE) and the Federal Attorney for Environmental Protection (PROFEPA).

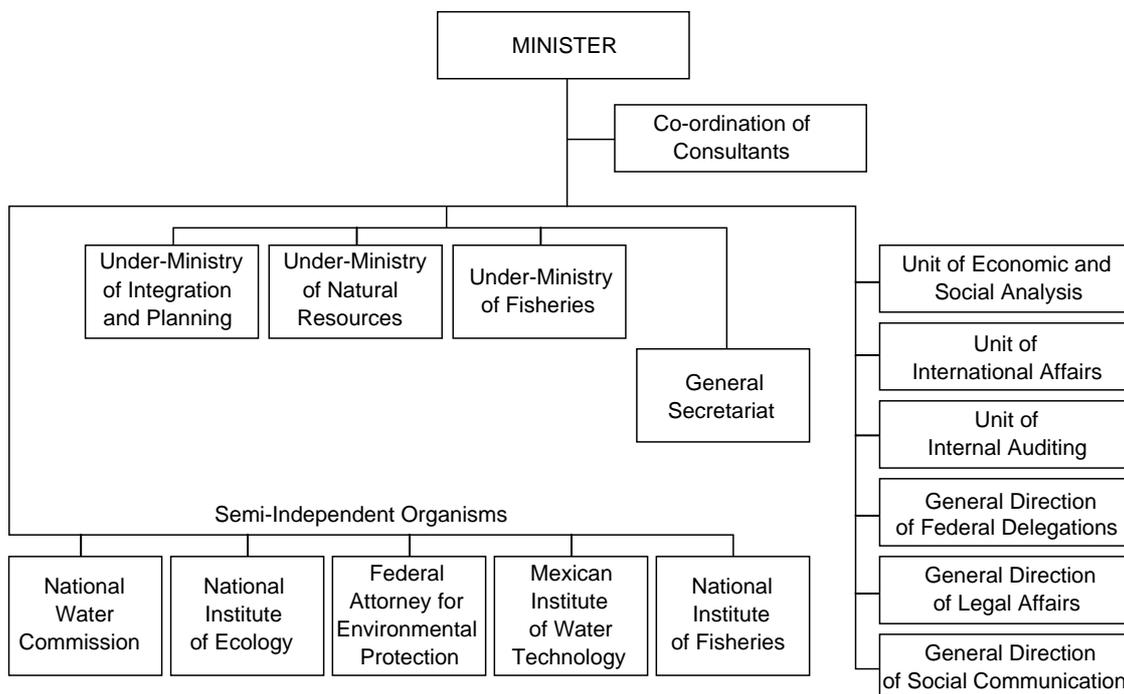
Current institutional structure

In 1994 the Ministry of Environment, Natural Resources and Fisheries (SEMARNAP) was set up with the aim of promoting a transition to sustainable development and restraining environmental and natural resource deterioration. SEMARNAP is responsible for fiscal policies, programmes and resources for forestry and fisheries, soil conservation and restoration, ecological issues and environmental policy planning. It is supported in this endeavour through the co-ordination of the policies and programmes of CNA, INE, PROFEPA, the National Institute of Fisheries (INP) and the Mexican Institute of Water Technology (IMTA) (Figure 2.1 and Annex 1).

The National Institute of Statistics, Geography and Informatics (INEGI), which plays a key role in providing economic and social information to the ministries, has recently extended its activities to include environmental accounting and the production of a compendium of environmental information. INEGI has particular expertise as a statistical office in handling data, standards and classifications, and in data analysis and presentation.

These ministries and agencies collect a considerable amount of environmental information according to their programmes and policies. The strengths of the existing arrangements are technical competence and experience within each organisation in the various environmental areas, and a strong sense of commitment to carrying out policies and programmes. In addition, the General Law of Ecological Balance and Environmental Protection (LGEEPA) provides a sound legislative basis for protecting the environment, underpinning all environmental efforts.

Figure 2.1 Structure of Ministry of Environment, Natural Resources and Fisheries (SEMARNAP)



Source: SEMARNAP.

The number of organisations involved, the evolution of the institutional system, the insufficiency of information units in SEMARNAP dependencies and the limited sense of corporate ownership of data all make it very difficult to manage environmental information effectively among ministries and agencies. Both institutional co-ordination and co-ordination of information are lacking, which has relevance for cross-media issues. Although policies, programmes and key issues are well defined and in many areas the data gaps and deficiencies are recognised, there is no appropriate generation (or transfer) of information according to a prioritisation of the key areas where information is needed most across all ministries and agencies. This is important, since funds to set up and run monitoring systems are limited; funds should be targeted to the areas of greatest need. The present arrangements do not allow much flexibility to monitor new environmental problems, particularly those involving more than one environmental medium. What is needed is an overarching environmental information system enabling the best and most cost-effective use of the information gathered.

Fostering cost-effectiveness and relevance

An institutional mechanism is needed to encourage coherence while allowing for participation by a variety of institutions involved in environmental information, taking account of their own specific needs and the need for a global vision. This institutional mechanism should aim for cost-effectiveness in funding and allocation of resources, and for policy relevance of environmental information.

It is recommended that a national committee on environmental information be set up, comprising representatives of ministries, institutes, commissions and other government agencies. It is recommended that the national committee have a specific mandate to co-ordinate the handling of environmental information and to influence new information initiatives in the framework of the INEGI-SEMARNAP Agreement (Bases del Convenio de Colaboración INEGI-SEMARNAP, signed by the heads of both

agencies on 5 July 1995). A memorandum of understanding agreed by all participating agencies could be considered. The terms of reference, which will need to be developed, might include responsibility for recommending new information projects, assessing priorities, advising on the most cost-effective ways to carry out new proposals and agreeing responsibilities for the collection of environmental information in the various ministries and agencies.

The committee could be co-chaired by the environment ministry and the national statistics office. Several working groups of the committee should be established to deal with specific areas of a more technical or detailed nature, such as:

- statistical information and methodologies;
- scientific information;
- administrative and economic issues;
- access to environmental information by the public and NGOs;
- technological issues (e.g. metrology, information technology).

Within the environmental administration, a number of bilateral agreements exist. These could continue to operate independently, or they might be incorporated in the arrangements described above, depending on the nature of the agreement. The relationship between the national committee and existing groups, such as the committee looking into the possibility of setting up a joint GIS, should be considered; where possible, such groups should be incorporated into the new structure. The possibility of the national committee having its own budget and a role in allocation of resources might also be considered. Permanent posts of a technical or specialist nature would help in establishing a sound base of expertise and experience in managing information. Also, the setting up of information units would help the various environmental institutions to improve the exchange of information and cost-effectiveness.

2.2 Environmental monitoring

Monitoring systems need to be based on sound but evolving scientific knowledge, measurement and information technology. They should provide reliable, harmonised and comparable environmental information. The development of monitoring networks requires considerable investment in infrastructure (monitoring instruments, computer networks, etc.), and their use needs to be carefully evaluated in terms of costs and benefits in relation to policy objectives and programmes. In Mexico the sustainability of natural resources is particularly important, since 26 per cent of the labour force is employed in agriculture, forestry, hunting and fishing, many at subsistence level. Other environmental problems requiring careful monitoring include air quality in the major conurbations, particularly Mexico City.

Achievements in monitoring

Monitoring systems that work reasonably well in Mexico cover natural resources – forests, fish stocks, biodiversity – and industrial emissions. The emphasis tends to be on management and control rather than sustainability.

Forest inventories were made in 1961, 1992 and 1995. These sample 20 000 sites, covering the whole country. Information is produced on variables such as the volume of standing timber, production and plantings, as well as on public and private ownership. Inspections on forest use are carried out every year. A biodiversity database holds information on species, including endangered ones, and is being expanded every year. An expert commission decides what biodiversity research should be carried out.

Information on pollution emissions by industry is available through from inspections covering water, air, and waste, as well as noise. A Mexican Pollutant Release and Transfer Register (PRTR) is

under development. Environmental audits are carried out; the results of 600 audits should be made available for examination. Half of companies in the border states and 30 per cent elsewhere are inspected every year.

Areas for progress

Pollution monitoring systems for air and water are less effective than those for natural resources, principally because resources and expertise are limited. Minimal monitoring is carried out for marine water quality, for disposal of hazardous waste and of industrial, commercial and household waste, and for noise. No national monitoring is done on bathing water quality. Nor is environmental expenditure tracked for the public sector, industry or consumers. No up to date inventory exists for soil.

