OECD Environmental Performance Reviews: Mexico 2013

2. Institutional framework for environmental and sustainable development policies

2.1. *The environment sector at federal level*

Mexico is a federal country that is still highly centralised but has embarked on a process of decentralisation.[9] The federal government collects most of the national budget income. More than half the federal budget is transferred to states and municipalities through a mix of conditional and unconditional transfers. Traditionally, the executive branch has been more powerful than the legislative and judicial branches. The federal government is structured around 19 ministries (*Secretarías de Estado*).

The current environment sector, as in many other countries, is the product of organic growth rather than design (Box 2.3). As a result, the Ministry of Environment and Natural Resources, SEMARNAT, combines policy-making, regulation and implementation functions, while some deconcentrated bodies also have policy-making functions. In terms of policy making, in recent years SEMARNAT has created a climate change directorate and an environmental policy integration subdirectorate, but there remains a gap as regards biodiversity policy. Having implementation functions (such as running the environmental impact assessment procedure) at SEMARNAT, rather than in a more independent environment agency, may also generate a risk of political influence on technical decisions. Potential conflicts of interest could be avoided, and greater institutional clarity achieved, by a clearer separation of functions. In line with the practices followed in many other OECD countries, SEMARNAT should focus on policy development and normative functions, while deconcentrated bodies should focus on implementation.

Box 2.3. **The structure of the environment sector in Mexico**

The Ministry of Environment and Natural Resources (SEMARNAT) is the leading environment institution. SEMARNAT has three main subdivisions: Environmental Planning and Policy (which includes directorates responsible for information, planning and evaluation, policy integration, and climate change); Promotion and Regulation (which includes directorates responsible for regulation and for overseeing the energy, industry, agriculture, and urban and tourism sectors); and Environmental Management (which includes directorates dealing with air quality, forestry and soils, hazardous substances, environmental impact and risk, wildlife, and federal coastal areas). SEMARNAT has delegations in each state charged with supervising local implementation of federal programmes and co-ordinating with local environment authorities.

The environment sector at federal level includes deconcentrated and decentralised bodies. Deconcentrated bodies are autonomous in decision making but controlled by SEMARNAT in administrative issues such as human resources and finances. They include the National Water Commission (CONAGUA), the National Protected Areas Commission (CONANP), the National Ecology Institute (INE) and the Federal Attorney for Environmental Protection (PROFEPA). Decentralised bodies exist as legal entities with their own budgets. They include the Mexican Institute of Water Technology (IMTA) and the National Forestry Commission (CONAFOR).

Political commitment to the environment has been evidenced in increased financial resources for the environment sector (Chapter 3). The bulk of the increase has been for water and forests. The environmental policy and management functions have also experienced significant increases, with the notable exceptions of enforcement (PROFEPA's budget has increased less than GDP) and the Federal Delegations (whose budgets have shrunk even in nominal terms) (Table 2.1). The increase in financial resources has not been matched by a parallel increase in human resources. CONAGUA accounts for nearly three-quarters of SEMARNAT's budget, and CONAFOR for a further 13%, due to the investment-heavy nature of the water and forestry programmes and the high priority given to those subsectors.

2.2. Horizontal co-ordination

Mexico is increasingly placing environmental mainstreaming (*transversalidad*) at the core of its environmental policy framework. All other sectors are expected to help achieve the environmental sustainability objectives through their respective programmes. A dedicated unit in SEMARNAT's Planning Department co-ordinates the contributions of the various sectors to the NDP environmental sustainability objectives. An information system tracks the sectors' progress towards the federal environmental objectives every two months, and an annual report on mainstreaming environmental issues in public policies

Table 2.1. **SEMARNAT budget, by administrative unit**

Administrative unit	Budget 2002		Budget 2011	
	Million pesos[a]	Share (%)	Million pesos[a]	Share (%)
Minister's office	451	2.0	1 811	3.5
Administrative support (*Oficialía Mayor*)	1 534	6.7	710	1.4
Environmental Planning and Policy Dept.	331	1.4	994	1.9
Promotion and Environmental Regulations Dept.	70	0.3	566	1.1
Environmental Management Dept.	533	2.3	1 157	2.3
Federal Delegations	1 036	4.5	571	1.1
INE (environmental research)	351	1.5	290	0.6
IMTA (water research)	314	1.4	251	0.5
PROFEPA (environmental protection)	944	4.1	1 013	2.0
CONAGUA (water commission)	14 711	64.0	36 399	71.1
CONANP (protected areas commission)	353	1.5	998	1.9
CONAFOR (forestry commission)	2 363	10.3	6 463	12.6
Total	**22 990**	**100.0**	**51 222**	**100.0**

a) 2011 prices.
Source: SEMARNAT.

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has been published since 2008 (SEMARNAT, 2010). Putting this arrangement in place is already a significant achievement. The challenge for the future is to ensure that the objectives to which every sector commits continue to go beyond what they would achieve under a business as usual scenario. In addition, there is a need to increase the level of co-ordination for environmental mainstreaming at subnational levels – for instance, in state environmental plans.

For more specific environmental issues, Mexico has continued to strengthen horizontal

co-ordination at the federal level by setting up co-ordinating bodies. Inter-ministerial commissions are high-level co-ordinating bodies. They include the Inter-Ministerial Commission on Climate Change (established in 2005), the Inter-Ministerial Commission on Biosafety of Genetically Modified Organisms (2006) and the Inter-Ministerial Commission for the Sustainable Management of Coastlines and Oceans (2008). At a lower level are the inter-ministerial working groups, such as the Working Group on Climate Change (2009) and the Working Group for the General Ecological Land Use Programme (2010).

Synergies between federal environmental programmes are generally not exploited. One reason is the design of the programmes' current rules of operations. The rules could be modified to favour packages of programmes that exploit synergies. Experience with biological corridors provides an example of how this can be done. The structure of the federal environmental administration might be another factor limiting opportunities to exploit synergies in policy implementation.

2.3. Vertical co-ordination

Mexico has seen progress in the development of an institutional framework for environmental sustainability at subnational level. The environmental responsibilities of each level of government are specified by the General Law on Environmental Protection (LGEEPA). An increasing number of states are paying attention to environmental sustainability. Currently 25 of the 32 states have specific, ministry-level institutions dedicated to environmental issues (SEMARNAT, 2011a). SEMARNAT has supported their

institutional development through the Environment Institution Development Programme. There is, however, a significant divide between the more economically-advanced states, which tend to have realised the importance of environmental issues sooner and have more capacity to deal with them, and less-developed states that are lagging in this area.

At municipal level, the situation in terms of awareness and capacity is even more complicated. Municipal environmental responsibilities include water and sanitation services and parks, while environmental protection is a joint responsibility with the state and federal governments. Significant efforts are needed by all three levels to ensure that municipalities fulfil their assigned environmental roles. The fact that, constitutionally, mayors serve three-year terms and cannot be re-elected impedes the development of long-term municipal environmental plans and programmes. At the same time, there are some good examples of inter-municipal co-operation for environmental protection (Box 2.4).

Box 2.4. **Junta Intermunicipal del Río Ayuquila (JIRA)**

JIRA is an inter-municipal, decentralised environment agency formed in 2007, grouping ten municipalities along the Ayuquila River. Its main objective is to offer technical and managerial assistance on environmental policies and programmes. It serves as a local governance model, with interaction by federal, state and municipal governments, as well as research institutions and civil society organisations. JIRA's environmental agenda includes environmental education, social participation and waste management.

JIRA has been able to leverage resources from the Jalisco state government, federal institutions (SEMARNAT and CONAFOR) and international donors (French Development Agency and Spanish Agency for International Development Co-operation). Benefits of the JIRA model include: *i)* local-level management with integrated regional territorial development; *ii)* collaboration of key multi-level government and social organisations; and

iii) transparency in the use of the resources due to its status as a decentralised agency, which can be an incentive for bilateral and multilateral donors.

Following this model, two inter-municipal agencies were recently created in the state of Jalisco (Río Coahuayana and Sierra Occidental y Costa) to address issues related to conservation and sustainable management of forest.

Source: World Bank (2011).

Mexico has continued and expanded its efforts to develop programmes involving different levels of government to tackle key environmental issues. One long-standing example of joint action between federal and state authorities is the programme called ProAire, which has been significantly expanded since 2000 (Box 2.5). More recent examples include the National Programme for the Prevention and Integrated Management of Waste (SEMARNAT, 2009) (which has resulted in 30 state and 84 municipal programmes for integrated waste management and prevention, as well as the establishment in 2004 of the GIRESOL Network), the development of state and city programmes on climate change (Chapter 4) and the formulation of regional and local marine environment regulations. The federal government signs co-ordination agreements for environmental investments with state and municipal governments. However, limited municipal institutional capacity has prevented better vertical co-ordination – for example, it is not sufficient to plan, implement and operate efficient waste collection and management systems, and it is one of the main obstacles to effectively implementing the climate change strategy in Mexico City (OECD, 2010).

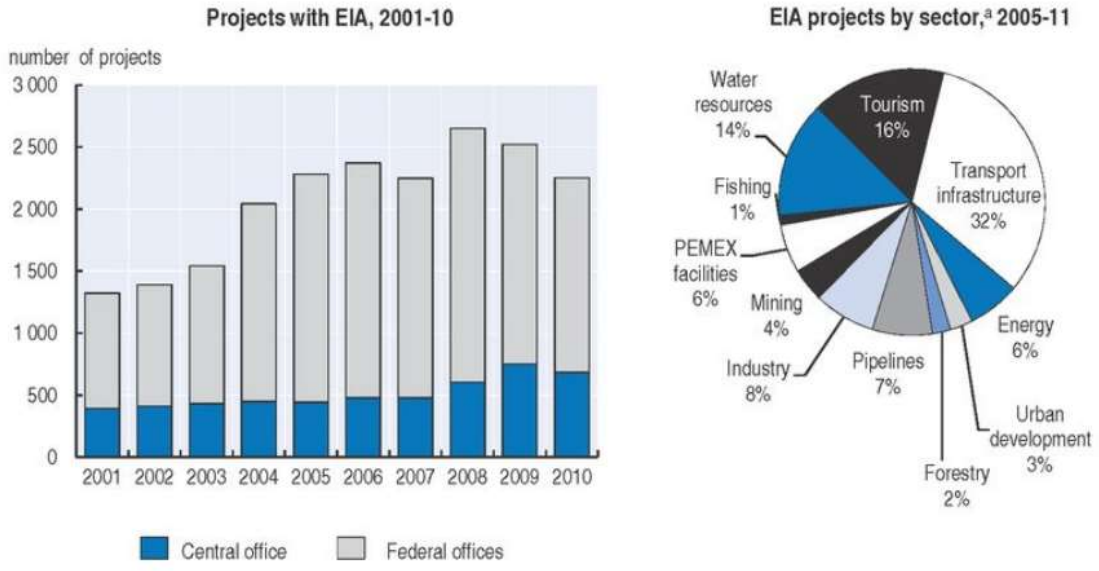
Co-ordination of environmental policy development and implementation at state level operate through two channels. The Federal Delegations of SEMARNAT and the state ministries of environment (or agencies in two states) co-ordinate their policies and actions through bilateral dialogue. In addition, the delegations take part in state development planning, participating in the planning committees for state development (COPLADES).

Effective co-ordination between federal and state programmes is hampered by the lack of state environment plans and by the way the federal budget is formulated. There are some state environment programmes but they reflect actions to be taken by state governments; they are not state environment plans that combine action by all government levels. In this context, when the national deputies negotiate in Congress to obtain budget earmarks for the states they represent, they do not always take into account the internal logic of federal programmes or the state's environmental priorities.

3.3. *Environmental impact assessment*

Environmental impact assessment (EIA) was introduced by LGEEPA and revised in the 2001 implementing regulations. Since 2001, over 20 000 projects have undergone EIA. In recent years, around 500 procedures have been handled per year by SEMARNAT's central offices and around 2 000 by the SEMARNAT delegations in all 32 states (Figure 2.1). The rejection rate has fluctuated between 47% (2003) and 27% (2010 and 2011). The Mexican experience with EIA shows a positive impact on awareness of project sponsors. A key challenge, however, is to determine the degree of compliance with the conditions set in the permits: that is, to what extent is the EIA system actually leading to reduced environmental impacts. Mexico has no strategic environmental assessment of policies, plans and programmes, and the requirements of the EIA system to include cumulative impacts are not fully implemented. Some observers worry that the simplification of EIA procedures as part of the government-wide better regulation initiative may result in the EIA system losing effectiveness.

Figure 2.1. **Environmental impact assessment**



a) Applications handled by SEMARNAT's central office.
Source: SEMARNAT, 2012.

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3.4. *Ecological land use planning (ordenamiento ecológico)*

Ecological land use planning is an environmental policy instrument that aims to regulate or influence land use and the location of productive activities in order to assure environmental protection and the sustainable use of natural resources.[15] It takes into account the potential use as well as trends in degradation. In a country like Mexico, which is still experiencing significant population and economic growth, this instrument could play a significant role in achieving environmental objectives. The adoption of the National Ecological Land Use Plan (ELUP) in 2012 is a significant achievement. The number of ecological land use plans decreed increased from 12 in 2000 to 85 in July 2012, with an additional 10 under way. However, effective use of this tool is hampered by a perception, particularly at subnational level, that environmental goals conflict with development goals. Municipal authorities favour development and rarely take into account the recommendations of ecological land use planning when developing local development plans. Increased co-ordination between the two approaches, particularly during planning and enforcement (through the responsible administrations as well as through increased public participation), remains a major challenge.

Protection of natural areas is also an important regulatory instrument, given Mexico's size, biodiversity and the pressures it faces. Since 2000, Mexico has significantly increased the total area under federal protection to 25.4 million hectares (13% of the territory) (Chapter 5).

Assessment and recommendations

In its transition to green growth, Mexico needs to address challenges that affect both developing and developed countries. On the one hand, population and income growth, urban sprawl and higher motorisation rates are placing growing pressures on natural assets and public health. On the other hand, the gap in living standards between Mexico and the rest of the OECD has widened, and Mexico's income inequality and poverty rates are among the highest in the OECD. Mexico has a rich natural asset base and production and consumption patterns are less energy- and material-intensive than in more developed economies, although this gap has narrowed over the last decade. The economic costs of environmental degradation and natural resource depletion have declined, but they still represented about 7% of GDP in 2010. As in other OECD countries, massive investment will be needed to support the transition to a low-carbon, resource-efficient economy and to enhance quality of life in Mexico.