SEMARNAP should continue its efforts to consolidate the air quality monitoring capacity, including equipment, control procedures and quality assurance. At present, ten cities have been selected (Mexico City, Guadalajara, Monterrey, Ciudad Juárez, Tijuana, Querétaro, Mexicali, Tula, Minatitlán and Puebla).

Water quality has been monitored since the early 1970s but some of the methods and equipment are obsolete or need updating and automating. In addition to its use in assessing contaminant concentrations at sampling points in rivers, such information might be combined with river flow data to estimate pollution loads entering coastal waters. The general quality of rivers is currently not monitored but there are plans to classify water bodies based on the use to which the water is put (e.g. to maintain aquatic life, for use in agriculture, for human consumption) and to set standards. A new system of monitoring general river quality, based on these classifications and standards, is expected to operate from the end of 1996.

The last soil inventory was compiled 25 years ago and needs updating. A GIS is currently being designed on land use/cover and this will include information about erosion.

Several attempts have been made to estimate hazardous waste generation and disposal, using methodologies adopted in other countries, but these have not proved successful because of characteristics of waste generation and disposal peculiar to Mexico. A proposal to create an inventory of hazardous waste is being developed.

Recommendations

It is recommended that a general reappraisal of all monitoring systems be made by the national committee and a co-ordinated, integrated monitoring programme agreed, taking into account needs, priorities and available resources. Particular emphasis should be given to measuring sustainability. Consideration should be given in particular to the following projects:

- continuing to equip the cities that suffer from the worst air pollution with modern monitoring systems, as planned, and in the longer term setting up monitoring systems for all major urban areas;
- improving river water quality monitoring by installing up to date equipment at sites that will yield a representative assessment of contaminants in rivers and estuaries, and specifically monitoring potential “hot spots” where contaminants are likely to be high because of discharges of industrial or sewage effluent; setting up a general system for assessing river quality, as planned, based on standards for rivers and classification by use;

- implementing a system of coastal water quality monitoring based on baseline sample surveys, and sampling coastal waters at potential “hot spots” where there are industrial or sewerage discharges, with particular emphasis where water quality is important for fisheries; including both physical and chemical parameters, and biological monitoring of fish and shellfish;
- setting up, as planned, a hazardous waste inventory.
- continuing to equip the national laboratory for environmental analysis at INE to be used as a reference laboratory.

2.3 Data quality and treatment

Ministries, institutes, agencies and NGOs collect a considerable amount of environmental data through monitoring systems, ad hoc surveys and research. These data need to be turned into usable information that is relevant for policy purposes and public information, with a focus on measuring sustainability.

Data quality

While this review does not examine data quality in any detail, there are indications of specific data quality problems: for air and water monitoring in some areas, due to lack of expertise and obsolete equipment; for waste generation and disposal, where the available information is known to entail wide margins of error; and for environmental impact assessments.

It is important to clearly identify and document data limitations and deficiencies so that they can be taken into account when drawing conclusions about environmental trends. Sensitivity testing should be carried out, particularly in areas where data quality is critical, such as the calculation of sustainable yields for fisheries and forests. Each ministry and agency should reassess data quality standards and the adequacy of data for the purpose to which they are to be used.

Data treatment

The available environmental information needs to be summarised by sectors, key issues, media, etc., so that trends can be identified and linked to economic data. Some progress has been made in producing environmental indicators based on the OECD framework.

Information technology is widely used in Mexico, particularly the application of geographical information systems. A number of GIS are being proposed or developed. Such systems are very resource and data intensive and their use needs to be carefully evaluated relative to the expected benefits. It may be better to focus on developing one GIS, or a few related ones, and pooling technical expertise.

The value of available information may be enhanced by looking at possible cross-sectoral applications, e.g. SO₂ emissions/depositions and soil acidity/critical loads, the interface between land and marine environment, or the relationship between environment and health. More use might also be made of administrative information, such as data on pollutant emissions derived from pollution control procedures.

2.4 Indicators

Environmental indicators

Mexican authorities have developed a system of environmental indicators (Sistema de indicadores ambientales, or SIDIA). These indicators are in the measurement stage, relying on figures collected by different institutions that produce data. They cover a broad range of issues such as:

- water pollution in urban centres;
- loss of biodiversity, etc.;
- climate change;
- municipal waste;
- soil erosion;
- forest resources;
- air pollution;
- desertification;
- watershed pollution;
- ozone layer depletion.

It is recommended that work on environmental indicators, based on the OECD framework, should continue but be modified and enhanced to suit Mexico's circumstances, and that the emphasis should be on linking environmental indicators to economic activity variables, and on sustainability.

It is further recommended that technical and administrative means be developed (e.g. standardised questionnaires, ready-to-complete tables) to improve the efficiency of producing environmental indicators. Priority should be put on developing indicators based on data already available but not yet exploited (e.g. water quality data on a watershed basis, kept by CNA). These indicators should eventually be drawn from a central database updated regularly from computerised or manual files furnished by the producers of the data.

Mexico City's air quality index, called IMECA (Indice Metropolitano de la Calidad del Aire), developed about ten years ago, is based on equivalence calculations for five parameters, permitting an aggregate figure to be disseminated daily by the news media. Statistics based on daily measurements are also available. This type of data should be developed for other large urban areas, such as Guadalajara and Monterrey. In general, indicators related to environmental conditions need to be developed for the most densely populated urban areas and those that are subject to severe environmental pressures.

Database of key environmental information and indicators

It is recommended that a database of key environmental information and related environmental and sustainability indicators be set up, containing the information that is of most value for environmental policy and monitoring purposes and to meet international environmental obligations and commitments. INEGI, which already acts as focal point for information in general and has legislative powers to require data from ministries, carries out such a function when compiling the environmental statistics compendium. A starting point for this key database might be the indicators SEMARNAP is producing and the INEGI compendium. The database might also be a means of bringing together information needed for OECD questionnaires on the environment. The emphasis should be on developing a workable system that can be operational quickly and is seen to be useful, rather than aiming initially for a more complex system that would take much longer to develop. Setting up information units in each SEMARNAP dependency would also greatly facilitate the exchange of environmental information.

Environmental accounts and indicators of sustainable development

INEGI, the national statistics office, in co-operation with the World Bank and the United Nations Statistics Office (UNSO), developed a system of accounts expressing the relationship between the economy and natural resources (SEEAM, System of Economic and Ecological Accounts of Mexico), initially for 1985-90 and later updated to 1992 (Box 2.1). A substantial amount of work has been carried out, including stock and flow accounts by economic sector based on standard national accounting methodologies, and an adjusted “green” GDP has been calculated. There is considerable debate internationally about the value of making GDP adjustments; it is suggested that the emphasis should be on improving input data and sensitivity testing, and on integrating environmental and economic variables at the sectoral level by media and selected environmental themes, for use in indicators work and modelling environment-economy interactions.

INEGI identified eight topics (forestry resources and change of land use, oil, water resources, soil erosion, air pollution, soil pollution, and groundwater pollution). Indicators could be elaborated to show variations in stocks (e.g. forests, oil, water, soil). The volume of pollution produced (e.g. municipal waste, discharges to water of oxygen-demanding substances) could also be shown. These indicators, drawn from physical accounts, do not claim to be exhaustive regarding sustainability, but they indicate the ability of the statistical system to show the evolution of stocks and volumes of pollution in various media.

The accounting approach expressed through this series of indicators forms the basis of what could become indicators of sustainable development. To this end, it is recommended that the prototype accounting system be extended and strengthened. For example, it could be extended to the fishing industry and changes in land use to develop indicators of sustainability related to activities in the areas of pisciculture, aquaculture and “artificialisation” of land that currently are not taken into account because of lack of data, organisation or geographical information.

In addition, it should be possible to elaborate other types of indicators in the medium term, such as sectoral indicators for agriculture, health, transport and energy as they relate to the environment. Indicators of the evolution of public and private environmental expenditure could eventually point to appropriate directions for public action.

2.5 Cost-effectiveness and financing

Because of the wide diversity of data sources that can be used, either directly or indirectly, regarding the environment, figures are not yet available on costs of planning, assembling, publishing and distributing environmental information. Institutions such as CNA, INE and PROFEPA have no specific lines in their budgets identifying operating or investment costs related to environmental information. Nor does INEGI produce budget figures on environmental information.

While the absence of specific budget and personnel breakdowns makes it hard to form a definitive picture of the cost-effectiveness of the current EIS, it seems clear that the methods used to compile technical and administrative data can be improved. Many of these data are produced by bodies whose responsibilities do not explicitly concern environmental protection, including some parts of SEMARNAP. Practically every sectoral agency produces pools of unaggregated data and lists such as inventories that could be used in an EIS.

Box 2.1 System of Economic and Ecological Accounts of Mexico (SEEAM)

Objective

- Link economic and environmental concerns using the framework of the national accounts system.

Background

- The first step (1990-91) was a pilot study referring to 1985 and developed in co-operation with the World Bank and the UNSO.
- Using this study as a basis, INEGI developed historical series for 1985-90, and more recently for 1992.

Methodology

- The overall analytical framework is that developed in UNSO's Draft Handbook on Environmental Accounting.
- Different methodologies are used to calculate, in monetary units, the costs of resource depletion* (variation in stocks) and pollution**.
- Using the value thus generated, different aggregates of the system of national accounts are adjusted to develop an "adjusted GDP" for selected environmental concerns, such as degradation of the environment and the depletion of natural resources.

Environmental topics under consideration

- | | |
|--------------------|------------------------------------|
| – Forest resources | – Land use changes (deforestation) |
| – Oil | – Water resources |
| – Soil erosion | – Air pollution |
| – Soil pollution | – Water pollution |

Main results

- On average, the costs of resource depletion and environment degradation in 1985-90 totalled was of 12.5% of GDP, with depletion costs accounting for 3.9% (and tending to decrease), and while degradation costs for 8.6% (and tending to increase).

Main conclusions

- Although progress has been achieved with the project, the results are considered preliminary and not usable as current macroeconomic indicators.
- The information demands generated by the project contributed to an evaluation of the state of environmental information in Mexico, shedding light on information gaps and showing that the development of an efficient EIS must be a priority for environmental policy.

* The income flow lost because of depletion of natural resource stocks (oil, wood, land, groundwater).

** Degradation costs, or environmental damage from erosion, soil pollution by solid waste, or water and air pollution.

Source: INEGI.

Improving cost-effectiveness

To develop a more cost-effective EIS, the first step is to set up a catalogue of data sources, classified by environmental theme (e.g. inland waters, marine waters, air quality, atmospheric emissions, biodiversity, household waste, hazardous waste) and by administrative or geographic area (federation, states, municipalities, border areas, natural habitats, protected areas, etc.). Such a catalogue should give the official name of each data source, its address, the type of information it produces, in what form it is available (on paper, on floppy disk), how often the data appear and, if possible, technical information such as measuring stations and standards. This “information about information” should be widely available. It would be important to extend such a catalogue to data sources that are more statistical than technical or administrative in nature. This work should be carried out by the environmental administration.

Second, there is a need to evaluate the quality and statistical validity of data produced by various agencies that may not have sufficient expertise to carry out such an examination themselves. It is equally important to determine how statistically representative are the monitoring networks (e.g. for air quality or biodiversity) and sampling methods (for example, as regards waste inventories). In other words, an audit should be conducted on the intrinsic quality of the data. Such an examination should lead to a strategy for consolidating existing data and eliciting supplementary information in the fields that are seen to be the weakest. It is important in the longer run to “environmentalise” monthly and/or annual statistical surveys, especially those relating to industry, services and trade. Complementary surveys could also be started, with the strategic co-operation of SEMARNAP and INE.

Third, INEGI is responsible for geographic information, using digital and cartographic techniques to produce an overall picture of land use, meteorological data and socio-economic information (e.g. population). INE, which keeps administrative statistics, would like to be able to use a database to cross-reference them geographically and gradually integrate information from various sources to develop an interactive function. Given staffing constraints and the start-up costs of such a system (including hardware and software), the extent of any duplication of functions with INEGI or other agencies should first be examined.

Fourth, there is the question of human and financial resources to assure the functioning of air quality monitoring networks, including the involvement of local authorities, who are not always tuned in to the idea of partnership. Existing networks should be consolidated, in so far as this corresponds to national priorities, and similar networks could be developed for the most populous and/or industrialised cities.

Fifth, for surface and groundwater quality, measurement methods and the conditions and location of monitoring stations are not always well adapted to current needs and strategies. CNA, which is responsible for water quality, seems aware how much funding and personnel are needed. Before any modernisation of this system, water quality should be thoroughly evaluated so that monitoring efforts can be concentrated in the most contaminated areas.

Financing

Reforming and strengthening Mexico’s EIS will require significant investment in coming years. Part of the funding may be provided through outside partners such as the World Bank. Particular attention should be given to human resources. It will not be enough to transfer staff among systems maintenance, data collection, data treatment, analysis and publication of information; to maximise cost-effectiveness, a training programme will also be needed. Particular stress should be laid on building lasting know-how and ensuring continuity of efforts over a perspective of at least ten years.

2.6 International co-operation

Environmental information is needed to monitor progress on Mexico's international commitments, whether bilateral, regional or global. In particular, efforts should be strengthened concerning:

- co-operative work with the United States on information to support Mexican commitments on the Mexican-United States border area (such as the La Paz agreement and the Integrated Border Environmental Plan);
- other specific co-operative work under the NAFTA environmental side agreement (e.g. shared information system on hazardous waste);
- environmental information to support co-operation and shared “leadership” within the Americas and Latin America.

Concerning international agreements and declarations about environmental information, Mexican authorities could give special attention to Agenda 21 and OECD Recommendations, and continue to work towards the harmonisation of environmental data at international level by using international classifications and standards, and by responding to international data collection efforts such as that of the OECD.

3. ACCESS TO INFORMATION

3.1 Access to and circulation of environmental information within the central administration

Current situation

Access to information among government institutions is formally unrestricted. INEGI has an explicit legal mandate to collect all the information necessary to carry out its work. In practice, various publications and reports circulate within the administration, but each agency tends to manage its own data sources and publications without much co-ordination or exchange of information about what is being produced. This is the case for information on the state of the environment (pollution related or natural resource related) and for sectoral information (e.g. data on pressures). Most parts of the environmental administration have no “gate” for access to the data or publications they produce.

Consequently, there is a general lack of awareness about what environmental information is available, and it is not easy to learn what work is being carried out. Neither is there any central record of environmental information or meta-information, nor a comprehensive list of data sources, environmental publications and reports.

Meta-database

It is therefore recommended that an electronic inventory of environmental meta-data, accessible to all ministries, agencies, regional authorities and the public, be established. Consideration might be given to producing an interim version on paper. It is suggested that the electronic version should be non-hierarchical (i.e. not based on a predetermined classification system, which tends to be more difficult to set up and run) but based on an anarchical system where meta-information is given in free fields with a minimum of structure to identify title, subject area, geographical coverage, etc., and accessed via standard software using keywords. (See also page 23.)

It is also recommended that the development of the PRTR be completed and that information from this register be made available on a substance by substance and pollutant by pollutant basis.

Networking

The accessibility and management of data and meta-information would be considerably enhanced by networks linking ministries and/or agencies. Such networks might also be extended to NGOs and the public via the Internet. It is recommended that local area networks be established within each ministry/agency, and wide area networks set up to connect ministries.

Role of the environmental administration

The environmental administration will have a major role in promoting change with respect to access and circulation of environmental information among the various producers of environmental data. SEMARNAP could hold seminars for sectoral representatives (from transport, agriculture, energy, etc.) on the principles of sustainable development and related information needs.

The circulation of environmental information should be stimulated by the national committee on environmental information. The committee should be the hub of communications among the various data sources. Formal agreements and memorandums of understanding containing precise technical specifications should help stimulate and structure the circulation of environmental information.

3.2 Public access to and dissemination of environmental information

The law of 1988 (LGEEPA) makes information on environmental quality obligatory. Hence the public authorities have established a number of communications mechanisms.

General environmental publications

The state of the environment report was first published in 1992. A 1993-94 report was published in 1994 in a print run of 3 000 and distributed free to government agencies, universities, NGOs and, more generally, anyone who asked for a copy (Table 3.1). The third edition of the report is expected in early 1997. The structure of the reports should evolve towards the pressure-state-response model, which will increase their scope, distribution and readability. A summary for non-specialists, describing the report's main conclusions, presented in a simple form and distributed in large numbers, can be an effective communications tool. Environmental indicators should be integrated into the state of the environment report and/or the summary for non-specialists. Distribution of the report should also evolve so that it becomes more widely available and receives media coverage.