As the last *OECD Economic Survey* recommended, Mexico needs to rebalance its tax structure by raising non-oil-related taxes and broadening the tax base. Extending the use of environmentally related taxes, and reforming environmentally harmful subsidies, could contribute to achieving this objective while also reducing environmental pressures. For example, Mexico does not apply excise duties on energy products. Prices of transport fuels are regulated via a price-smoothing mechanism that results in an implicit subsidy at times of high world oil prices. This subsidy represented net expenditure of 1.2% of GDP in 2011, despite the fact that the government progressively raised fuel prices in the late 2000s. Overall, energy subsidies, including those for electricity consumption in the agricultural and residential sectors, averaged about 1.7% of GDP per year over 2005-09. This policy is costly and inhibits incentives to reduce energy use.

There is also considerable scope to improve the tax treatment of motor vehicles. Vehicle taxes, while less economically efficient than fuel taxes and road charges in reducing emissions, can help renew the fleet in favour of cleaner vehicles. Mexico levies taxes on purchase and ownership of vehicles, but related revenue is lower than in most other OECD countries. In 2012, states were authorised to levy the annual vehicle ownership tax, but fewer than half have done so. While new electric and hybrid cars are exempt, tax rates are not linked to the environmental performance of vehicles. These taxes have not fostered the use of more efficient, lower-emission vehicles, and generally favour the better off. In addition, other distortionary incentives for road transport are in place. They include a 50% tax credit on road tolls paid by transport businesses and very favourable tax treatment of company cars and parking spaces for employees. Overall, this mix of incentives encourages vehicle ownership and use, exacerbating congestion, accident risks and environmental problems.

Wider use of market-based instruments, in addition to promoting more efficient use of energy and other resources, would help finance much-needed environmental infrastructure. Investment in water infrastructure nearly tripled between 2000 and 2010,

enabling Mexico to exceed the water and sanitation Millennium Development Goals. However, substantial additional investment will be needed to bring the provision of environmental services up to the levels in other OECD countries. Mexico has made some progress in implementing water charging systems: abstraction charges vary according to water availability, and pollution charges are based on the status of water bodies and type of pollutants, thereby applying the polluter-pays principle. However, these charges have provided limited incentives to reduce water losses and improve efficiency of water use. Water abstraction for agriculture is virtually free of charge. Tariffs for public water services remain relatively low and do not allow service providers to cover their costs. The private sector has played a limited role in the water sector, not always improving the efficiency, or reducing the cost, of service provision. Very few cities charge for waste services, and investment in waste management fell by a third between 2000 and 2009. Weaknesses in local waste management have allowed the informal sector to play an important role in provision of waste services, with negative consequences for both the quality of service and the living and health standards of the workers. Governance in the water and waste management sectors needs to be strengthened in parallel with increased financing.

Mexico has continued to reform its support policy to agriculture and fisheries: the level of support has declined since the early 2000s and is well below the OECD average. However, subsidies linked to production still account for half of overall agricultural support, which is higher than in a number of other OECD countries. As these forms of support stimulate production and input use, they provide environmentally harmful incentives and encourage intensification and expansion of agriculture. Overall, many energy and agricultural subsidies have been intended to address social concerns. However, they have not efficiently supported low-income households and farmers: the poorest 20% of the population captures only 11% of residential electricity subsidies and less than 8% of

transport fuel subsidies; similarly, 90% of agricultural price support and 80% of electricity subsidies for water pumping benefit the richest 10% of farmers. All these subsidies could be replaced by direct social spending. Programmes such as the one to replace electricity subsidies for pumping irrigation water with direct cash transfers illustrate the way forward and should be scaled up.

Tackling poverty and improving affordability of basic services have long been high on the political agenda in Mexico. New targeted cash transfer programmes such as "Oportunidades" have helped improved education and health outcomes. In the late 2000s, SEMARNAT launched a programme for indigenous people and the environment. The government also implemented programmes, such as "ProÁrbol", that aim to alleviate poverty in rural communities by promoting sustainable management of their natural resources. However, Mexico spends more on regressive and environmentally harmful energy and agricultural subsidies than on direct social transfers.

The need to boost the productivity and competitiveness of the economy through innovation has been recognised in Mexico for some time. However, the overall framework for innovation has not been effective and Mexico has fallen short of its objectives. It has the least R&D-intensive economy in the OECD and one of the lowest private sector shares in gross expenditure on R&D. Innovation outcomes have been weak, though there have been somewhat higher levels of patenting activity for some environmental technologies and renewables. A widespread preference for imported technology has hindered technology diffusion and transfer to Mexican firms, particularly small and medium-sized enterprises.

Programmes to promote sustainable urban transport and efficient buildings have potential for creating green markets.

Mexico receives very limited official development assistance (ODA), equivalent to about 0.02% of GDP over the last decade. However, it has received increased support for climate change since the Copenhagen pledges, in sectors such as forestry, which could play a strategically important role in leveraging domestic efforts. Mexico is among the most active countries in triangular co-operation in Latin America, particularly on environment, climate change and green growth. In 2011, a law on development co-operation was passed and an aid agency was established with the obligation to report on ODA flows both received and granted. Trade agreements have also provided mechanisms for environmental co-operation and compliance. However, further efforts could be made to better integrate environmental and trade policies.

Recommendations

- Gradually replace the diesel and petrol price-smoothing mechanism with an excise tax on transport fuels; introduce excise duties on other energy products; differentiate the excise tax rates to reflect the environmental externalities associated with the use of these products, including their contributions to greenhouse gas (GHG) emissions and local air pollution; where needed, provide social transfers for those adversely affected by increased energy prices.
- Restructure vehicle taxes to take account of vehicles' environmental performance, including emissions of GHGs and local air pollutants; ensure that the vehicle ownership tax is applied in all states; reduce perverse incentives for vehicle use by removing tax credits for fuel use and road tolls, and by reforming the tax treatment of company cars and parking spaces.
- Regularly assess the environmental, social and economic impacts of existing and proposed direct and indirect subsidies in an integrated way, with a view to improving transparency and identifying trade-offs and subsidies that could be removed, reduced or redesigned; replace perverse subsidies to energy use, agriculture and fisheries with targeted cash transfers to low-income households and small farmers (e.g. building on the "Oportunidades" programme).
- Building on the 2030 Water Agenda and the OECD-Mexico water dialogue, develop a strategic financing plan for the water supply and sanitation sector, based on a projection of the medium-term public expenditure required and a gradual introduction of pricing based on sustainable cost recovery; implement the proposed policy and institutional reforms; identify ways to ensure that even the poorest people have adequate access to water services.
- Extend the waste charging system; develop a sound waste management system that includes the participation of workers currently part of the informal waste sector; promote and monitor the performance of public-private partnerships in waste management.
- Strengthen innovation capacity, including by greater support for higher education, international co-operation in science and technology, and public-private partnerships; strengthen the capacity to absorb and adapt cleaner technology, particularly in small and medium-sized enterprises.
- Develop a strategy for development co-operation focussing on areas where Mexico has expertise, such as forestry, biodiversity and climate change; speed up the development of the Mexican Information System on International Co-operation for Development in line with international methodology and guidelines.
- Continue to promote integration of environmental and trade policies, including by enhancing co-operation to address environmental issues in the northern border region; reinforce efforts to assess the environmental impact of trade, including by involving the public.

2. Greening the tax system

Mexico's tax system stands out among OECD countries in several respects, including the low tax-to-GDP ratio, the reliance on oil-related tax revenue, the extended use of tax benefits, the low tax collection rate and the low level of local taxation (Box 3.1). The 2011 *OECD Economic Survey of Mexico* recommended reforming the tax system so as to secure the substantial resources the country needs to effectively promote economic growth and alleviate poverty and inequality. Tax reform should primarily aim at raising non-oil-related tax revenue and broadening the tax base by removing most tax expenditure.

Box 3.1. **Key features of the Mexican tax system**

In 2010, total tax revenue accounted for about 18% of GDP, the lowest tax-to-GDP ratio in the OECD.[1] The total includes revenue from taxes on oil production and sale, which averages about a third of the government budget receipts. This reliance on oil-related tax revenue leads to volatility and uncertainty, and affects public spending cycles, because revenue depends on world oil price fluctuations. In addition, maintaining the current level of oil production (and revenue) in coming decades will require high investment in exploration (OECD, 2011a).

Several factors contribute to keeping non-oil tax revenue low. They include the large informal economy and the large share of low-income households, which make it difficult to raise revenue from income taxes. Another factor is the extended use of tax expenditure,[2] which narrows the tax base, generates revenue loss and introduces complexity in the tax system. Government estimates indicate that tax expenditure accounts for 4% of GDP and around 20% of government revenue. Tax expenditure takes the

form of zero and reduced VAT rates, special tax regimes for some economic activities, exemptions on fringe benefits and a special tax mechanism for transport fuels (which is discussed further in this chapter). Tax revenue of subnational governments is also low and covers a limited share of their spending. Subnational governments have some taxing power, but have made limited use of it due to weak enforcement capacity and political disincentives (OECD, 2011a).[3]

1. For comparison, the OECD average was about 34% in 2009.
2. Tax expenditure is defined as provisions of tax law, regulation or practice that reduce or postpone revenue for a comparatively narrow population of taxpayers relative to a benchmark tax. They may take a number of different forms: allowances, exemptions, rate relief, tax deferral, and credits.
3. For example, local property taxes make up for a lower share of revenue than in other Latin American countries (OECD, 2011a). State and local authorities prefer to lobby for higher transfers from the federal government instead of bearing the political cost of tax increases (see also Chapter 2).

Extending the use of environmentally related taxes and removing environmentally harmful subsidies (Section 4) would substantially contribute to this objective and generate environmental benefits, such as GHG emission abatement, water savings and preservation of ecosystem services. The government has acknowledged this in policy documents such as the Special Climate Change Programme 2009-12 (Chapter 4). Also, the greening of typical local taxes, such as those on property, and better use of service charges could help strengthen the budgets of local governments, which are responsible for providing basic environmental services.[1] As the following section explains, there is wide scope to improve environmentally related taxation while addressing the distributional impact through targeted social benefit programmes.

2.1. Environmentally related taxes

As in all OECD countries, environmentally related taxes largely coincide with taxes on energy use and vehicles.[2] However, Mexico does not apply fixed excise duties on energy products used for transport and stationary combustion. Instead, since 2000 it has applied a price-smoothing mechanism to diesel and petrol. In practice, the government sets domestic fuel prices every month. If they are higher than international reference prices, the differential effectively represents an excise duty, known as the Impuesto Especial Sobre Producción y Servicios (IEPS). However, if domestic users pay prices below the international reference prices, the IEPS becomes an implicit subsidy.[3]

Figure 3.1 shows the application of this mechanism: real fuel prices were kept nearly constant between 2000 and 2008, which resulted in declining or even zero (or negative) tax rates in 2003-08, while world oil prices were rising. This mechanism cancelled the potential incentive to reducing fuel use that higher fuel prices would have provided. In a welcome move, the government has gradually raised consumer prices since 2008.[4] Preliminary estimates by the National Ecology Institute (INE) indicate that this price increase may have resulted in reducing petrol consumption by between 10 billion and 44 billion litres (depending on the assumptions) from 2006 to 2011, resulting in lower emissions of GHGs and local air pollutants (Muñoz Piña et al., 2011). However, transport fuel taxes and prices remain lower than in most OECD countries, although less so when differences in purchasing power are taken into account (Figure 3.1).

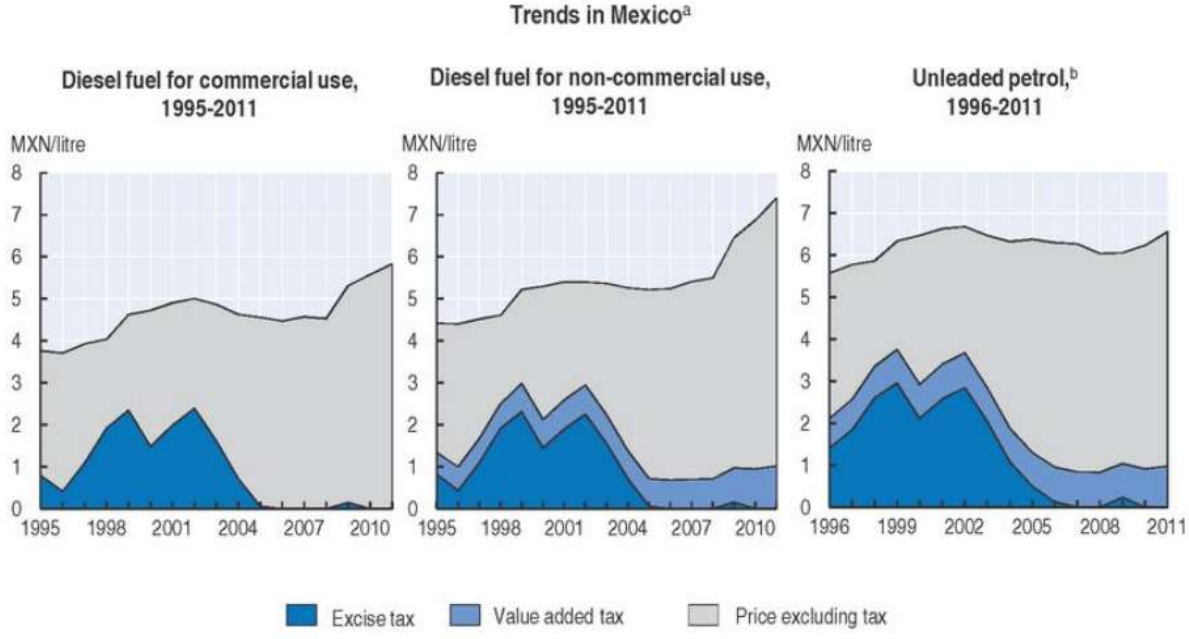
This price-smoothing mechanism results in annual variations of revenue from energy taxes and from overall environmentally related taxes (Figure 3.2). In 2002, when oil prices were low, revenue from energy taxes and environmentally related taxes reached 1.6% and 1.9% of GDP, respectively. This was in line with the corresponding OECD averages that year.

However, with high oil prices in 2008, the Mexican price-setting method resulted in net expenditure for fuel subsidies of 1.8% of GDP. According to an OECD estimate, this was equivalent to subsidising CO_2 emissions from transport at a rate of USD 234 per tonne of CO_2 (OECD, 2012a). Despite the subsequent increase in fuel prices, energy and environmentally related tax revenue continued to be negative in 2010-11, while environmentally related taxes averaged about 1.6% of GDP in the OECD (Figure 3.2).

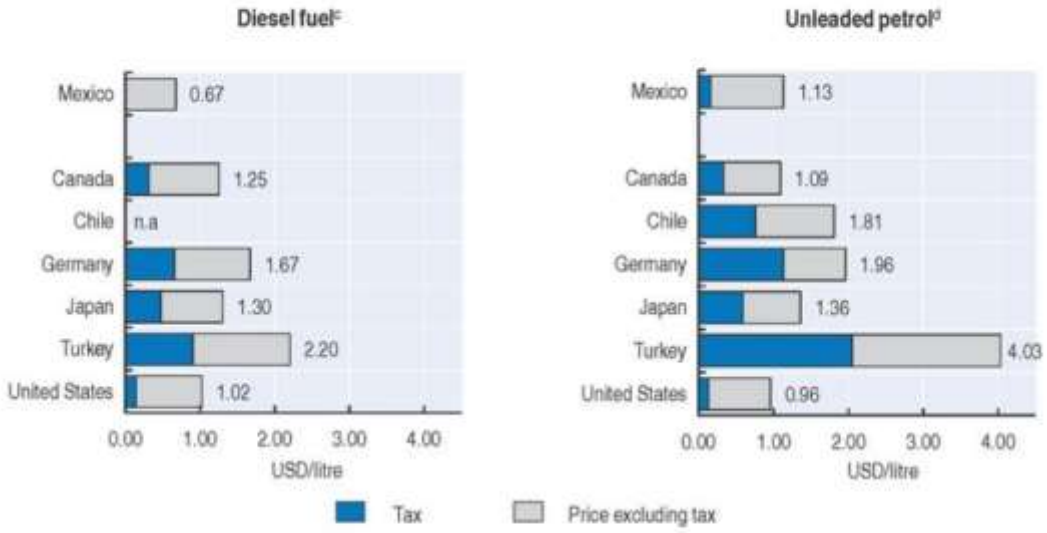
Mexico should let diesel and petrol prices be freely determined by the market, and replace the price-smoothing mechanism with an excise tax on transport fuels. This would lead to additional revenue as well as environmental and welfare gains. For example, Parry and Timilsina (2009) estimated that an excise duty of USD 1 per gallon of petrol (or about MXN 3.6 per litre) would increase annual welfare by a value of about USD 80 per capita in Mexico City due to reduced congestion, pollution and GHG emissions.[5] In addition, Mexico should levy excise duties on other energy products that are not currently taxed, such as electricity, natural gas and coal, and remove a number of tax credits and direct subsidies to energy use (see Section 4). Ideally, energy tax rates should include a component reflecting the carbon content of fuels to ensure that a form of carbon price emerges across the economy. Tax rates should also be differentiated according to the content of other pollutants, such as sulphur. There have been some government proposals to tax energy products while increasing social welfare programmes, but they have always met strong political opposition.

Taxes on vehicle purchase and ownership are the other main component of environmentally related tax revenue, although they play a minor role. Revenue from

Figure 3.1. **Road fuel prices and taxes**



State, 2011



a) At constant 2005 prices.
b) Regular unleaded.
c) Automotive diesel for commercial use at current prices and exchange rates.
d) Unleaded premium (95 RON) at current prices and purchasing power parities. Mexico and Japan: Unleaded regular.
Source: OECD-IEA (2012), *Energy Prices and Taxes*.

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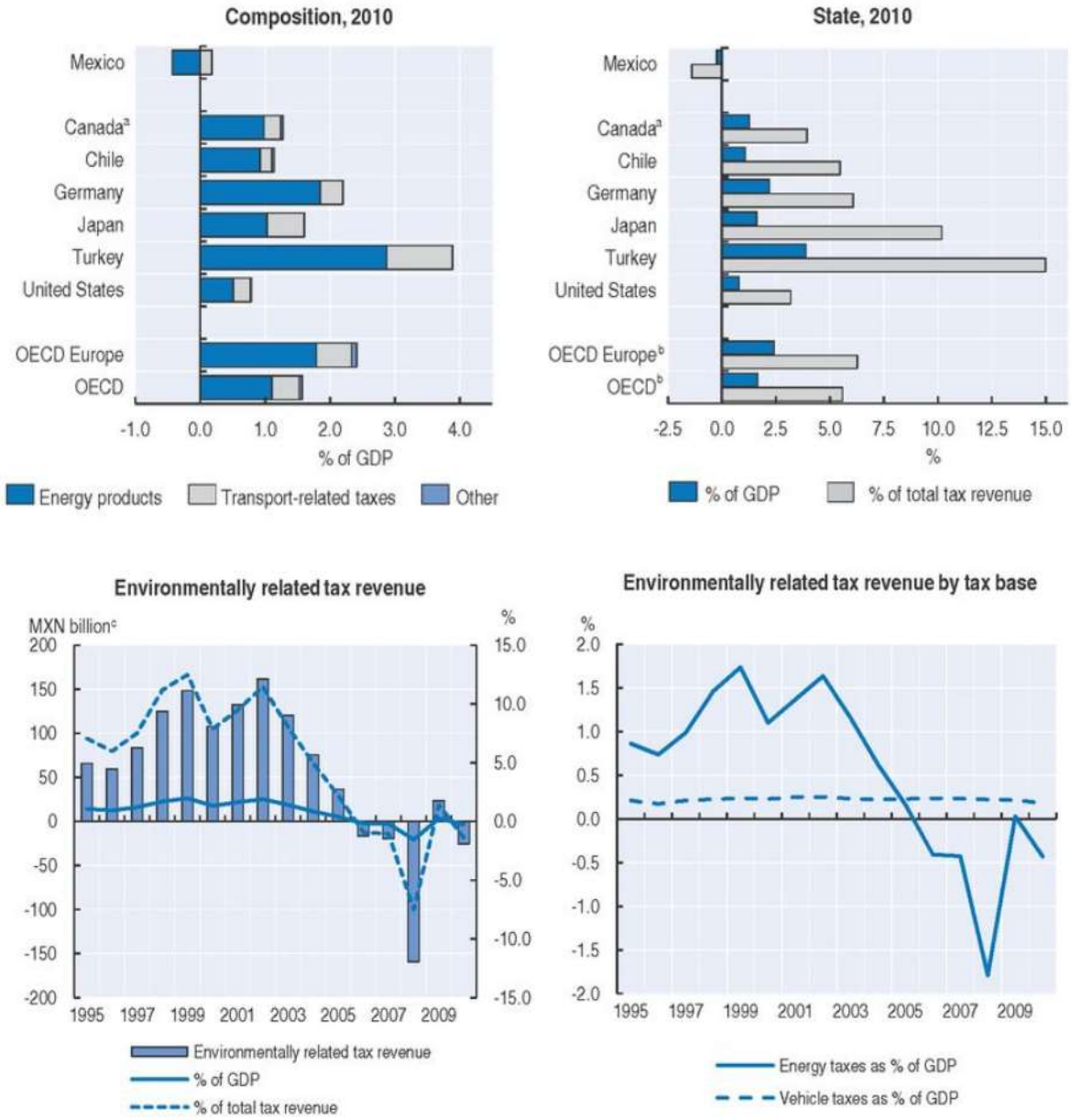
vehicle taxes hovered around 0.2% of GDP between 2000 and 2010, one of the lowest shares among OECD countries and about half the OECD average.

Mexico levies a one-off tax on purchases of new passenger vehicles (including imports), the *Impuesto Sobre Automóviles Nuevos* (ISAN). The rate is progressive, rising with the vehicle purchase prices, and exemptions are granted to cheaper vehicles. Another tax, the *Impuesto Sobre Tenencia o Uso de Vehículos* (ISTUV), used to be paid annually on vehicles less than ten years old, at rates depending on vehicles' value and passenger capacity or

Figure 3.2. **Environmentally related taxes**



a) 2009 data.
b) Weighted average.
c) Constant 2005 prices.
Source: OECD-EEA(2012), *OECD/EEA Database on Instruments Used for Environmental Policy and Natural Resources Management;* OECD (2011), *OECD Economic Outlook No. 90.*

StatLink http://dx.doi.org/10.1787/888932755680

weight. The tax was repealed in 2012 at federal level, but states can now levy the tax and collect the full revenue. Fewer than half the states (among them the Federal District) have exercised this power, and tax competition among states has eroded the tax rates. While neither tax takes vehicle environmental performance into account, in 2008 the government introduced an exemption for new electric and hybrid cars.

Overall, these taxes have not provided sufficient incentives to shift to smaller, more efficient and lower-emission vehicles. Estimates indicate that in 2000-08 the fuel economy of new cars purchased in Mexico improved less than in other countries, such as European countries, partly due to an increase in the market share of heavier vehicles (Sheinbaum-Pardo and Chávez-Baeza, 2011). A shift towards smaller and more fuel efficient new vehicles has been observed in recent years, however, probably due to the impact of the 2009 recession (Islas Cortés et al., 2012; see also Chapter 4). In addition, as the ISAN applies only to new vehicles and both taxes are progressive in terms of purchase price, they encourage purchases of cheaper and older used vehicles, which tend to be less technologically advanced and therefore potentially more fuel and emission intensive. Used vehicles represent a relatively large share of the vehicle fleet, especially in the northern border regions: in the late 2000s, some 80% of vehicles in use in these regions were relatively old used vehicles imported from the United States of America (INE, 2011).

Mexico should restructure both vehicle taxes to take account of vehicles' environmental performance, as many other OECD countries do. With many parts of the country, including the capital, suffering from high air pollution and being prone to photochemical smog, the tax rates could be partly based on emission levels of local air pollutants and GHGs, as is done in Israel, for example (OECD, 2011b). At the same time, vehicle fuel efficiency or CO_2 emission standards should be introduced in addition to the existing pollutant emission standards (Chapter 4). While taxes on vehicle ownership are theoretically less economically efficient than fuel taxes and road charges in reducing emissions (OECD, 2009a), the experience of many countries shows that such taxes help renew the vehicle fleet in favour of cleaner vehicles.

3. Extending the use of other market incentives for environmental policy

Mexico has made some progress in using market-based instruments other than taxes to create incentives for using natural resources more efficiently and reducing pollution and environmental damage. Overall, economic instruments have primarily taken the form of environmentally motivated subsidies. Charging systems have been implemented mainly in

the area of water and, to a lesser extent, biodiversity management. As discussed below, the pricing mechanisms in place have a number of weaknesses.

3.1. Water charges and prices

Water abstraction and pollution charges have long been in place (OECD, 2003), in an effort to reflect the value of the water resource and to apply the polluter-pays principle (Box 3.2). However, charges vary significantly depending on use, and water abstracted for agriculture is mostly not charged. Overall, the water abstraction charges do not provide sufficient incentives to reduce water losses and improve efficiency of water use, which remains very low in both agricultural and urban areas (Chapter 1). The incentive function is also virtually nullified by some subsidy programmes, especially in the agricultural sector (Section 4).[6] At the same time, difficulties enforcing pollution charges undermine their effectiveness. In addition, water charges are not systematically adjusted for inflation. As a result, revenue from water abstraction and pollution charges declined as a percentage of GDP in the 2000s; in 2010, it represented less than 0.1% of GDP.

Tariffs for household water supply and sanitation services remain relatively low and benefit from a zero VAT rate. Averaging about MXN 7 (USD 0.50) per cubic metre in 2008, they were the lowest in a sample of 20 OECD countries (CONAGUA, 2010a; OECD, 2010a). The national average hides wide variations among municipalities,[7] but generally the tariffs do not reflect the water stress of the service area. Also, they cover operating costs for only a minority of water service providers (Box 3.2). This shortfall undermines service efficiency and the ability to invest in infrastructure development.

Box 3.2. **Water pricing**

Water charges are set by the Federal Duties Law and are collected by the National Water Commission (Comisión Nacional del Agua, CONAGUA). They include water administration charges (e.g. for processing water concession titles or water discharge permits) and water abstraction charges. Part of the revenue from the latter is earmarked for national programmes of payment for ecosystem services (Chapter 5). The abstraction charges are volumetric and apply to abstraction of both underground and surface water to be used in public water supply, agriculture, industry self-supply, thermal power generation and hydropower. They vary according to the classification of municipalities in nine zones of availability, ranging from MXN 1.6092/m^3 to MXN 20.5042/m^3. Water service providers pay charges for raw water for domestic use at significantly lower levels, ranging from MXN 0.047/m^3 to MXN 0.40620/m^3 depending on zone. Those charges are doubled when per capita consumption in the service area exceeds 300 litres per day. Rural population centres of less than 2 500 people and agricultural water users are exempt from water use charges and from water administration charges. Agricultural users only pay for water use that exceeds the licensed amount, at a rate of MXN 0.1452/m^3. There are also charges for non-consumptive use, such as hydropower generation, aquaculture and spas.

Water pollution charges are applied to users discharging wastewater above pollution levels, which vary according to status of water body (three levels) and type of pollutant (chemical oxygen demand and total suspended solids). Two federal programmes reimburse water charges to water utilities to pay for investment in water supply and sanitation (PRODDER) and reimburse water pollution charges to users who invest in water pollution control equipment (PROSANEAR).

Tariffs for water supply and sanitation services are set independently by each municipality. Water tariffs generally have an increasing-block structure, with between

5 and 17 blocks in the main cities, and are differentiated by type of final user. In Mexico City, tariffs are also differentiated by affordability criteria (Section 5). In 2006, the average tariff covered some 45% of total costs; thus most water utilities are not financially self-sufficient and over half did not even recover operating costs. Moreover, water tariffs often do not keep up with inflation; from 2006 to 2007, out of a sample of 32 cities, four increased tariffs but by a rate less than inflation, five did not change tariffs and one reduced them. In the last decade, increasing attention has been paid to increasing billing and bill collection rates; between 2002 and 2007, the bill collection rate increased from 72% to 84%.

Source: Cámara de Diputados (2011); CONAGUA (2010a); OECD (2010a).

3.2. Paying for biodiversity benefits

As Chapter 5 discusses in more detail, Mexico applies several economic instruments for biodiversity conservation and sustainable use. They include an internationally renowned programme of payment for ecosystem services (PES), targeting multiple ecosystem services. It takes a relatively sophisticated approach, channelling financing to forest areas with high watershed benefits, high risk of deforestation, and globally significant biodiversity. However, evidence on the effectiveness of the PES, for example in terms of reducing deforestation, is mixed (Chapter 5; OECD, 2012b). The Forest Land-Use Change Compensation Mechanism is similar to biodiversity offsets, and requires developers of infrastructure projects to compensate for loss of forest area by paying into a compensation fund. Pricing instruments, such as fees for access to protected areas and for sport hunting and fishing licences, are also in place. The number of protected areas

charging access fees steadily increased over the 2000s. These charges have helped finance conservation activities and accounted for some 7% of the federal budget allocated to protected areas in 2010. Their use could be further extended to cover growing financing needs, as only 40% of protected areas currently charge an entrance fee. Overall, Mexico should broaden its array of economic instruments for biodiversity policy, introducing instruments that can encourage sustainable use of natural resources as well as generate revenue. Examples include taxes/charges on agricultural inputs, duties on fishing licences and royalties on harvested timber (OECD, 2012c).