INEGI published a compendium of environmental data in 1995. This type of document is generally a reference work for many users, from government officials to scientists and non-government associations. Its regular publication should be encouraged. The compendium serves as a technical complement to the state of the environment report; data consistency between the two should be ensured. The compendium should be mainly a compilation of data whereas the state of the environment report should provide factual information (quantitative or not) and its interpretation. The former should address users of data, the latter a wider public.

The 1995 INEGI-SEMARNAP agreement is expected to translate into effective co-operation in this field. The state of the environment report and the compendium of environmental data should be seen as companion volumes, with different aims and audiences, complementing one another. Thematic brochures covering different environmental media (air, water, waste, etc.) or economic sectors (e.g. transport, energy) could be derived from the compendium.

Table 3.1 **Outline of the Mexican state of the environment report**

PART I NATIONAL CONTEXT

1. Physical, social and economic context.
2. Sustainable development.
3. Policy integration.
4. Economic instruments.
5. Ecological land use planning.
6. US-Mexico border.

PART II NATURAL RESOURCES

7. Soil.
8. Wildlife, protected natural areas and biodiversity.
9. Inland water.
10. The sea, the islands and their resources.

PART III INDUSTRY

11. Mexican industry and sustainable development.
12. Mining.
13. Oil industry.
14. Electricity industry.
15. Transport.

PART IV ENVIRONMENTAL MANAGEMENT

16. Environmental health.
17. Air.
18. Waste.
19. Environmental impact, risks and enforcement.
20. Environmental education.
21. Environmental science and technology.

PART V ENVIRONMENTAL CO-OPERATION

22. Social participation.
23. International co-operation.
24. North American Free Trade Agreement (NAFTA).
25. Organisation for Economic Co-operation and Development (OECD).

PART VI FEDERAL ENTITIES AND THE STRENGTHENING OF ENVIRONMENTAL MANAGEMENT

26. Federal entities.
27. Decentralisation.

Source: SEDESOL (1994), Report on the General State of Ecological Equilibrium and Environmental Protection, 1993-1994.

Targeting environmental information

A range of environmental publications is available, including the quarterly newsletter “Gaceta Ecológica”, which popularises and informs on environmental issues, standards and laws. This type of publication might be tailored to groups, such as municipal services, educational institutions and libraries of specialised enterprises and institutions.

Given the strong link between the concept of sustainable development and the behaviour of producers and consumers, publications should aim at these groups. Industry in particular should be a target for information on the state of the environment and technology. To facilitate the “greening” of production processes and of products themselves, industry needs to be receiving administrative, legal and technical data (measurement results, best available technologies, environmental management methods, quality standards, etc.).

Mexico’s rural population is another target group, requiring information on proper management of and attitudes towards natural resources to deal with issues such as bacteriological contamination of wells, pesticide use, overharvesting of forests and unsustainable farming methods. Leaflets on the short- and medium-term consequences of current rural practices are cost-effective tools. To be fully effective, such information should ideally take into account the local dimension, since problems found in semi-arid regions, for example, differ from those in the tropical forest. The information also needs to be conveyed in various forms to accommodate the full range of literacy encountered in the rural population.

Making environmental information easily accessible

The environmental administration should ensure that there is easy access to environmental information and a major “gate” to such information; some means of access should be at no cost while others would be at cost.

For example, a widely disseminated brochure of “who’s who” in environmental matters in Mexico (with organisational charts, address lists, etc.), including the state and municipal levels and both public and private actors, could be decisive in encouraging the public to request information. Such a brochure could describe citizens’ rights to environmental information, including the legal basis and access procedures. A list of publications on the environment should be compiled and regularly updated by the authorities in charge of the catalogue of data sources and the meta-database.

Concerning environmental impact assessments, LGEEPA obliges developers to produce or commission an “impact manifest” for each project. Thus far no official public consultation is involved, but a proposed amendment to the law would allow citizens to review project plans in the initial stages, and the developer would have to explain each project at a public meeting. Public participation in decision making would thus be improved. Public hearings like those in some other Member countries should possibly be adopted. A resource centre for impact studies might be considered, where the scientific and socio-economic data used in such studies would be available (on microforms or in other archive-library formats). Several countries have set up such centres for both academic and business use. As a first step, an annual collection of the most interesting impact studies could be organised by type of project and made accessible to all.

Concerning support systems, attention should be given to the balance among electronic, printed and audio-visual information. The new approach to EIS now being elaborated would include an Internet server; this initiative should be pursued, as should computer development and electronic support systems more generally, to allow standardised access to data. Eventually a hypertext link to a meta-database

should be made. In addition, however, information should continue to be available on paper (including maps, tables, figures, etc.) as a matter of high priority, since the number of potential users with access to a computer is not yet large enough in Mexico for electronic distribution to be the preferred form. Dissemination of environmental information in audio-visual form should also receive high priority. Newspapers, radio and television stations are of major significance for environmental information.

PART II

SELECTED ENVIRONMENTAL DATA

SELECTED ENVIRONMENTAL DATA

This part of the report comes within the scope of the broader work programme on environmental data and indicators carried out under the auspices of the OECD Group on the State of the Environment. It is designed to provide contextual information for the report on both i) data concerning Mexico itself and ii) the situation of Mexico with respect to selected countries. Environmental data and indicators have already been published for other OECD countries as well as for selected central and eastern European countries.^{***}

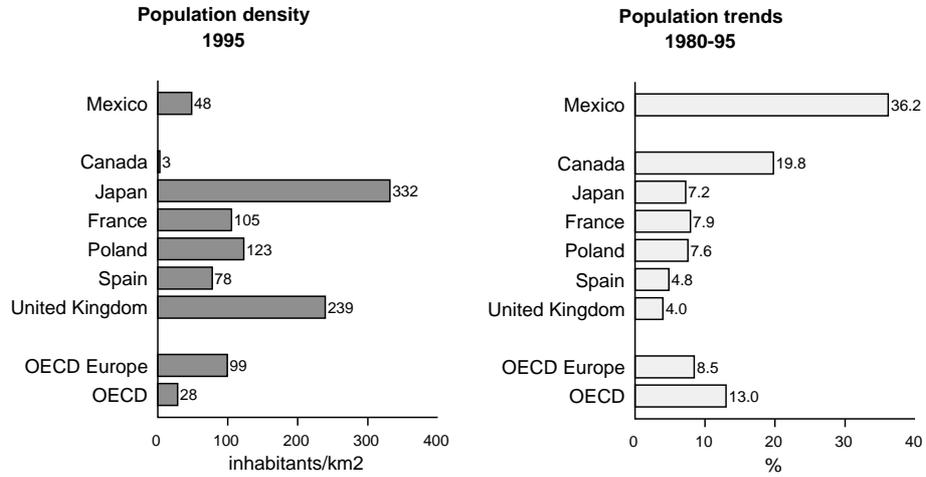
The following pages are based on the Mexican reply to the 1994 and 1996 OECD questionnaires on the state of the environment and have been complemented with data from other OECD and international sources, as well as from selected national reports and yearbooks. Data for other countries presented here are drawn from the *OECD Environmental Data: Compendium 1995* and have been partially updated with countries' replies to the 1996 OECD questionnaire. OECD aggregates may include provisional figures and Secretariat estimates and refer to OECD Member countries as of 1995. Unless otherwise noted, GDP data used here are expressed in US\$ at 1991 prices and purchasing power parities. All data refer to the year indicated or the latest year available.

The data presented here cover selected items. Their interpretation has to take account of varying classifications, definitions and measurement methods as mentioned in the footnotes to the 1995 OECD Compendium.