3.3. Waste charges

Mexico is lagging in the use of economic instruments for waste management. Deposit-refund systems have been implemented for beer bottles and for car batteries, oil and tyres, with mixed results. Only seven cities have imposed charges for household waste collection, and in only four of them (Aguaprieta, Merida, Puebla, and Tehuacan) is billing effectively, albeit not fully, enforced: only in Merida, the waste bill collection rate reaches 80%. These cities levy flat-rate charges differentiated by city area, with lower rates for the service provided in poorer areas.[8] The charges are not quantity based, however, so they do not encourage waste reduction. Still, despite being very low, they have helped generate some revenue to cover a part, albeit very limited, of the cost of service provision (SEMARNAT, 2009a). Such charging systems could usefully be extended to other cities.

The 2009-12 National Programme for the Prevention and Integrated Management of Waste envisages the introduction of economic instruments, including waste collection tariffs, based on evaluation and feasibility studies. The programme also foresees increased participation of the private sector in the provision of waste management services, with a view to implementing an integrated waste and material management approach

(SEMARNAT, 2009a). However, little progress has been made in this regard. Limited municipal institutional capacity and the large role of informal workers (*pepenadores*) in the waste sector constitute a barrier to wider implementation of waste charges. In some cities, including the capital, household waste charges are prohibited by law. While there is wide social resistance to paying for formal waste collection, a large part of the population pays tips to informal waste pickers. The government calculates that, in some cases, the tips are higher than municipal waste charges would be. As the programme recognises, formally involving the pepenadores is necessary to assure implementation of effective municipal waste-management systems, as well as to improve the social, health, and living standards of these workers.

3.4. Greenhouse gas emission trading

The 2012 Climate Law opens the possibility of establishing a domestic trading system and linking it to those of other countries (Chapter 4). This could enable Mexico to sell emission rights to countries participating in such systems that have more expensive abatement options. However, such instruments generally entail high start-up administrative and transaction costs and a steep learning curve, and require sound monitoring and enforcement procedures. A careful evaluation of the costs and implications of such a system will, therefore be needed. A form of carbon tax, as mentioned in the previous section, could be an easier option to implement, as a system for collecting taxes is already in place. Mexico has extensively used the clean development

mechanism since 2005. However, more consideration could be given to projects with large emission reduction potential, such as those in the electricity and oil industries (Chapter 4).

3.5. *Rewarding environment-friendly goods and activities*

In general, in the area of pollution control and climate change mitigation, including energy efficiency, Mexico has primarily used subsidy-based instruments to reward the purchase of supposedly more environment-friendly goods. The instruments have included soft loans and tax deductions for businesses' environment-related investment (including in renewable energy sources); zero tariffs on imports of pollution control equipment;[9] and tax credits for scrapping of buses and heavy goods vehicles. A vehicle scrapping programme ran between 2009 and 2010 (Chapter 4).[10] Measures to improve energy efficiency in the residential sector have included subsidies to replace old home electric appliances and loans to low income households for purchases of energy- and water-efficient houses or for home retrofitting (*hipotecas verdes*). The contribution of these measures to reducing energy consumption and GHG emissions is discussed in Chapter 4 (see also Table 4.1).

All these mechanisms can encourage businesses and consumers to make more environment-friendly purchases by raising awareness, reducing upfront costs and/or improving access to credit. However, they come at a cost to the budget and discriminate against households and businesses that cannot afford such purchases and investments. From an environmental perspective, these measures are generally less efficient than instruments such as taxes that directly incorporate the cost of environmental damage into market prices. Among other effects, by targeting a limited range of "cleaner" products or activities, subsidy-based measures encourage firms and consumers to adopt the subsidised solutions even when other options would be more effective (OECD, 2012d). And the funds they free up can be used to increase consumption of energy and natural

resources, thereby offsetting the potential efficiency and environmental gains at product level (rebound effect). This is of particular concern in Mexico, where energy prices are kept artificially low. Such incentives would be less necessary or more effective if a number of subsidies to energy use were removed, as discussed in the next section.

4. Removing environmentally harmful subsidies

As the following sections discuss in more detail, Mexico spends a considerable amount on support measures that have the potential to harm the environment. They include direct and indirect subsidies to energy use, agriculture, fishery and car use. Many of these subsidies contravene the polluter-pays and user-pays principles, distort competition, lock in inefficient technology and lead to inefficient allocation of resources. They weigh on current public finances, and can entail additional expenditure to compensate for their distortive effects and to remediate the potential environmental and health damage. Many subsidies have long been in place to address social concerns. However, as Section 5 notes, most of these subsidies have not efficiently supported low-income households and farmers, as they tend to benefit the wealthiest population groups, and could be replaced by direct social spending programmes.

A reform of these perverse support measures would help improve Mexico's environmental performance and the efficiency of public expenditure, with potentially high social and economic benefits. Subsidy reform raises intricate political economy concerns. The experience of countries that have undertaken such reform shows that the conditions for success include systematic analysis of the likely social impact (identification of winners

and losers); appropriate compensatory measures; transparent communication of the purpose, cost and beneficiaries of the subsidies and of their removal; and awareness-raising initiatives (OECD, 2012b; World Bank, 2012a). The Mexican government already conducts annual surveys of subsidies and tax expenditure and of their distribution among segments of the population. It could build on those surveys to assess its subsidy policy's broader environmental, social and economic impact. This would help identify the subsidies that could be removed, reduced or reshaped.

4.1. *Energy subsidies*

Support to energy consumption accounts for a large part of the environmentally harmful subsidies. The government estimates that subsidies for electricity, petrol, diesel and liquefied petroleum gas (LPG) for domestic use averaged more than MXN 200 billion or about 1.7% of GDP per year over 2005-09. Electricity use in the residential and agriculture sectors accounted for most of these subsidies (63%), followed by petrol and diesel (31%) and LPG (SENER, 2010).

Petrol and diesel use is indirectly subsidised by means of the price-smoothing mechanism described in Section 2. Despite increases in regulated fuel prices (Section 2; Figure 3.1), in 2011 this subsidy was estimated at MXN 169 billion or nearly 1.2% of GDP (SHCP, 2011). In addition, when fuel prices are such that the IEPS is a positive tax, fuel-tax credits are available in the agriculture and fisheries sectors and for commercial vessels, commercial road freight and passenger transport, manufacturing and certain non-transport uses of diesel (OECD, 2011c; OECD, 2012a).

Electricity consumption in the agriculture and residential sectors benefits from subsidies in the form of reduced tariffs.[11] Electricity subsidies in Mexico are among the

largest in the world and are partly linked to the high cost of electricity provision (Komives et al., 2008; OECD, 2011a). The cost of the subsidy for household electricity was more than three times the amount of investment in the electricity sector for 2007-10. These subsidies are one reason why residential electricity consumption has grown more rapidly than that in other sectors and in the economy as a whole (Chapter 4). In agriculture, Mexico spends more on subsidies to partly cover the cost of electricity for water pumping than it does to improve irrigation infrastructure: in 2011, the subsidy cost MXN 8 074 million (USD 649 million), more than nine times the support to farmers' investment in more efficient water infrastructure (MXN 855 million) (OECD, 2012).[12] This subsidy, together with the exemption from the water abstraction charge, has encouraged wastage of water resources and runs counter to the objective of, and public spending on, efficient irrigation systems (Box 3.3).

Overall, by lowering end-use energy prices, energy subsidies encourage wasteful energy consumption, thereby impairing energy security and generating higher GHG emissions. As they reduce incentives to invest in energy-efficient technologies and appliances, the subsidies also weaken the effectiveness of various forms of budgetary support for renewables and energy efficiency (Section 3; Chapter 4). The LPG subsidy, furthermore, hampers the uptake of natural gas and renewables such as thermal solar for domestic use. This system is highly costly and inefficient, and it runs counter to Mexico's ambitious climate change mitigation goals. OECD simulations indicate that phasing out fossil fuel consumption subsidies could reduce Mexico's GHG emissions by 10% by 2050, compared with business as usual (Chapter 4).

Box 3.3. **Electricity subsidisation in the agricultural sector**

Water used in agriculture accounts for over three-quarters of Mexico's water abstraction. The agricultural electricity subsidy covers more than 60% of the cost of electricity for pumping irrigation water (Muñoz Piña et al., 2006). By artificially lowering prices for pumping irrigation water, the subsidy has contributed to keeping the efficiency of water use low and to the overexploiting of groundwater aquifers (Chapter 1). The subsidy also discourages investment in more efficient irrigation technology. In addition, it has a very unequal distribution, as it is mostly captured by owners of large irrigated farms. Farmers in the highest income decile receive an annual subsidy of more than USD 330 000, whereas farmers in the lowest decile receive from USD 28 to USD 72 per year (Table 3.1).

Table 3.1. **Distribution of agriculture electricity subsidy across farm income deciles**

	Average implicit electricity subsidy for water pumping (USD per year)	
Income decile	Aquifers suffering low to medium overexploitation	Highly overexploited aquifers
1	28	72
2	300	558
3	965	1 931
4	2 464	4 243
5	4 674	6 675
6	7 507	9 746
7	11 239	13 680
8	16 590	18 671
9	24 793	27 129
10	330 814	388 714

Source: INE.

Research shows that removing the subsidy would lead to water abstraction falling by 15% in the short term. It would also encourage a shift to more water-efficient technology such as drip irrigation and sprinklers, resulting in a 19% reduction in water abstraction in the long term (Muñoz Piña et al., 2006). In addition, INE estimated that this would result in GHG emission savings of about 980 000 tonnes of CO_2 eq per year (Muñoz Piña et al., 2010).

Because of these results, in July 2011, the government launched a pilot programme to partly decouple the amount of the subsidy from electricity use. The programme involves 13 aquifers with more than 8 000 potential beneficiaries. Participating farmers pay a higher electricity price, although still partially subsidised and below the average cost of electricity generation. In exchange, they receive a cash-transfer equivalent to the forgone electricity subsidy, calculated on the basis on their average consumption for the previous three years. The result is that farmers receive a less distorted price signal yet do not incur a net income loss.

Source: INE; Muñoz Piña *et al.* (2006).

The government, in national energy strategies, has reiterated its goal of reforming energy prices and subsidies. Some progress has been made, although much more could be done. As Section 2 indicates, the government has gradually increased regulated prices of petrol and diesel, but this does not prevent implicit subsidies when world oil prices are

high, as in 2011 (Figure 3.1). The government has launched a new cash-transfer programme to help poor households cover their energy needs, yet the household electricity subsidy remains fully in place. Mexico's pilot programme to replace electricity subsidies for pumping irrigation water with direct cash transfers in some states, thus removing the price distortion (Box 3.3), could provide experience to support broader energy subsidy reform.

These direct and indirect subsidies should be gradually removed. The government should address the potential negative impact on household budgets and well-being through targeted cash transfers; for example, it could expand the successful "Oportunidades" programme (Section 5). Such transfers should be designed so as to avoid a shift to cheaper, dirtier fuels such as traditional bioenergy (e.g. wood or animal manure). Improving the efficiency of the electricity sector and allowing for more competition, accompanied by sound regulation, would also help lower end-use prices and create a basis for removing electricity subsidies. In addition to halting environmentally harmful incentives, such a reform would be more effective in alleviating poverty and would help reduce public expenditure, as implicit subsidies to higher income households would be avoided (OECD, 2011a).

4.2. *Agricultural support*

Agriculture accounts for a larger share of GDP and employment in Mexico than in many other OECD countries (Chapter 1). As in many other OECD countries, agricultural producers receive various forms of support. Mexico has continued to reform its support policy to agriculture in the last decade. The level of support had declined since the early 2000s, in terms of what is provided to farmers and the cost to the economy as a whole: total agricultural support dropped from an average 1.25% of GDP in the early 2000s to 0.7% of

GDP in 2009-11, slightly below the OECD average of 0.9%. In particular, support for farmers as measured by the share of producer support estimate (PSE)[13] declined from 23% of gross farm receipts in 2000-02 to 12% in 2009-11. This is well below the 20% OECD average.

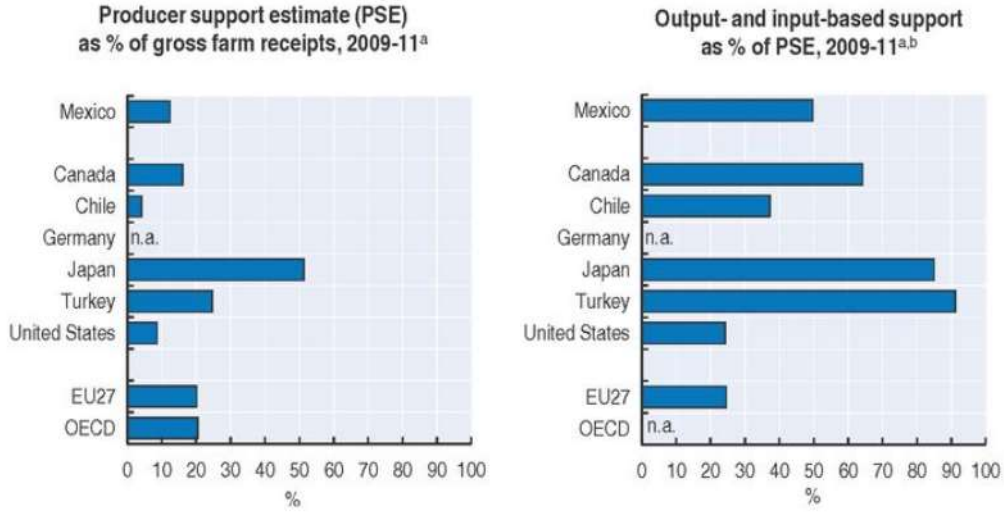
PSE from subsidies linked to output level and input use, the most distorting subsidies, also declined, from 20% of gross farm receipts in 2000-02 to 9% in 2009-11 (Figure 3.3). However, support based on input use has increased since 2000. This includes the electricity subsidy for water pumping (Box 3.3) and tax exemptions on fuel use. Despite their decline, subsidies linked to production still account for half of PSE, a level higher than in many other OECD countries (Figure 3.3). Such subsidies include a price support programme that targets ten basic crops (mainly grains), some of which are water-intensive (Ingreso Objetivo).[14] Overall, as they stimulate production and input use, these forms of support provide environmentally harmful incentives and encourage intensification and expansion of agriculture, with a potentially negative impact on the use of water, land, fertiliser and pesticides. The amount of these subsidies is estimated to be well above that of environment-oriented programmes such as the PES system. There is evidence that some subsidy programmes have accelerated land-use change and deforestation in some areas of the country, thereby working against Mexico's biodiversity policy (Chapter 5). In addition, as Section 5 will show, many agricultural subsidies are highly regressive, since they mainly target the largest producers with little positive impact on overall productivity (OECD, 2011a).

Water, a key factor in agricultural production, is still heavily subsidised. While farmers in irrigation districts pay fees for irrigation services (Garrido and Calatrava, 2010), farmers with consumption below a certain threshold are exempt from the water abstraction charge. Even when applied, the charge remains below those in other sectors and does not

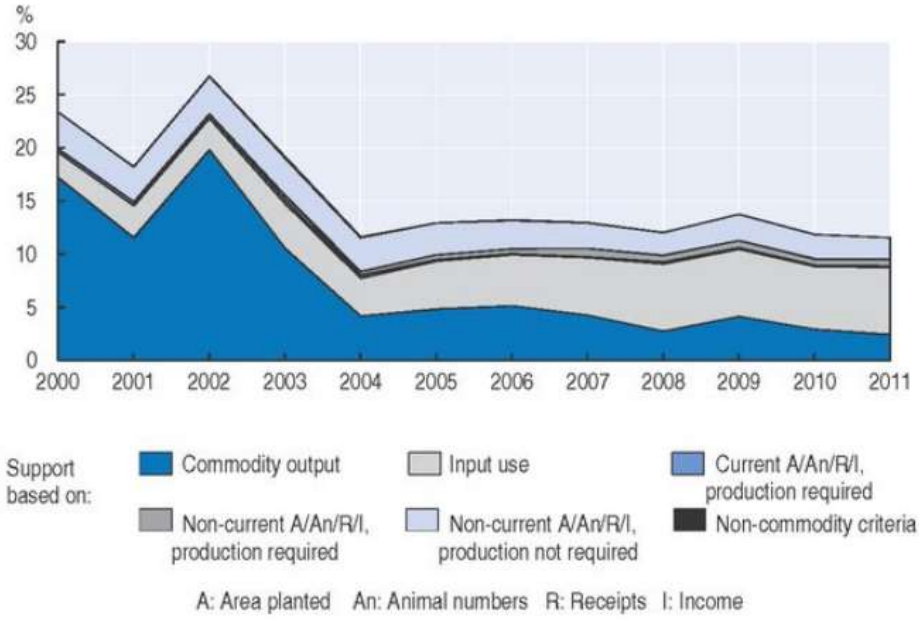
vary with water availability (Box 3.2). This represents an implicit subsidy to agriculture, a sector that also benefits from an electricity subsidy for irrigation water (Box 3.3) and a VAT exemption on agrochemicals.

The government should consider ending potentially distorting subsidies such as Ingreso Objetivo and divert the resources to support general services to agriculture, including investment in rural infrastructure, training and education. During a transition period, beneficiaries could receive cash transfers decoupled from production and prices as a temporary compensation measure. The pilot programme to decouple subsidies from electricity use can provide useful experience in this regard (Box 3.3). Remaining agricultural support should be tied to meeting environmental requirements.

Figure 3.3. **Agricultural subsidies**



PSE level and composition, by support categories, as % of gross farm receipts, 2000-11



a) Unweighted averages.
b) Payments based on commodity output and variable input use.
Source: OECD (2012), *Producer and Consumer Support Estimates Database*.

StatLink http://dx.doi.org/10.1787/888932755699

4.3. *Fishery support*

Mexico is one of the major fishing countries in the OECD (Chapter 1). Between 2000 and 2010, its fishery production, including aquaculture, grew by 20%. Mexico provides financial transfers to both marine capture fishing and aquaculture. Government financial transfers to the marine capture industry account for two-thirds of total transfers to the sector. They decreased from 19% of the value of production in 2003 to 8% in 2007, which is well below the OECD average of 22%. Most transfers in this sector have been direct payments and cost-reducing transfers, primarily fuel subsidies, direct grants and a decommissioning programme for the shrimp fleet. In 2007, such support amounted to 8% of the value of landings, well above the OECD average of 3% (OECD, 2006; OECD, 2010b; OECD, 2011d).

Some of these subsidies, particularly those for fuel, engine purchase and vessel modernisation, have potential for environmentally harmful effects as they encourage increases in fishing capacity and effort, despite most Mexican fish stocks being classified as fully exploited (OECD, 2010b). Moreover, while the decommissioning subsidy resulted in a decrease in fleet size, there remains a risk of fishing effort expanding, as major fisheries are regulated only by limits to entry; there are few constraints on expansion of input or effort. Most of the direct payment and cost-reducing transfer programmes should be reduced, as they mask price signals for inputs, distorting operating decisions and generating increased fishing pressure. In addition, financial transfers should be accompanied by management changes to ensure that effort does not expand (OECD, 2011d).

4.4. *Incentives to vehicle ownership and use*

In addition to implicit subsidies to fuel use, other distortionary incentives for road transport are in place and can have a potentially negative environmental impact. There is, for example, a 50% tax credit on road tolls paid on national motorways by transport businesses. Also, as in many countries, the tax treatment of company cars can provide incentives to car ownership and use. Mexico is one of the few countries in which company cars are fully exempt from employee income taxation, a fact that can encourage employers to provide income in the form of a car. About one-third of all newly registered cars in 2009-11 were company cars, a higher share than in many other OECD countries, including the US. The OECD (2012f) estimates that forgone revenue due to this tax exemption amounts to nearly 0.3% of GDP. The fixed cost of company cars is deductable from corporate income up to a certain threshold, which provides an incentive to buy cheaper, smaller cars.[15] They are not necessarily less polluting or more fuel efficient, however. Fuel expenses, moreover, are deductable from corporate income up to a generous cap of MXN 250 (USD 18.5) per-day per-car (SHCP, 2011). Hence, employers have nearly no incentive to limit the use of company cars by employees, who in turn face virtually no additional cost linked to actual car use and have no incentive to drive less or more efficiently. While it is difficult to distinguish between personal and work use of company cars, some form of taxation of their ownership and use should be considered.

Free parking for employees provided by employers is also a non-taxed benefit in kind. In contrast, commuting expenses paid by employers are part of employees' taxable income, though with some tax advantage when public transport is used (OECD, 2012f). Overall, this mix of incentives encourages driving to work (mainly at rush hours and to/from particularly congested locations), exacerbating congestion, accident risk and environmental problems. The incentives should be removed by, for example, including parking spaces among taxable benefits. The environmental effects of removing these distortionary incentives for car ownership and use would be enhanced to the extent that efficient and reliable alternatives to private car transport are made available.

6. Investing in the environment to promote economic growth

6.1. *Environment-related components of the stimulus packages*

In response to the 2008-09 economic crisis, Mexico adopted a stimulus package accounting for 1.6% of GDP in 2009, less than the OECD average of 3.9% (OECD, 2009b; OECD, 2009c). Priority was given to spending measures (1.2% of GDP), mostly investment programmes, subsidies to employment and social transfers. Of particular interest from an environmental perspective were additional investment in sustainable urban transport, sewerage and water efficiency improvement, subsidies for replacement of inefficient light bulbs and electronic appliances, and a car scrapping programme. It is estimated that these measures[19] accounted for 10% of the total package (SEMARNAT, 2011b; ILO, 2010; GoM, 2010).

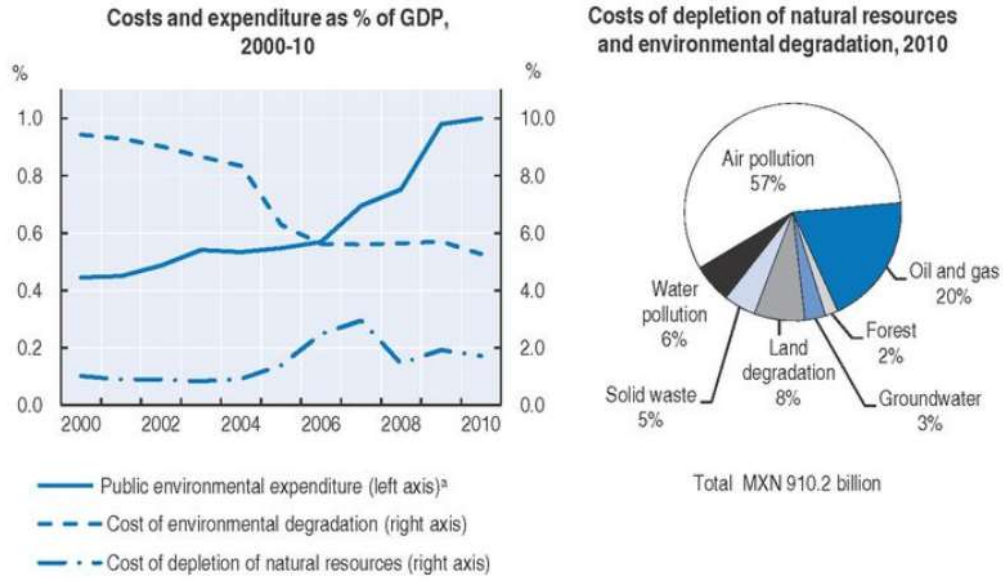
Investment in urban public transport has already recorded positive outcomes with growth in rail passenger traffic in metropolitan areas, but it has to be strengthened in the long term to influence the modal split (Chapter 4). Support to energy-efficient equipment in the residential sector has led to a broader project included in the Special Climate Change Programme. It is expected to have reduced GHG emissions by 2.7 Mt CO_2 eq by 2012, to have a low rebound effect and to assure appropriate disposal of scrapped items (including ozone-depleting substances) (World Bank, 2010); its environmental outcomes and cost effectiveness remain to be assessed. The car scrapping programme contributed to only a minor share of new vehicles sold and it was not linked to environmental performance of vehicles purchased. It is likely that the car industry in Mexico has benefitted more from the scrapping programme in the United States. In addition to these "green" measures, the stimulus package included increased energy price support, representing about 0.4% of GDP. The Mexican economy recovered swiftly from the global downturn, mainly on the strength of exports to the US.

6.2. *Environment-related expenditure and financing*

Public environmental expenditure[20] more than doubled in real terms between 2000 and 2010, growing from 0.4% to 1.0% of GDP. The growth was driven by increased investment related to wastewater, soil and groundwater and spending on biodiversity and forests, while investment on waste was reduced by one-third. By comparison, the cost of environmental degradation and depletion of natural resources was estimated at 7% of GDP in 2010, down from 10% in 2000 (Figure 3.5) (Box 3.4).

The federal budget continues to be the main source of funding for environmental expenditure. Only about 10% of subnational government revenue comes from subnational taxation and non-tax revenue. Charges on waste and wastewater cover a limited share of the cost of service provision. Between 2002 and 2011, the federal budget for environment and natural resources increased by about 9% annually, more than the average in other sectors (Chapter 2). This reflects the government's growing priority on addressing pressing environmental needs. Nevertheless, at 2% of the overall federal budget, the share for environment remains small. Financing for environment is also provided through loans secured by multilateral development banks (World Bank, Inter-American Development Bank). For example, in 2008-09, USD 2.7 billion in development policy lending was committed to environmental sustainability, climate change and green growth, equivalent to 16% of public environmental expenditure for the period (World Bank, 2011c). However, the exact amount of these flows and their conditions are difficult to assess.

Figure 3.5. **Environmental expenditure and costs of depletion of natural resources and environmental degradation**



a) Investment and current expenditure of federal (including public enterprises), state and local governments (municipalities since 2003). Includes expenditure on i) pollution abatement and control covering air protection, waste and wastewater management, protection and remediation of soil and groundwater, and other environmental protection activities (R&D, administration, education); and ii) biodiversity and landscape protection. Excludes expenditure on water supply.

Source: INEGI (2012), *Sistema de Cuentas Nacionales de México: Cuentas económicas y ecológicas de México, 2006-2010.*

StatLink http://dx.doi.org/10.1787/888932755737

Box 3.4. **Economic and environmental accounting**

Mexico was among the first countries to develop and implement a system of integrated economic and environmental accounting in the early 1990s. The Sistema de Cuentas Económicas y Ecológicas de México (SCEEM) makes it possible to estimate the impact on GDP of depletion of natural resources (oil and gas, forest, groundwater) and environmental degradation (air, soil and water pollution, land degradation). It is regularly updated under the National Statistics and Geography Institute (INEGI). SCEEM provides aggregated indicators such as net ecological domestic product, which is GDP adjusted for depreciation of capital and for imputed cost for environmental use (natural resource depletion and environmental degradation).

The costs of natural resource depletion increased until the middle of the past decade, driven by growing hydrocarbon production and declining reserves, but the trend has been reversed in recent years with new discoveries and reduced production levels. The costs of environmental degradation have declined due to air quality improvement.

Results of the SCEEM have provided useful insight for the drawing up of national development plans and environment programmes. However, they are not used to calculate budgetary requirements to offset environmental degradation, nor are they integrated in periodic reports of GDP.

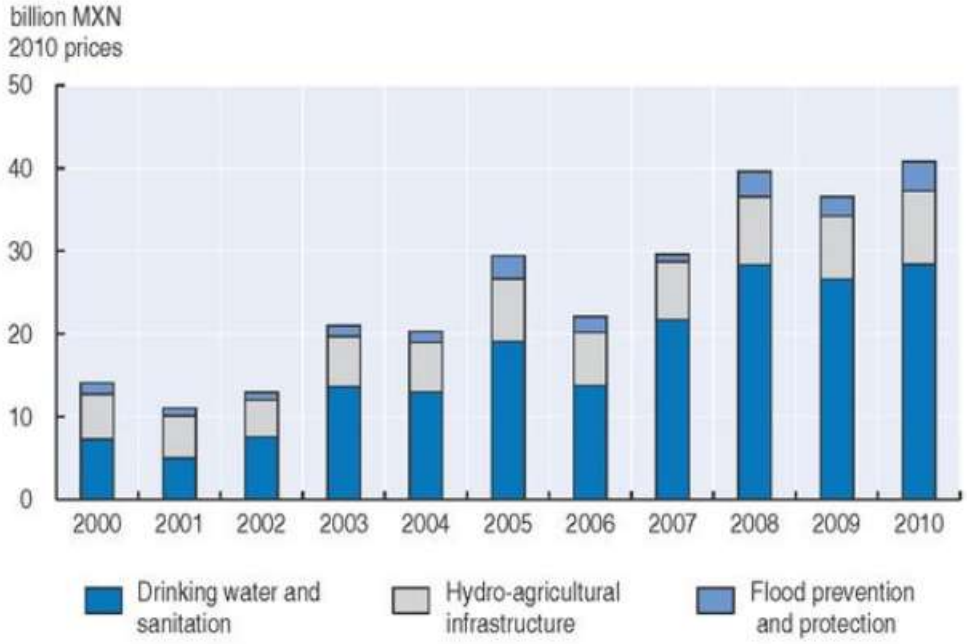
Source: INEGI (2012), *Sistema de Cuentas Nacionales de México. Cuentas económicas y ecológicas de México, 2006-2010.*

In the past decade, forests have become a national priority (Chapter 5). Since 2002, CONAFOR's budget has nearly tripled, in real terms, to MXN 6.5 billion (USD 520 million) in 2011, resulting in a significant increase in the forest area under conservation and sustainable management.