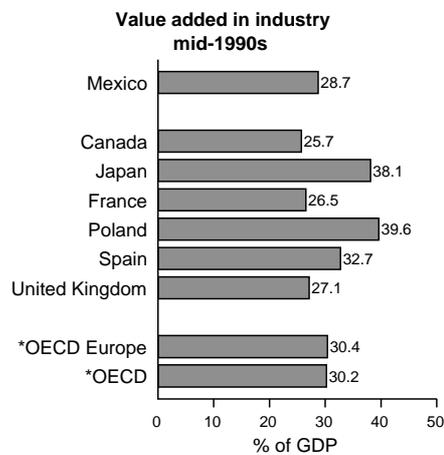
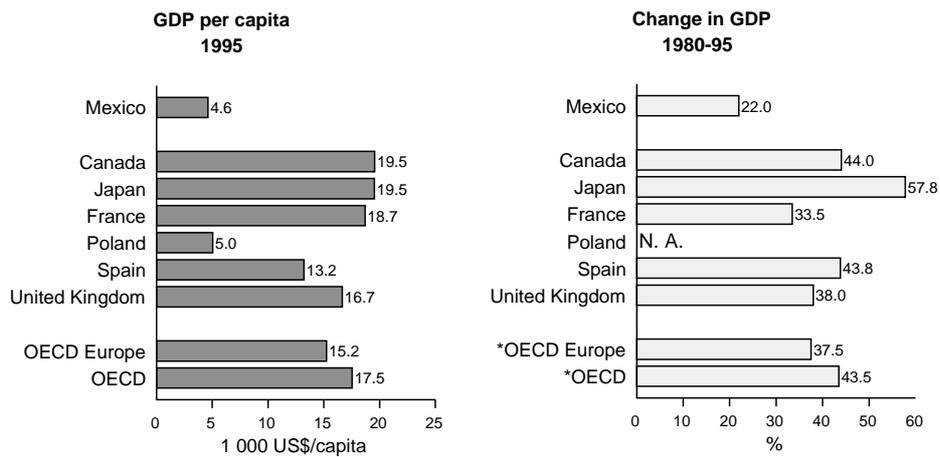
^{***}See OECD (1995), *OECD Environmental Data: Compendium 1995*; OECD (1994), *Environmental Indicators: OECD Core Set*; OECD (1993), *Environmental Information Systems and Indicators: A Review of Selected Central and Eastern European Countries*; OECD (1994), *Environmental Information Systems in Belarus: An OECD Assessment*; and OECD (1996), *Environmental Information Systems in the Russian Federation: An OECD Assessment*.

GENERAL DATA

POPULATION



GROSS DOMESTIC PRODUCT

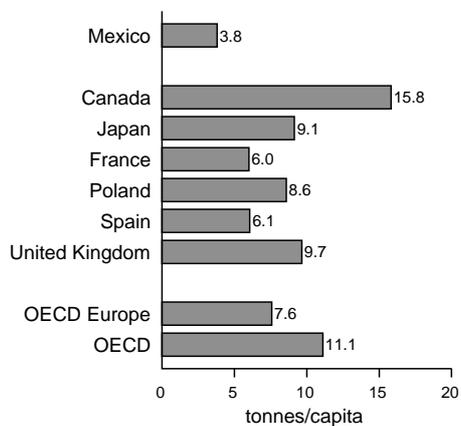


* Includes western Germany only.

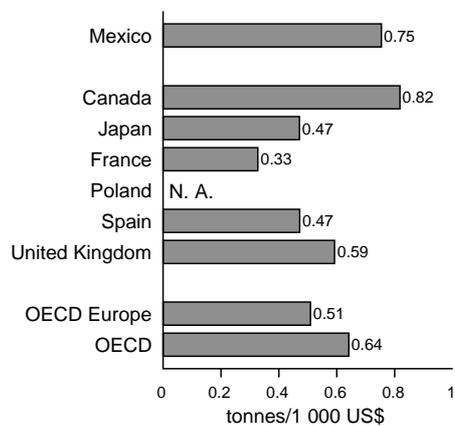
OECD Selected Environmental Data

AIR POLLUTION

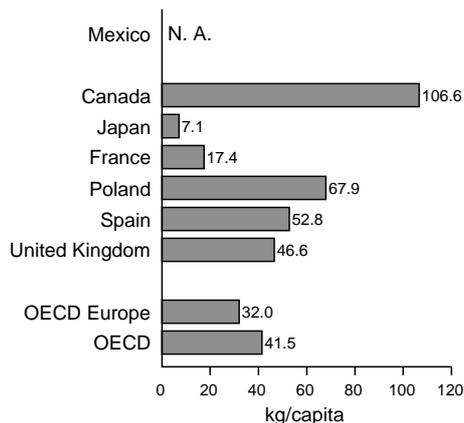
**Emissions of CO₂^a per capita
1994**



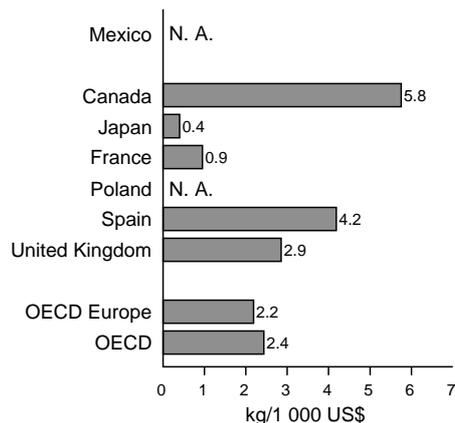
**Emissions of CO₂^a per unit of GDP
1994**



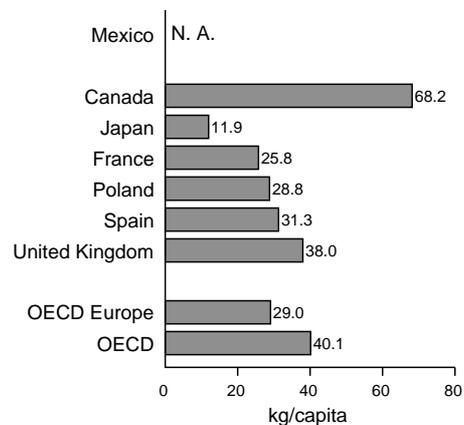
**Emissions of SO_x per capita
mid-1990s**



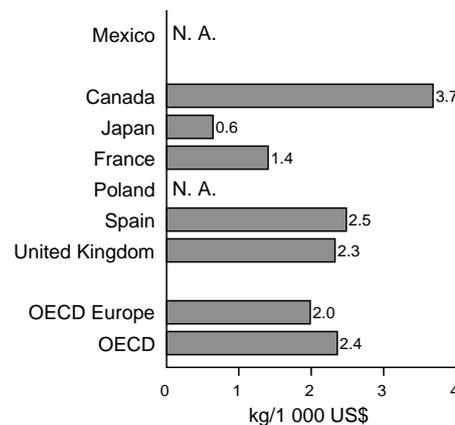
**Emissions of SO_x per unit of GDP
mid-1990s**



**Emissions of NO_x per capita
mid-1990s**



**Emissions of NO_x per unit of GDP
mid-1990s**

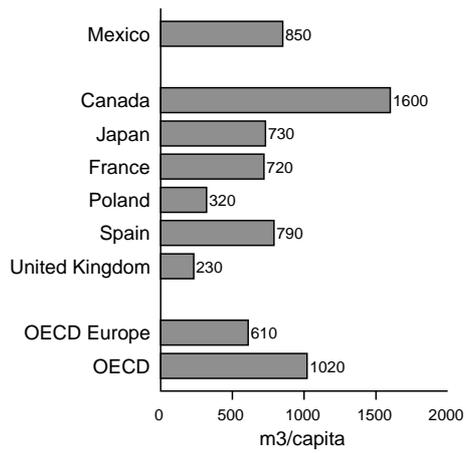


a) CO₂ from energy use only; excludes international marine bunkers.

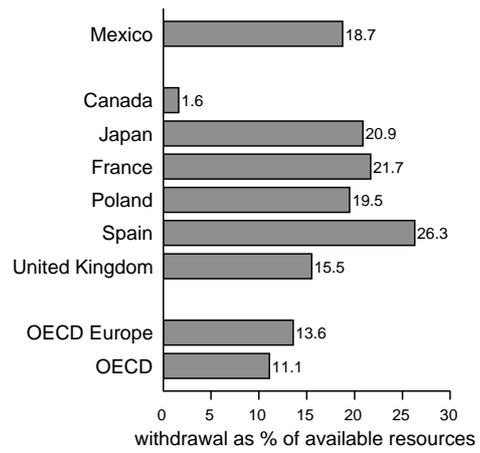
OECD Selected Environmental Data

WATER

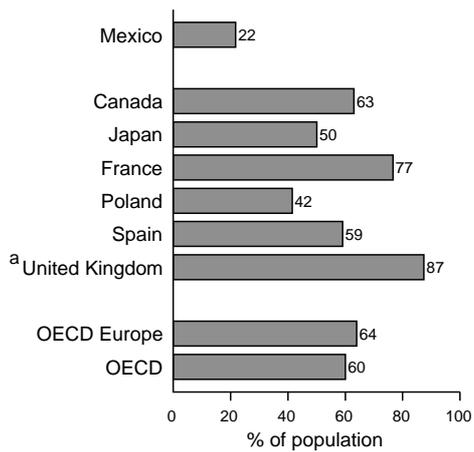
**Water withdrawal per capita
early 1990s**



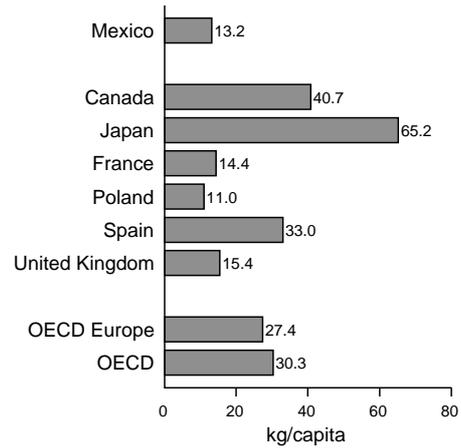
**Intensity of use
early 1990s**



**Waste water treatment
mid-1990s**



**Fish catches
1993**

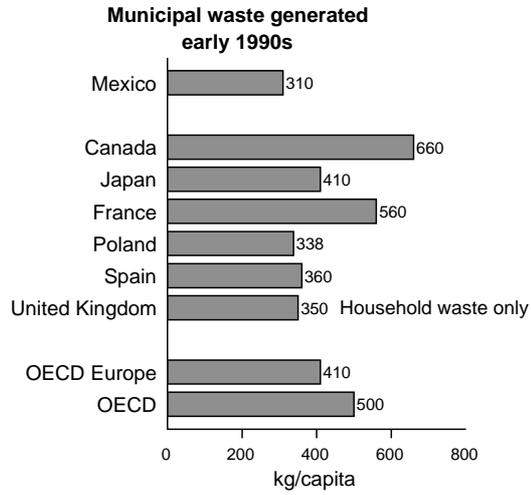


a) Great Britain only.

OECD Selected Environmental Data

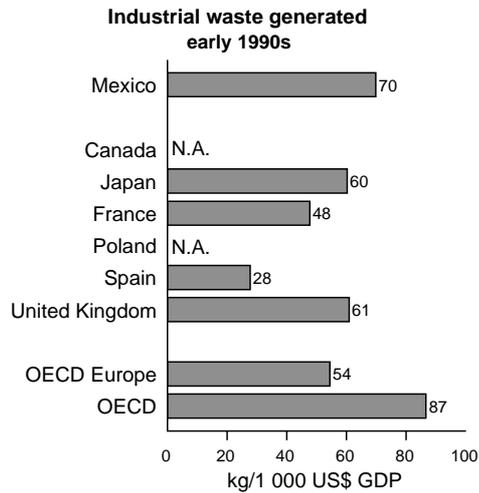
WASTE MANAGEMENT

MUNICIPAL WASTE



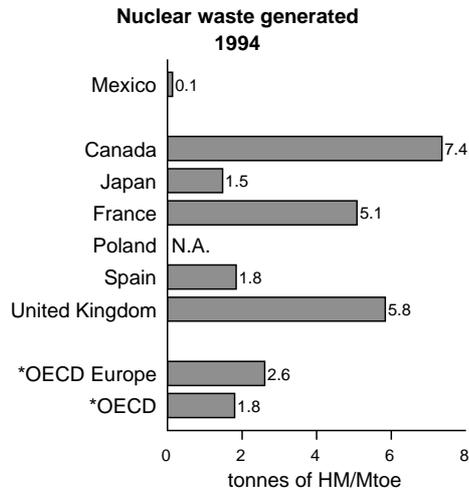
INDUSTRIAL WASTE

(Waste from manufacturing industries)



NUCLEAR WASTE

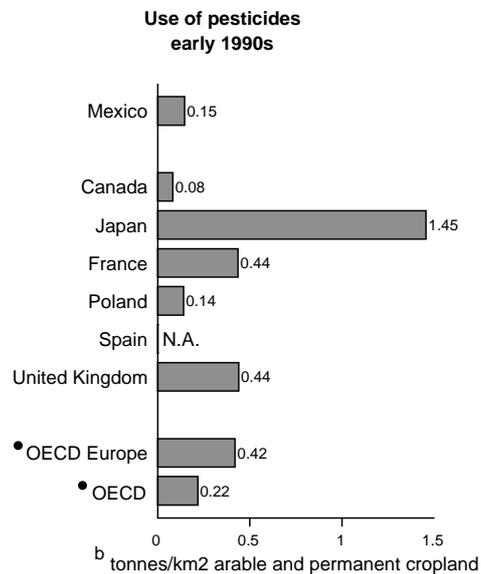
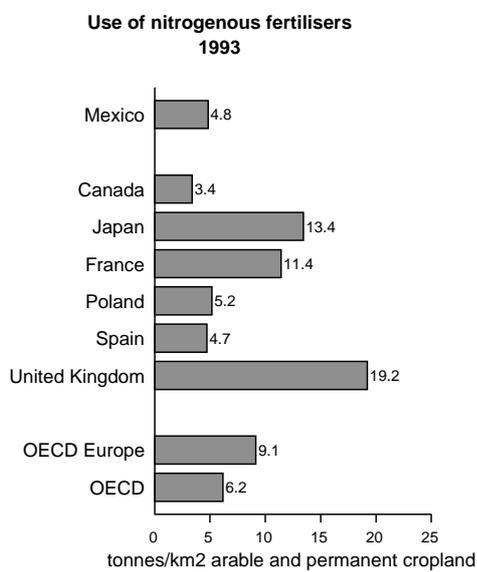
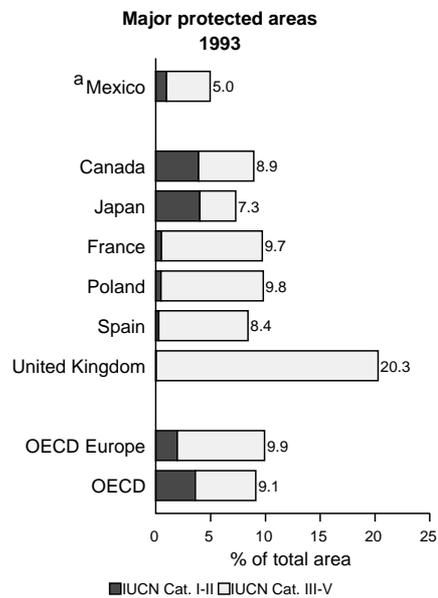
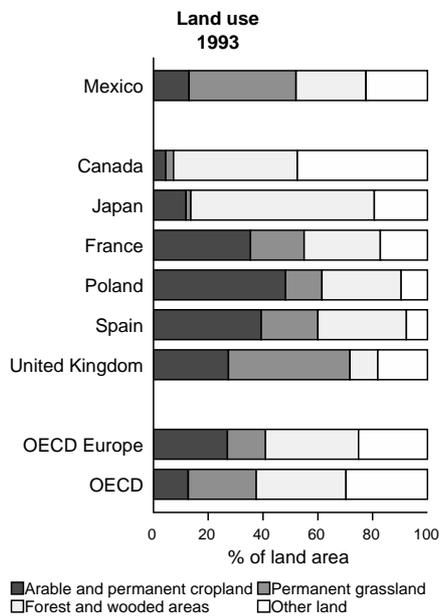
(Spent fuel arisings)



* Includes western Germany only.

OECD Selected Environmental Data

LAND AND SOIL



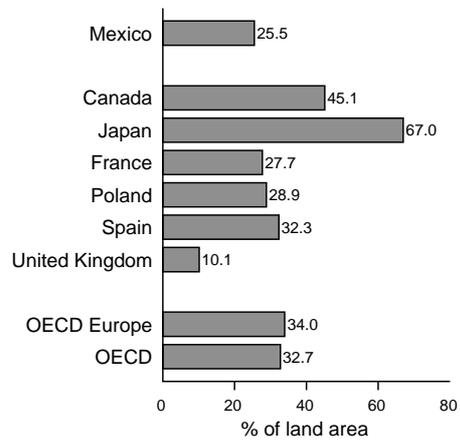
• Partial total.

a) According to national classification there are 82 national protected areas under the National System of Natural Protected Areas (SINAP), with a total size of 97,277 sq. km.