Water resource management has also been high on the Mexican policy agenda. Investment[21] in water infrastructure nearly tripled between 2000 and 2010 (Figure 3.6). Investment growth was particularly notable for drinking water and sanitation and, in the second part of the decade, flood prevention and protection. As a result, considerable progress was achieved in improving access to water services and decreasing mortality from water-related diseases. Between 2000 and 2011, the share of the population with access to drinking water increased from 87.9% to 91.6% and sanitation coverage rose from 76.2% to 90.2%. Mexico achieved and exceeded the related Millennium Development Goals and has set more stringent objectives for 2015.

Figure 3.6. **Investment in water infrastructure**

2000-10



Source: GoM (2011), *Quinto Informe de Ejecución del Plan Nacional de Desarrollo 2007-2012.*

However, the funding gap remains a major concern. Mexico has the lowest rate of connection to public wastewater treatment plants in the OECD. The rural population still has much less access to drinking water and sanitation than urban dwellers (Chapter 1). Within urban areas, there are significant backlogs in infrastructure and basic services. It has been estimated that MXN 51 billion (USD 4 billion) per year is necessary to achieve clean water bodies by 2030, along with balanced supply and demand for water, universal access to water services and settlements safe from catastrophic floods, as well as to maintain and operate the water infrastructure (CONAGUA, 2011b). There is therefore an annual funding gap of MXN 14 billion[22] (USD 1.1 billion). The National Water Commission (CONAGUA) estimates that the cost of the resulting restrictions on industrial activities would increase over time to MXN 1.5 billion (125 million USD) per year by 2030.

The lack of cost recovery through user fees is a major impediment to meeting investment needs in the water sector (OECD, 2010c). Funding relies almost entirely on government budgets and is disbursed through a variety of federal programmes, the largest

of which are managed by CONAGUA. Overall, private-sector participation and direct private financing of water investment has been rare (Box 3.5). There have been a few private sector participation contracts in the water and sanitation sector, which have been effective in raising funds for investments in facilities. However, with few exceptions (Aguascalientes, Cancun/Isla Mujeres, Saltillo), they have not improved the efficiency of water and sanitation providers and have increased the cost of service. The government is engaged in a water policy dialogue with the OECD to support implementation of Mexico's 2030 Water Agenda and identify institutional reforms needed to achieve its objectives (Chapter 2).

Box 3.5. **Private sector participation in water supply and sanitation services**

Private sector participation in water supply and sanitation services has been limited. Between 1992 and 2000, 26 contracts were signed, including service contracts (9 out of over 1 200 water operators in Mexico), concessions (5), management and leasing contracts (2) and build-operate-transfer/build-operate-own contracts (15). Between 2002 and 2008, only eight contracts were signed, all of them build-operate-transfer for wastewater treatment plants.

A successful example of private sector participation is the Aguascalientes full concession. The Aguascalientes service area has 693 000 inhabitants in the state capital and 46 rural communities. Under the concession contract, the private operator abstracts water, treats it, supplies it to customers, bills for it, collects payment and provides after-sales service. The process of private sector participation evolved gradually: it started in 1989 with a renewable 3-year partial service contract, and in 1993 a 20-year full concession contract was signed, which was later extended to 30 years. The partial service contract focussed on increased commercial performance; its achievements included a 42% increase

in the number of registered customers, the installation of over 100 000 metres of pipe, productivity gains (the number of employees per 1 000 connections fell from 5 to 3) and a quadrupling of revenue. The concession contract was developed to meet a need for over MXN 660 million in investment to rehabilitate and expand infrastructure in order to increase coverage, service quality and efficiency.

Key indicators of success are improvements in technical efficiency (from 30% in 1993 to 50% in 2002, thanks to reduced water losses), commercial performance (the bill collection rate reached 97% in 2009) and coverage (it reached 98% in 2009, up from 61% in 1993). Between 1993 and 2002, tariffs increased from MXN 1.74 to MXN 8.05/m^3 in nominal terms; at the same time 7% of the revenue went into a social fund to provide support for households that couldn't pay the tariff. As a result of tariff increases and improvements in metering, billing and bill collection, water consumption was reduced from 370 litres per capita per day in 1993 to 240 in 2002.

Source: CONAGUA (2010b).

Mexico is vulnerable to natural disasters, including earthquakes, volcanic eruptions, floods and hurricanes. In 2010, economic losses due to severe hydrometeorological events were equivalent to 0.7% of GDP (Chapter 1). Mexico has moved from a corrective to a preventive approach to disaster risk management. It has developed an institutional framework for disaster preparedness involving risk assessment, risk reduction, prevention promotion and insurance. In particular, Mexico has developed a financial strategy for managing federal disaster costs, including: *i)* a natural disaster fund (FONDEN), drawing on

budgetary resources to cover the costs incurred in the most frequent types of disasters; *ii)* a reinsurance programme to cover unusually large losses without affecting public finances; and *iii)* a catastrophe bond that provides immediate emergency funds if a major disaster occurs. By issuing these catastrophe bonds, Mexico's federal government became one of the first governments to protect its public finance by transferring its exposure to hurricane and earthquake risks to specialised investors in the financial markets (Michel-Kerjan et al., 2011; World Bank, 2012b). In addition, SEDESOL launched in 2011 the Programme for Risk Prevention in Human Settlements (Programa de Prevención de Riesgos en Asentamientos Humanos), which extends financing of risk reduction to all municipalities.[23]

Shifting to a greener growth path requires Mexico to improve transport infrastructure and to better integrate transport and urban planning policies. Between 2000 and 2009, the transport sector was the fastest growing consumer of energy and the rate of motorisation doubled (Chapter 1). Investment in transport infrastructure increased significantly, from 0.3% of GDP in 2000 to 0.7% in 2010, just below the OECD average (Chapter 4). In 2008, Mexico created the Federal Support for Mass Transit Programme (PROTRAM) to improve the efficiency of urban transport systems. PROTRAM, complemented with loan programmes, has fostered the growth in rail passenger traffic in metropolitan areas in recent years. However, investment in rail accounted for 8% of total investment in transport infrastructure in 2010, a proportion well below that of other OECD countries. Support to public transport would need to be significantly scaled up to have an impact on car usage, and it will take many years to overcome the lock-in effect of the current organisation of cities.

In 2010, Mexico achieved the largest absolute increase in renewable energy investment in Latin America (UNEP, 2011). Investment in renewables, mainly in wind but also geothermal, more than quadrupled to reach USD 2.3 billion in 2010. This growth followed the adoption of the Law for Use of Renewables and Financing for Energy Transition and its implementing programme, which set a target of raising renewables-based power capacity (excluding large hydro) to 7.6% by 2012 (Chapter 4). Measures associated with high electricity prices for industry and technological developments have resulted in a significant expansion of wind power capacity for private self-generation. Despite a fall in investment in 2011 (to USD 0.2 billion), the renewables market is expected to strengthen from 2012 onwards (UNEP, 2012). However, much potential remains to be tapped, and the share of renewables in electricity production declined over the past decade. Fostering deployment of renewables will require better integration of environmental and social externalities in the cost of electricity, further grid development and steps to address land compensation issues.

8. Environment, trade and development

8.1. *Official development assistance*

Mexico as a recipient

As an upper-middle-income economy, Mexico does not receive a significant amount of official development assistance (ODA): about 0.02%, on average, in the past decade. However, increased support for climate change activities has been reported since the Copenhagen pledge to scale up climate financing (Chapter 4). In 2010, DAC donors committed USD 340 million of bilateral ODA to Mexico for climate change mitigation, a contribution 16-times higher than in 2009 (DAC Statistics, June 2012). In addition, support to climate change adaptation amounted to USD 13 million. Bilateral aid in 2010 in support

of other Rio conventions also increased – twelve-fold for desertification, to USD 29 million, and two-fold for biodiversity to USD 20 million. Overall, bilateral environment-focussed aid to Mexico represented 0.04% of GDP.

Between 2000 and 2012, the Global Environment Facility granted USD 335 million to Mexico, of which about 41% was for co-financing activities related to climate change, 37% for biodiversity and the remainder for multifocal areas, international waters and persistent organic pollutants. In addition, Mexico receives support from the climate investment funds managed by the World Bank. In particular, the Clean Technology Fund (CTF) approved USD 414 million[25] in concessional loans over 2009-12 to support sustainable urban transport, energy-efficient equipment and renewables. In 2011, the Forest Investment Program (FIP) disbursed USD 42 million to help advance the REDD+ agenda on emission reduction from deforestation and forest degradation. While relatively small, these sums are expected to leverage significant co-financing from government, multilateral, public and private financial institutions (USD 3.6 billion for the CTF, USD 629 million for the FIP). As Mexico has been receiving an increasing amount of funds for climate-related initiatives there is a pressing need to measure and assess the environmental outcomes of this funding.

Mexico as a donor

Mexico's bilateral and regional development co-operation is directed mostly to Latin America and the Caribbean and primarily takes the form of technical and scientific co-operation for capacity development (OECD, 2011g). Mexico has implemented innovative support programmes, such as horizontal and triangular assistance co-operation with similar and less developed countries. It is among the most active countries in triangular co-operation in Latin America. It is engaged with Japan in environment and disaster

prevention in Guatemala and El Salvador, with Germany and Japan on waste management in Guatemala and the Dominican Republic, with Spain on water and sanitation in Haiti and with Korea on climate and green growth in Latin America (OECD, 2009e). In 2011, environment accounted for 12% of the number of bilateral co-operation projects (Foreign Ministry, 2012).

In 2011, a law on development co-operation went into force and the Mexican Agency for Development Co-operation was created; it has an obligation to report on ODA flows both to and from Mexico. The Ministry of Foreign Affairs recently established a national system of information on international development co-operation, with support from INEGI, the OECD Development Assistance Committee (DAC), and the UN Development Programme. The system is intended to facilitate efficient, transparent reporting on Mexico's co-operation to the DAC.[26] In particular, this should help increase coherence, transparency and predictability in climate finance under the Busan Building Block on Climate Finance and Development Effectiveness,[27] which Mexico supports. A strategy on development co-operation will be developed to specify priorities of Mexico's development co-operation. The law specifies that sustainable development, environmental protection and climate change are to be among those priorities.

8.2. Trade and environment

International trade plays an important role in the Mexican economy. In 2010, exports of goods and services accounted for 30% of GDP and imports for 32%, above the respective OECD averages. Despite Mexico's efforts to engage in free trade agreements with other countries, the

United States remains its most important trading partner: around 80% of Mexican exports go to the United States, and 48% of Mexican imports are of US origin. Environmental co-operation provisions have been included in trade agreements signed with the US and Canada (the North American Free Trade Agreement, or NAFTA, 1994), the European Union (2000) and Japan (2005). In addition, Mexico unilaterally put a zero tariff on imported anti-pollution equipment that is not competitive with locally manufactured equipment.

The Commission for Environmental Co-operation (CEC) was created in 1994 following the entry into force of the North American Agreement on Environmental Co-operation (NAAEC), which accompanied NAFTA. The CEC addresses regional environmental concerns, helps avoid potential trade and environment conflicts, and promotes effective enforcement of environmental law (OECD, 2003). It has contributed to capacity building in Mexico in areas such as sound management of chemicals, pollution prevention and development of a pollutant release and transfer registry. It also set up a citizen submission process whereby residents and non-government organisations can raise issues related to failures to enforce environmental law. Overall, the establishment of the CEC was an innovative development. However, the Joint Public Advisory Committee (JPAC), which advises the CEC Council, recently recommended reviewing the citizen submission process with a view to increasing its impact on enforcement practices (JPAC, 2011). In response to these and other concerns, the CEC Council committed to and directed the implementation of a number of improvements to strengthen the governance of the CEC, including revisions to increase the timeliness, transparency, and accessibility of the citizen submission process, and reinvigorate public participation in the work of the CEC.

The CEC was also mandated to assess the environmental effects of NAFTA. It conducted symposia in 2000, 2003, 2005, and 2008 examining a broad range of environmental effects of

trade in North America (CEC, 2008). A survey on eco-industries was part of this work (Box 3.6). Overall, only anecdotal evidence was found to support the "pollution haven" hypothesis that industry would relocate production facilities to benefit from lower environmental standards. On the contrary, a number of examples indicate that trade within NAFTA has helped improve environmental standards and regulations in Mexico (e.g. in the cement industry).

Increased trade has increased the scale of some activities, notably in the transport sector, where freight transport expanded massively, with associated effects on air quality. Increasing trade among NAFTA countries also spread alien invasive species, introduced through exchange with non-NAFTA countries (Perrault et al., 2003). JPAC recently expressed concern about transboundary movement of used lead acid batteries. Greater trade liberalisation was expected to facilitate diffusion of cleaner technologies and products, but only a few cases of technology diffusion were found, underlining the need to better link local firms with the global value chains of multi-national enterprises. Initiatives such as the Green Supply Chains Program[28] initiated by the CEC have delivered positive outcomes in this regard (Lyon and van Hoof, 2010). In sum, the analysis has shown that the objective of fostering collaboration among the three NAFTA countries on trade and environment issues has not been fully realised. The use of CEC studies for policy making has been limited, and efforts to integrate trade and environment issues have not been effective (Allen, 2012).

Under the NAAEC, the bilateral Border Environmental Co-operation Commission evaluates infrastructure projects for financing through the North American Development Bank (NADB). Since its establishment in 1994, the NADB has contracted a cumulative total

Box 3.6. **Trade and eco-industries in Mexico**

Improved environmental regulations and policies have been the main drivers of demand for and supply of environmental services and equipment in Mexico. The market value of the environmental goods and services (EGS) sector was estimated at USD 5.1 billion or 0.6% of GDP in 2006, up from 0.4% in 1995 (Table 3.2). Although it is difficult to clearly identify the effect of trade, increased influx of foreign manufacturers into Mexico, some of which brought higher environmental standards, contributed to the market growth. Mexican firms represented only 45% of the EGS market in 2006, and the trade deficit in EGS has widened over the years.

The water sector was the main source of employment in the EGS sector in 2009, with 132 484 jobs, followed by waste management (38 805 jobs), material recycling (37 752) and environmental consultancy and services (7 469) (SEMARNAT, 2011a).

Table 3.2. **Environment market and industry in Mexico**

	Mexican market[a] (% of total)		Mexican industry[b] (% of market)	Number of Mexican companies[c]	Imports (% of market)	
	1995	2006	2006	2006	2001	2006
Equipment						
Water equipment and chemicals	7	10	22	200	80	78
Air pollution control	6	4	29	100	75	75
Instruments and information systems	1	2	11	30	90	90
Waste-management equipment	4	5	71	300	40	40
Process and prevention technology	-	1	80	30	20	20
Services						
Solid waste management	16	15	73	1 200	20	28
Hazardous waste management	1	2	56	350	40	40
Consulting and engineering	4	4	50	900	50	50
Remediation/industrial services	8	7	43	120	60	60
Analytical services	-	1	67	70	40	40
Water treatment works	17	19	34	2 340	33	66
Resources						
Water utilities	25	20	57	1 360	33	44
Resource recovery	6	6	21	1 200	70	80
Clean energy systems and power	5	5	17	100	80	86
Total	**100**	**100**	**45**	**8 300**	**46**	**56**
Total (% GDP)	**0.4**	**0.6**	**0.3**			

a) Revenue from Mexican customers of all companies worldwide.
b) Revenue generated by Mexican companies worldwide.
c) Includes enterprises of the public sector, mostly in water, wastewater and waste management.
Source: Ferrier (2010).

of about USD 1.3 billion[29] in loans and grants to finance 154 certified projects for a total cost of USD 3.3 billion (NADB, 2012). About 60% of this funding went to projects in Mexico, and 40% to the US. Loan disbursements in real terms increased sixfold between 2006 and 2010. While historically the priority has been given to water and wastewater treatment, in 2010 air quality projects (road rehabilitation) constituted half of the NADB loan portfolio (NADB, 2010). As a result, progress has been achieved in addressing environmental and

public health problems in the border region. The ten-year Border 2012 Programme recorded: improved access to water and wastewater treatment services, establishment of an air monitoring system; retrofitting of diesel vehicles; remediation of contaminated sites; removal and sound disposal of used tyres; establishment of hazardous waste handling facilities; and development of binational emergency response plans in all 15 sister cities (SEMARNAT-EPA, 2011a). The new Border 2020 Programme includes strategies for: *i)* climate change; *ii)* underserved communities; *iii)* children's health; *iv)* environmental education; and *v)* strengthening of tribal, state, federal and international partnerships (SEMARNAT-EPA, 2011b).

3.2. Information on the economic valuation of biodiversity and forests

Another important type of information useful for prioritising policy interventions concerns the economic value of biodiversity and forests. As many of the benefits associated with biodiversity and forests are not reflected in market prices, economic valuation techniques – a component of cost-benefit analysis – serve to inform efficient resource allocation and use.

While several economic valuation studies have been undertaken in the context of biodiversity and forests in Mexico, only a handful have been used in policy decision making and design. Examples are valuation studies informing the design of the national PES programme, the level of access fees for protected areas and assessments of the impact of bat colonies on agriculture (Box 5.2). There are plans to assess the economic benefits of biodiversity in the context of national climate change adaptation plans under the REDD+ initiative to reduce greenhouse gas emissions from deforestation and forest degradation

Box 5.2. **Results of selected studies on economic valuation of biodiversity and forests in Mexico**

Terrestrial

Protected areas provide economic benefits and cost savings equivalent to almost MXN 49 billion (USD 3.4 billion) a year by storing carbon, protecting water supplies and supporting tourism. It is estimated that every Mexican peso invested (USD 0.07) in protected areas generates 52 pesos to the economy (USD 4) (Bezaury-Creel and Pabon-Zamora, 2009).

Pest control by bats reduces the need for pesticides by an estimated 25-50%; where pesticides are not used, bats reduce production losses by 55%. This natural pest control service is valued at between USD 6.5 million and USD 61.6 million a year (Gandara et al., 2006).

Adger et al. (1994) estimated the total economic value of forests in Mexico. The study placed the annual lower-bound value of the services of the total forest area at about USD 4 billion. This aggregate value stems from the non-marketed services provided by non-consumptive use (e.g. recreation and tourism), from future potential use of the genetic resources and from pure existence values, combined with the functional values of hydrological and carbon cycling, which accounted for the largest proportion of economic value.

Marine and coastal

Sanjuro and Welsh (2005) estimated that in the Pacific mangrove areas, the value of the environmental service was as low as USD 1 per hectare in the current situation of disorganised and overexploited fishery, but could be as high as USD 77 per hectare if optimal fishing effort and catch were present (cited in Guevara-Sanginés, 2009).

In 2002, Mexico introduced entrance fees of USD 1.80 for access to coral reef natural protected areas. To gauge the reaction of visitors to various fee levels, Rivera-Planter and

Munoz-Pina (2005) carried out a contingent valuation survey and constructed aggregate demand for several parks. They explored the benefits and costs of differentiating fees, looking at both revenue maximising and welfare maximising fees. In Cancún, for example, during the high season, revenue maximising fees would be as high as USD 36 for a foreign visitor and USD 20 for a Mexican visitor (see also Section 4.3).

Guevara-Sanginés (2009) drew on a number of studies on economic valuation of biodiversity and ecosystems in Mexico and suggests that in many cases a consumer surplus existed – i.e. full economic potential was not being met.

INE is currently conducting a study on the economic valuation of damage from the 2010 oil spill.

(see climate change chapter). But more comprehensive assessments of the costs and benefits associated with biodiversity would enable more efficient policy design. Notably, INE planned to prepare a national study in 2012 on the economics of ecosystems and biodiversity, in collaboration with CONANP, CONABIO, CONAFOR and the United Nations Environment Programme study on the topic.

More broadly, efforts are under way to integrate biodiversity into national accounts. As discussed in Chapter 3, INEGI calculates the Net Internal Ecological Product (PINE)[6] as part of its National System of Economic and Ecological Accounting. While this exercise is useful on a general level for expressing environmental deterioration as a component of the national accounting system, it cannot yet put an economic value on biodiversity *per se*.

Table 5.1. **Overview of policy instruments for biodiversity and forest conservation and sustainable use in Mexico**

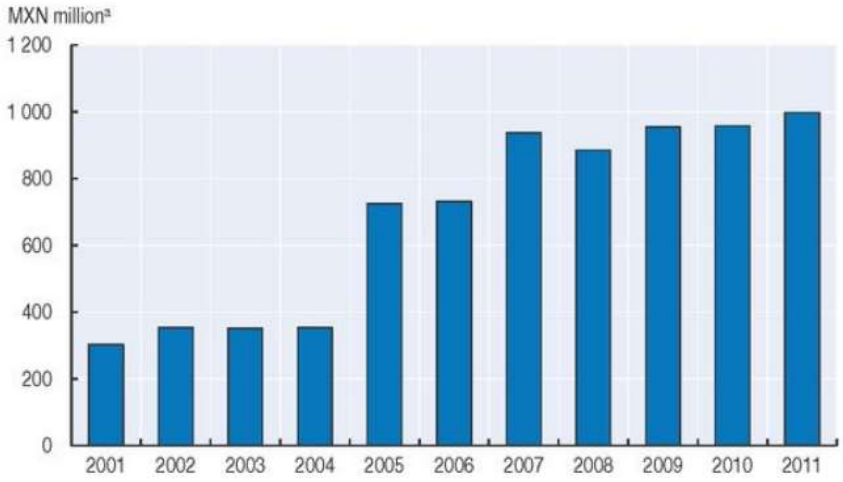
Regulatory approaches	Economic instruments	Voluntary and information
Protected areas (terrestrial and marine)	Access fees for protected areas	Eco-labelling and certification: • Forestry certification (Mexican Standard for the Certification of Sustainable Forest Management* and FSC wood) • Green certification for coffee (Bird-friendly coffee and Rainforest Alliance coffee) • Eco-certification of tourism-related businesses
Ecological land-use plans (ELUPs)	Payments for ecosystem services (PES) (ProÁrbol)	
Fishing permits, logging permits Hunting licenses (e.g. for bighorn sheep)	Reforestation subsidy (ProÁrbol)	
• Ban on harvest, use and trade of all sea turtles and turtle products • Gill net and trawl fishing ban in the vaquita refuge (part of the vaquita PACE) • Ban on shark and stingray fishing (May-August) starting in 2012	Forest Land Use Change Compensation mechanism	
Environmental impact assessment (EIA)	Promotion of Conservation and Sustainable Use of Wildlife, through Management Units for Wildlife Conservation (UMAs) and Facilities for Wildlife Handling (PIMVS) in rural areas	
PACE (Action Programmes for Species Conservation)	Fishery buybacks (part of the vaquita PACE)	
	Wastewater regulation – charges and fees Tradable development rights Sian Ka'an biosphere reserve	

* This allows sustainably managed forests to obtain national certification for their products to be eligible for purchase by the federal government under its green procurement criteria (CONAFOR, 2011).

The study examined the representativeness of eco-regions in the network of federal, state and municipal protected areas. Of the 96 eco-regions evaluated, 11 were found not to be represented, 50 were under-represented and 34 were represented in higher proportions than the percentage protected at national level. In 2006, just over 50% of federal protected areas had personnel for basic operation. Financial resources for protected areas increased from 3.4 pesos (0.3 USD) per hectare in 2001 to 12.7 pesos in 2006 (roughly 1 270 pesos or USD 98 per km^2). Figure 5.6 shows total federal budget spending on protected areas from 2001 to 2011.

Figure 5.6. **Federal budget for natural protected areas**

2001-11



a) At constant 2011 prices.
Source: OECD (2011), *OECD Economic Outlook No. 90;* SEMARNAT, 2011.

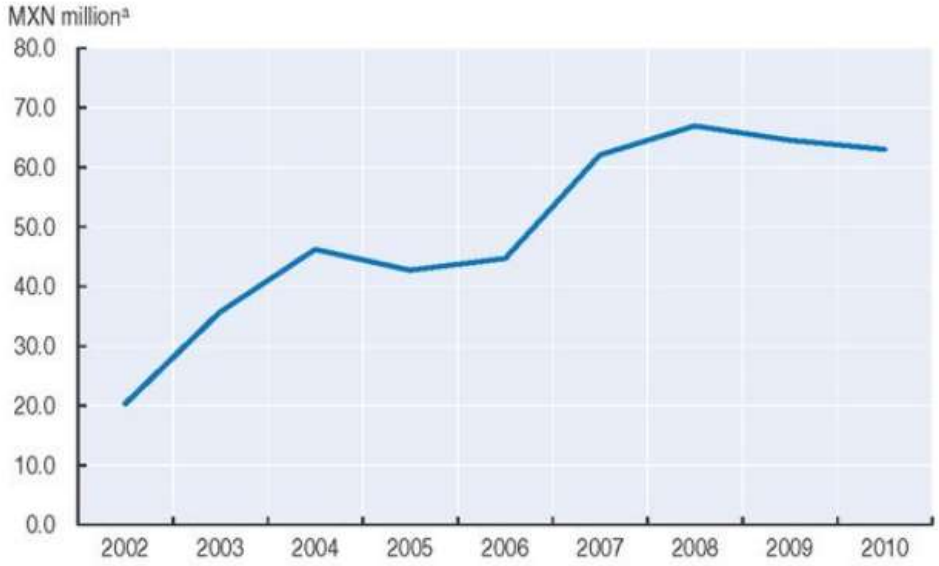
4.2. Economic instruments

As was noted earlier, many economic instruments applied in Mexico concerning biodiversity and forests are subsidy based. There may be a good rationale for such approaches when natural resource users are especially poor, though the objectives and means of achieving them require careful consideration. In Mexico, over 53%% of the forests are owned by local communities – either *ejidos* or indigenous communities (Reyes et al., 2012). Although ownership of forests was legally transferred to rural communities long ago, establishing rights-based land tenure policies, including agrarian reform laws and recognition of indigenous peoples' territories, would provide a sounder basis for conservation and sustainable use of forests and biodiversity. At the same time, opportunities should be sought to reflect the value of ecosystem services and environmental externalities in the pricing system, particularly for those sections of the population that can afford to pay.

Mexico has implemented several economic instruments affecting biodiversity and forest conservation (Table 5.1). Access fees to protected areas, for example, were introduced in 1998; initially the revenue went to the federal government budget, however, so incentives to apply them effectively were weak. This changed in 2001 when, after a request from SEMARNAT, Congress earmarked the revenue for activities in parks (Guevara, 2009). From 2002 to 2010, the number of protected areas participating rose from 13 to 68 (out of 174), and the total revenue collected increased from about MXN 20 million to MXN 63 million (Figure 5.7), equivalent to 7% of the federal budget allocated for protected areas in 2010.

Figure 5.7. **Revenue from charging for access to protected areas**

2002-10



a) At constant 2010 prices.

Source: OECD-EEA (2012), *OECD/EEA Database on Instruments Used for Environmental Policy and Natural Resources Management;* OECD (2011), *OECD Economic Outlook No. 90.*

The revenue raised from these charges is invested in conservation projects for protected areas, and in the *ejidos* (common property land) and communities which live in and around them, to maintain landscapes and biodiversity for the public and visitors alike.

The scope and level of these access fees could be further increased and new ways explored to raise additional finance for protected areas. This will be particularly important as Mexico has a goal of further expanding the coverage of protected areas in accordance with the Aichi biodiversity targets for 2020, as well as Mexico's Vision 2030 and sustainability goals, which state that protected areas are to increase to 16% of the total territory. Management effectiveness can also be further improved.

A widely-known programme in Mexico and abroad is the national system of payment for ecosystem services (PES). The federal government, through CONAFOR, launched two PES initiatives involving forest management: the Hydrological Ecosystem Services Programme (PSAH) in 2003 and the Programme to Develop Ecosystem Service Markets for Carbon Sequestration and Biodiversity and to Establish and Improve Agro-forestry Systems (CABSA) in 2004. These PES programmes involve 3.25 million ha, making Mexico's one of the world's largest PES programmes (Box 5.3). Since 2011, both programmes have been integrated into one with two modalities (hydrological ecosystem services and biodiversity conservation), along with an environmental endowment fund and the promotion of local PES mechanisms through matching funds.