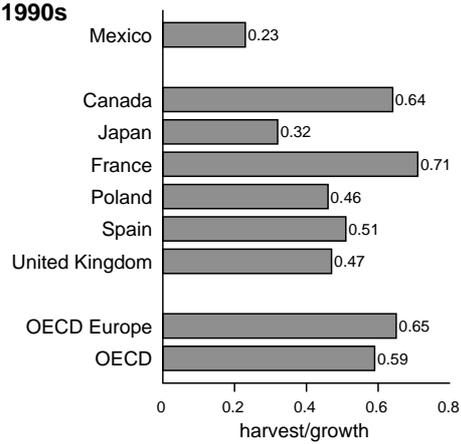
b) Tonnes of active ingredients.

FOREST RESOURCES

AREA OF FOREST AND OTHER WOODED LAND, 1993

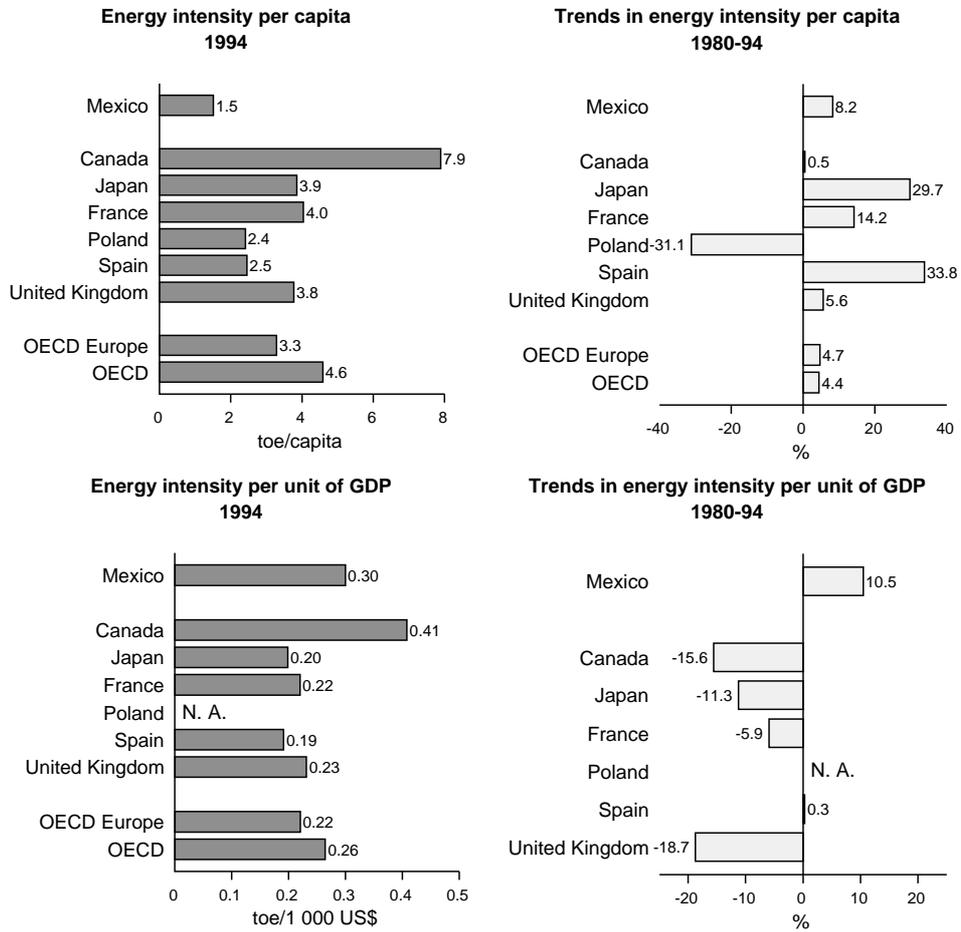


USE OF FOREST RESOURCES, early 1990s

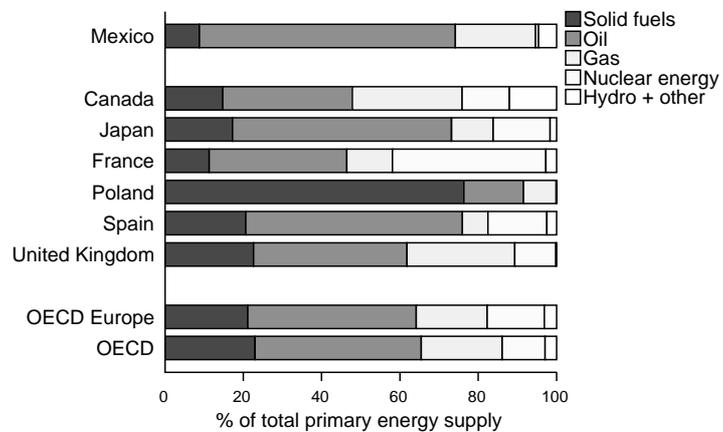


ENERGY

ENERGY INTENSITY



STRUCTURE OF ENERGY SUPPLY^a

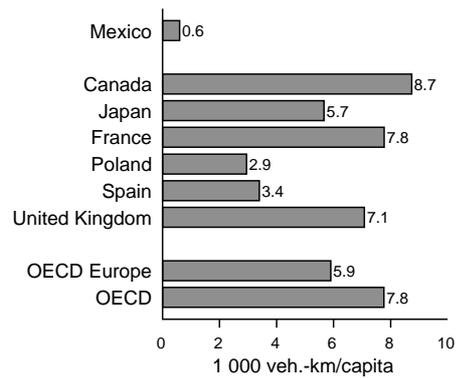


a) Excludes electricity trade.

ROAD TRANSPORT

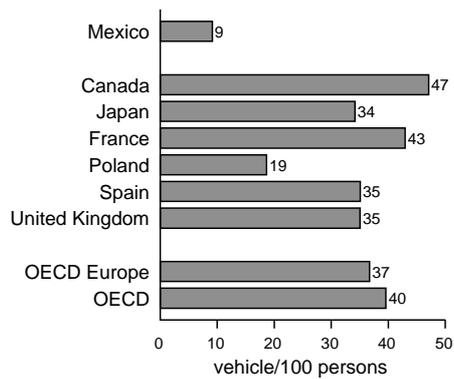
ROAD TRAFFIC ^a

Road traffic per capita
1994

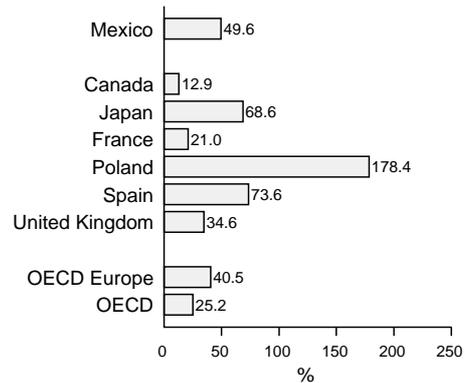


OWNERSHIP

Vehicle ownership
1994



Trends in vehicle ownership
1980-94



a) Motor vehicles with 4 or more wheels(except Japan which includes 3 wheeled good vehicles).

ANNEX I

ADMINISTRATIVE STRUCTURE FOR ENVIRONMENTAL PROTECTION IN MEXICO

1. Institutional framework

The United Mexican States form a federal republic operating under a centralised government. The republic is divided administratively into 31 states (estados) and one federal district encompassing Mexico City, the capital.

The Mexican Constitution generates and demarcates the powers of the three branches of the Federal Government: the executive branch (the President and the federal departments and agencies), the legislative branch (a bicameral National Congress) and the judiciary branch (the Supreme Court of Justice and federal courts). It also provides the basis for the allocation of statutory authority to the federal and state governments. The separation of power among the federal branches, and the relationship between the Federal Government and the states, form the foundation on which federal and state governments enact, implement and enforce environmental protection laws.

The National Congress, the legislative branch of the Mexican Government, consists of two elected chambers: the Senate (128 seats) and the Chamber of Deputies (500 seats). The two have generally equal functions in making laws. Environmental proposals, like other laws, may be initiated by members of either house, as well as by the executive branch. To become law, proposals must be approved by both chambers and the President (who has veto power).

The executive branch of the Government is responsible, among other things, for developing environmental policy and implementing and enforcing federal environmental statutes.

2. Institutions for environmental protection

Though there have long been efforts to deal with environmental protection in Mexico, the first attempt to formalise environmental concerns institutionally came in 1972, the year the *Under-Ministry of Environmental Improvement* was created in the *Ministry of Health and Public Aid*, with the main goal being to incorporate environmental concerns into health policy.