Box 5.3. **The National Programme of Payment for Ecosystem Services**

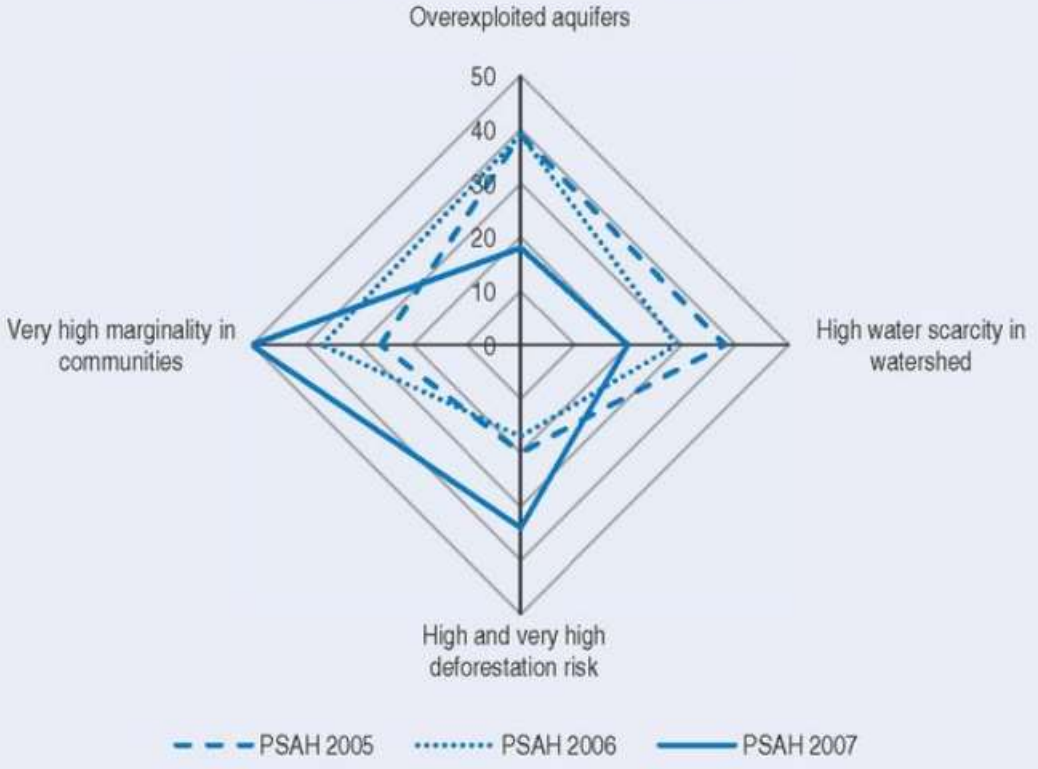
The federal government has established two PES programmes involving forest management: PSAH is aimed at protecting hydrological ecosystems and CABSA concerns carbon sequestration, biodiversity and agro-forestry systems. Payments are made annually. Verification of forest cover through satellite image analysis or ground visits is conducted annually on about half of all enrolled properties (McAfee & Shapiro, 2010). Areas where deforestation is detected are removed from the programme and payments are reduced proportionally. PSAH is funded mainly by a national fee on water use. In contrast, the CABSA budget is negotiated every year in Congress and hence does not have stable, long-term funding. Ecosystem service providers in Mexico are predominantly *ejidos*.

A key feature of cost-effective PES programmes is to target areas with high biodiversity benefits, high risk of loss (to ensure additionality) and low opportunity costs (OECD, 2010a). Mexico has adjusted and revised its PES programme several times to address the first two of these elements. As Figure 5.8 shows, there are trade-offs involved in terms of the priorities of the PES programmes.

Table 5.2 summarises the payment levels that landowners/users are eligible for, depending on the type of ecosystem and the deforestation risk index.

Between 2003 and 2007, PSAH prevented an estimated 18 000 ha from being deforested. However, 1.8 million ha was enrolled in the programme (Muñoz-Piña, Rivera, Cisneros and García, 2011). The conservation impact of PSAH has therefore been fairly low. This can be partly explained by the design of the programme with respect to the weight given to environmental, social and other objectives. In 2006, there were nine selection criteria that could give a maximum of 45 points, which determined plot eligibility. Environmental criteria accounted for over 40% of total points. In 2010 there were 26 selection criteria for up to 106 points. Environmental criteria represented only 19% of possible points, with social and other secondary criteria accounting for the rest. The secondary criteria, which are intended to generate complementarities with other government programmes and ease the administrative process, accounted for more than 65% of possible points (Garcia Romero, 2012). If the PSAH is to meet its intended objective, substantially greater weight should be given to environmental criteria.

Figure 5.8. **Targeting PES in Mexico**



Source: OECD (2010), *Paying for Biodiversity: Enhancing the Cost-Effectiveness of Payments for Ecosystem Services.*

Table 5.2. **Differentiated payments for ecosystem services**

PES eligibility	Payment region	Ecosystem type	Deforestation risk index	Eligible area (hectares)	Payment/ha/year (MXN)
Hydrological	I	Cloud forest	Very high	58 520	1 100
	II	Cloud forest	High, moderate, low	1 558 111	700
	III	Coniferous forest Tropical dry forest Oak forest Pine-oak/oak-pine forest	Very high, high, moderate, low, very low	22 133 267	382
Biodiversity	IV	Tropical rainforest	Very high, high, moderate, low, very low	6 559 680	550
	V	Tropical dry forest Thorn forest	Very high, high	4 531 672	382
		Mangrove	Very high, high, moderate, low, very low		
	VI	Tropical dry forest Thorn forest	Moderate, low, very low	18 677 587	280
		Desert and semi-desert	Very high, high, moderate, low, very low		
		Natural grassland			
Total				**53 518 837**	

Source: SEMARNAT, 2011.

Another economic instrument for forests, adopted in 2005, is the Forest Land Use Change Compensation mechanism. In the case of land-use change for infrastructure, when the projects are of federal jurisdiction and require authorisation by SEMARNAT, a precondition of permission being granted is involvement in this mechanism. It requires successful land-use change applicants to reforest an area at least the same size as the deforested area (usually larger) and with species of the same type, with the aim of redressing the long-term balance of ecosystem cover. In this sense, the mechanism is akin to a biodiversity offset system. A developer is obligated by law to pay into a compensation fund managed by CONAFOR (Box 5.4). However, the current system has not assessed whether the reforestation activities linked to compensation are successful and whether their location and timing truly compensate for the environmental services lost. Better monitoring, reporting and verification are crucial. Timing has also been an issue; to help address it, INE is preparing an initiative in which SEMARNAT will develop a method of banking biodiversity offset credits. In addition, PROFEPA and CONABIO have formulated an agreement to launch an offset-like programme (the Programme for Environmental Restoration and Compensation) that aims to compensate for regulation violations and accidents through the planned restoration or recovery of ecosystems and natural resources on site, or, if that is not possible, avoiding or mitigating damage elsewhere.

Box 5.4. **The Forest Land Use Change Compensation mechanism**

The Biodiversity Code requires the environmental authorities to ensure that negative impacts of projects on wildlife and habitats are avoided, prevented, repaired, compensated or minimised. More specifically, Article 2.306 of the code stipulates that when *in-situ* reparation of environmental deterioration is impossible, it will instead be subject to

Biodiversity Restoration and Preservation Fund (Fondo para la Restauración y Preservación de la Biodiversidad), managed by CONAFOR.

The valuation of the indemnity in monetary terms can be carried out by SEMARNAT, the Environmental Protection Administration (Procuraduria de Proteccion al Ambiente del Estado de Mexico), qualified experts, educational institutions or research institutions (Darbi et al., 2009). The project developer can choose whether to create its own offset or to pay into the compensation fund. An example of a developer-created offset is PEMEX's Jaguaroundi project, in which the state oil company aggregated its required offsets into a single 961 ha tract of tropical rainforest near PEMEX refineries.

If the developer chooses instead to pay into the fund, Mexican legislation requires a compensation ratio greater than 1:1, with CONAFOR responsible for setting the ratio. CONAFOR then uses the resulting money to complete reforestation activities on behalf of the developer. The compensation amount per hectare is calculated using the average cost of reforestation activities (not including the cost of purchasing the land) instead of an estimate of the value of the environmental service affected.

Complementing these programmes is "ProÁrbol",[15] which includes a national reforestation programme, PRONARE. Managed by CONAFOR, PRONARE gives support to landowners/users for reforesting degraded forest land, providing seedlings, training and funding. Since 2007, 1.87 million ha have been reforested. A study has indicated that without this programme, the total area reforested annually in Mexico would be only 10% of

its present total (UACH, 2010). It is not clear, however, if this finding reflects the area of land where seedlings have been replanted, or, more comprehensively, if it reflects monitoring to assess tree survival over time. Secondary support was later introduced to the reforestation programme to protect and maintain reforestation. As demand for this support is considerably oversubscribed, additional features should be added to target and prioritise payments to areas with high benefits and high probability of enhancing provision of ecosystem services (similar to the PES programme). Indeed, as the eventual objective of the reforestation programme is to restore ecosystems and habitats for biodiversity, the design features should be adjusted so as to further these ends.

In response to increasing demand and interest of landowners regarding access to new productive activities in rural areas, in 2010, SEMARNAT launched the subsidy programme "Promoting the Conservation and Sustainable Use of Wildlife, through Management Units for Wildlife Conservation (UMAs) and Facilities for Wildlife Handling (PIMVS) in rural areas". This programme is aimed at poverty eradication in the local communities with the lowest human development index by supporting the establishment of management units for wildlife conservation (UMAs) for income and employment generation. Since 2010, 504 projects for establishing UMAs or reinforcing existing ones have been subsidised by this programme with a total of 225 million pesos. These new UMAs are now part of the SUMA, which covered more than 37 million ha as of 2012.

To assess the effectiveness of UMAs with respect to conserving species populations and their habitats, CONABIO is co-ordinating a project with financing from SEMARNAT that will include gathering data from the field.

Another subsidy programme concerns sustainable fishing promotion and conservation of the vaquita, probably the world's smallest and most at-risk cetacean.

Since 2007, fishing in the northern California Gulf has been influenced by programmes and subsidies co-ordinated through a PACE for the vaquita. One element of the PACE is buyouts for fishers who are willing to stop fishing or "switch-outs" for those who agree to switch to alternative, vaquita-safe fishing methods. As of 2008, these subsidies resulted in the gill net permits being retired for about one-third of the legal fishers (Barlow et al., 2009). Switch-out subsidies have encouraged "technological reconversion" by helping replace gill nets and tangle nets (which have been responsible for accidental capture and drowning of vaquitas) with more sustainable alternatives, and buyout payments have helped encourage "productive reconversion" by giving fishers an incentive to take up other activities, including some directly related to biodiversity conservation. These measures are believed to have helped reduce threats to the conservation of vaquitas and to have begun decreasing the total level of fishing in the area, with conservation benefits for other marine species.[16] Table 5.3 gives a breakdown of the subsidies in the PACE for the vaquita.

4.3. Voluntary agreements and other instruments, including private sector engagement

Mexico has some voluntary agreements and information instruments, notably for green certification. Green certification has been established for products including coffee; 10% of all coffee producers in Mexico are in the certified coffee market, a higher percentage than in other countries. Although timber certification has also increased (with almost 1.8 million ha of forest certified or in the process of being certified by national and international standards), illegal timber extraction remains a major challenge. Eco-certification of tourism-related businesses presents key opportunities, especially as this is a large

Table 5.3. **PACE subsidy breakdown**

By year (MXN)

PACE subsidy type	2007	2008	2009	2010	**Total**
Technological reconversion	4 200 000	30 000 000	24 850 000	15 300 000	**74 350 000**
Productive reconversion	30 800 000	97 700 000	7 700 000	300 000	**136 500 000**
Conservation activities	–	25 341 500	21 249 000	31 620 000	**78 210 500**
Technological development	–	–	7 310 000	17 250 000	**24 560 000**
Subtotal	35 000 000	153 041 500	61 109 000	64 470 000	**313 620 500**
Operational costs and technical assistance	757 475	2 225 154	1 361 670	1 563 175	**5 907 473**
TOTAL	**35 757 475**	**155 266 654**	**62 470 670**	**66 033 175**	**319 527 973**

Source: CONANP, 2011, Unpublished data.

StatLink http://dx.doi.org/10.1787/888932756174

growth sector; such opportunities should be further encouraged and developed (see also Section 4.2).

While some initiatives have been undertaken by the private sector (Box 5.5), further efforts are needed to engage the private sector in biodiversity and forest conservation and sustainable use, whether via voluntary approaches or through the use of regulatory approaches and economic instruments. Taxes on timber and other natural resource extraction, for example, can help provide correct price signals, induce more sustainable production and consumption patterns, and mobilise revenue.

Box 5.5. **Engaging the private sector in biodiversity conservation and sustainable use**

An alliance between WWF, SEMARNAT and the Carlos Slim Foundation, formed in 2009, has promised to mobilise USD 100 million to undertake actions that strengthen biodiversity conservation and sustainable development in Mexico. The initiative planned to target 17 natural reserves in six regions, including the northern deserts, tropical Caribbean beaches and eastern jungles. In co-ordination with beneficiaries of the Programme for Species at Risk (PROCER), the alliance partners invited other private sector organisations to become involved in efforts to implement the projects concerned. It is not clear to what extent such support has materialised.

Mexico should also work further to raise awareness in the private sector on the business risks and opportunities associated with biodiversity and forests. This can be undertaken through channels such as information on websites, training workshops and co-operation with state and municipal government. Such efforts have been undertaken in the context of climate change (including the development of guidelines – see Chapter 4), which could be used as models to develop such tools for biodiversity.

4.4. Public expenditure on biodiversity and forests

The SEMARNAT budget in 2011 was MXN 51.2 billion (see Chapter 2). The CONANP's share in 2011 was MXN 0.99 billion (1.9%), an increase from MXN 0.35 billion in 2002. CONAFOR's budget was MXN 6.46 billion (i.e. 12.6%), a threefold increase in real terms since 2002. In comparison, the SAGARPA budget in 2011 was MXN 73.00 billion. Mexican data indicate that expenditure on biodiversity increased from MXN 2.56 billion in 2001 to MXN 8.41 billion in 2009, although the categorisation of data is not consistent over the years, making comparison difficult.

While the data are not complete, Salcido et al. (2009) examined financing sources for a sample of 1 013 conservation projects in Mexico and found that the public sector contributed the largest share (74%), followed by funds and foundations (18%), with the private sector accounting for just 0.06%.[17]

5.2. *Biodiversity and tourism*

Tourism is the third most important economic activity in Mexico, generating more than 8% of GDP. In 2000, SECTUR, in co-operation with SEMARNAT, CONABIO and several other institutions from the public, private, social and academic sectors, published a National Policy and Strategy for Sustainable Tourism, with useful guidelines and action plans. More recently, the 2009 General Law on Tourism included clauses relating to sustainability. Within the Sustainable Tourism Programme in Mexico, SECTUR diagnosed major destinations so as to identify priorities for promoting sustainable tourism, and is currently working to promote eco-certification of tourism-related businesses, in conjunction with the Rainforest Alliance and EarthCheck programmes,[19] so as to comply with the Global Sustainable Tourism Criteria. Between 1997 and July 2011, for example, a total of 4 828 Clean Industry certificates and Environmental Quality certificates (including tourism quality) were issued. Ecotourism is an important sector with green growth potential and should be further promoted. In addition to access fees for federal protected areas and reserves, other instruments to capture the international public good benefits provided by protected areas should be explored (see also Alpizar, 2006). For instance, in Belize, an environmental tax is levied on visitors upon departure.