Ten years later, in 1982, the *Ministry of Urban Development and Ecology* (SEDUE) was created. This was Mexico's the first institution to have environmental protection as a main purpose. Since then, environmental concerns have become increasingly important in the government's political agenda.

Environmental policy was given very high priority in the *National Plan of Development 1989-1994*, as reflected in several modifications to the institutional structure. To improve water management, the *National Water Commission* (CNA) was established in 1989, defined by law as the sole authority on matters of water management within the federation; it was given technical and operative autonomy. In 1992, SEDUE was transformed into the *Ministry of Social Development* (SEDESOL), with powers to develop, manage and evaluate general policy on social development, including environmental aspects. SEDESOL's environmental work was assisted by two entities with technical and operative autonomy: the *National Institute of Ecology* (INE) and the *Federal Attorney for Environmental Protection* (PROFEPA).

In December 1994, Congress approved the creation of the *Ministry of Environment, Natural Resources and Fisheries* (SEMARNAP), whose main goals are to promote a transition to sustainable

development and to restrain environmental deterioration and natural resource depletion. The new ministry was set up early in 1995 to:

- foster the protection, restoration, and conservation of ecosystems, natural resources, environmental products and services so as to favour their use and sustainable development;
- develop environmental regulation of activities related to the use and exploitation of natural resources;
- establish and monitor the implementation of standards for the protection, restoration and conservation of ecosystems and the environment;
- foster “ecological land use planning” (ordenamiento ecológico) in co-ordination with other federal, state and municipal authorities and with the involvement of individuals.

The current structure brings together in one federal office the policies, programmes and administrative resources for forestry and fisheries, soil conservation and restoration, environmental management of federal laws and environmental policy planning. In addition, SEMARNAP co-ordinates the programmes and policies of CNA, INE, PROFEPA, the National Institute of Fisheries and the Mexican Institute of Water Technology (Figure 2.1).

3. Legislative framework

Mexican laws related to environmental action date from the early 1940s, when the *Soil and Water Conservation Law* was promulgated. Several legislative measures since then have made environmental policy more comprehensive, and amendments to the Constitution have strengthened legislation and provided a better basis for environmental protection. In 1982, the *Federal Law of Environmental Protection* was passed as a new, more comprehensive legal instrument. In 1987 the Constitution was changed to give the states power to mandate actions to conserve and restore ecological balance on private property. The National Congress was empowered to issue laws allocating responsibilities to the Federal Government, states and municipalities.

The 1988 *General Law of Ecological Balance and Environmental Protection* (LGEEPA) sets forth a comprehensive view of environmental problems, including the concepts of sustainable development and efficient use of natural resources (Table A1). It provides the basis for:

- defining principles of environmental policy;
- preserving, restoring and improving of the environment;
- protecting natural areas and wildlife;
- preventing and controlling air, water and soil pollution;
- promoting concurrence and co-ordination among the different levels of government;
- encouraging social participation and environmental education;
- establishing control and safety measures, and sanctions for non-compliance.

Regulations on environmental impact assessments, hazardous waste, air and water pollution, marine pollution and noise, as well as various environmental standards, followed the passage of LGEEPA. The law introduced the following elements to environmental policy:

- ecological land use planning;
- environmental impact and risk assessments;
- instruments for the protection of natural areas;
- research and environmental education;
- the importance of information;
- monitoring.

Table A1 General Law of Ecological Balance and Environmental Protection (LGEEPA)

Title	Chapter	Section
General Dispositions	I. Preliminary norms II. Responsibilities of Federal Government, states and municipalities III. Responsibilities of the ministry and institutional co-ordination IV. Environmental policy V. Policy instruments	1. Environmental planning 2. Ecological land use planning 3. Environmental concerns for development 4. Environmental regulation of human settlements 5. Environmental impact assessments 6. Technical standards 7. Measures for the protection of natural areas 8. Environmental education 9. Information and monitoring
Protected Natural Areas	I. Classification and establishment of protected areas II. National System of Protected Areas III. Wildlife	
Rational use of Natural Resources	I. Water and aquatic ecosystems II. Soil and related resources III. Non-renewable resources and effects of their use on ecological balance	
Environmental Protection	I. Control and prevention of air pollution II. Control and prevention of water pollution III. Control and prevention of soil pollution IV. Risk management V. Hazardous waste and material VI. Nuclear energy VII. Noise, vibrations, thermal energy, smells, visual pollution	
Social Participation		
Security and Control Sanctions	I. Compliance II. Inspection and monitoring III. Security measures IV. Administrative sanctions V. Complaint mechanisms VI. Federal offence procedures	

Source: SEDESOL-INE

4. State and local environmental responsibilities

LGEEPA distributes environmental responsibilities among the federal, state and municipal administrations. It thus provides for decentralisation of these responsibilities, which had been mostly at the federal level. Each state now has its own environmental law, reflecting the specific characteristics of the state, as the basis for the organisational structure of the state environmental administration. Many municipalities also have regulations and environmental offices tailored to their needs. Most state institutions are weak, however, because of limited budgets, low priority for environmental concerns and lack of experience in environmental management.

To co-ordinate and assist local administrations, SEMARNAP has 32 federal delegations (one for each state and the federal district). Their administrative structure varies according to the characteristics of each state. One of their main purposes is to ease the transition to a more decentralised administration, but the federal level still has considerable influence on states' environmental policies.

To foster sustainable development, four Regional Consultative Councils and one National Consultative Council were established in April 1995. One of their main duties is to co-ordinate with state, regional, national and international organisations and help them exchange experiences.

Each Regional Consultative Council includes state representatives from the academic world, the community, business, government and NGOs. The regional councils deal with:

- national, state and municipal legislation and strategies;
- education, training, science, technology and dissemination of information;
- protected natural areas;
- poverty and sustainable development.

ANNEX II

MAP OF MEXICO



ANNEX III

SELECTED PUBLICATIONS

Environmental Information

- SEDESOL-INE (1992), Chemicals Regulation and Management in Mexico: an International Perspective.
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- SEDESOL (1994), Report on the General State of Ecological Equilibrium and Environmental Protection, 1993-1994.
- SEDESOL-INE (1994), Official Mexican Standards on Environmental Protection.
- SPESCA (1994), Fishing Atlas of Mexico.
- SARH (1994), National Forest Inventory, Mexico 1994.
- SARH (1994), Statistical Compendium of Forest Production, 1989-1993.
- INEGI (1995), Statistics on the Environment: Mexico 1994.
- SEMARNAP-CNA (1995), State of Potable Water, Sewerage and Sanitation to December 1994.
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- SEMARNAP-INE (1995), Hazardous Waste in Mexico, Workshop on Sustainable Development.
- SEMARNAP-INE/CONABIO (1995), Atlas of Biosphere Reserves and other Natural Protected Areas.
- SEMARNAP (1996), Statistical Yearbook on Fishing, 1994.
- SEMARNAP-INE (various years), Ecological Gazette (quarterly).

Policy Documents

- SEMARNAP (1995), Work Report 1994-1995.
- SEMARNAP (1996), The Transition to Sustainable Development.
- SEMARNAP/DDF/Edomex/SS (1996), Programme for Air Quality Improvement in the Mexican Valley, 1995-2000.
- SEMARNAP-INE (1996), Environment Programme, 1995-2000.

ANNEX IV

ABBREVIATIONS

CNA	National Water Commission
CONABIO	National Biodiversity Commission
DDF	Government of Mexico City
Edomex	Government of the State of Mexico
EIS	Environmental information system
GDP	Gross domestic product
GIS	Geographic information system
HM/Mtoe	Heavy metal per million tonnes of oil equivalent
IMECA	Air quality index of Mexico City
IMTA	Mexican Institute of Water Technology
INE	National Institute of Ecology
INEGI	National Institute of Statistics, Geography and Informatics
INP	National Institute of Fisheries
IUCN	International Union for Conservation of Nature
LGEEPA	General Law of Ecological Balance and Environmental Protection
NAFTA	North American Free Trade Agreement
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
PROFEPA	Federal Attorney for Environmental Protection
PRTR	Pollutant Release and Transfer Register
SARH	Ministry of Agriculture and Hydraulic Resources
SEDESOL	Ministry of Social Development
SEDUE	Ministry of Urban Development and Ecology
SEEAM	System of Economic and Ecological Accounts of Mexico
SEMARNAP	Ministry of Environment, Natural Resources and Fisheries
SIDIA	System of Environmental Indicators
SPESCA	Ministry of Fisheries
SS	Ministry of Health
UNSO	United Nations Statistics Office