

# Environmental Performance Reviews

## PERU

2016

Highlights and recommendations



UNITED NATIONS

ECLAC



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This is a joint publication of the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and the Organisation for Economic Co-operation and Development (OECD). This work is published under the responsibility of the Secretary-General of OECD and the Executive Secretary of ECLAC. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the ECLAC or OECD member countries.

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This document sets out the background and main environmental trends for the core period covered by the review (2003-2013) and the conclusions and recommendations resulting from a joint ECLAC-OECD mission to Peru undertaken from 31 August to 5 September 2015. A draft of this document was presented and discussed at the OECD Working Party on Environmental Performance, held in Paris from 8 to 10 March 2016.

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## FOREWORD

The Republic of Peru has experienced notable economic growth in recent years. Between 2005 and 2015 Peru's gross domestic product grew by an annual average of 5.8%, owing to a combination of macroeconomic stability, openness to trade and growing inflows of foreign direct investment attracted by the country's wealth of natural resources and high commodity prices. Despite the marked significance of this growth phase, the challenge that remains is to transform that growth into more inclusive and sustainable economic development.

Peru is a multicultural and megadiverse country with abundant ecosystems and natural resources and an age-old tradition of managing its resources sustainably. However, the increasing pressure of the extractive industry, unplanned urbanization and deforestation are threatening both this natural heritage and the well-being of the Peruvian people, undermining what could be the foundations of solid long-term growth.

The country's high vulnerability to environmental changes, particularly those caused by climate change and extreme weather events such as El Niño, poses additional challenges to the development model. It is therefore ever more necessary to develop an institutional environmental strategy to ensure that economic progress goes hand in hand with proper environmental protection and that costs and benefits are shared fairly. That strategy must also promote the sustainable use of the natural heritage and anticipate environmental changes in order to help boost resilience.

During the period under review—from the early 2000s to the present—significant progress has been made towards this end: the legal framework and environmental institutions have been strengthened, information systems have been improved, management tools that integrate economic and environmental components have been applied and progress has been made in defining a green growth strategy. Efforts made in environmental education, promoting citizen participation and access to justice on environmental matters are contributing to a more aware and active society in support of sustainable development.

Continuing to promote sustainable growth requires a State commitment to actively incorporate environmental protection into economic and sectoral policies, building synergies with environmental policy. Peru has good environmental indicators, including moderate waste generation, a small vehicle fleet and a limited contribution to climate change. This situation may make it easier to promote the changes needed to achieve sustainable development.

The aim of this environmental performance review is precisely to help Peru assess its progress towards achieving its environmental goals, enrich and ensure that the necessary policy dialogue continues uninterrupted, promote better accountability and deepen the awareness of all actors involved in the economic and social development of Peru. The 66 recommendations included in this study target some of the country's main environmental challenges:

- Continue to strengthen environmental institutions and environmental management systems at all levels, and ensure the effective implementation of environmental protection policies.
- Ensure that the green growth strategy is a central pillar of development that involves sectoral ministries and makes them responsible for the environmental impact of their policies.
- Promote greater use of economic instruments for environmental management, particularly environmental taxes, and eliminate damaging subsidies.

- Ensure better environmental management in the extractive industries, tackling informality, improving the handling of chemical and dangerous substances and combating their negative effects on biodiversity and ecosystems.
- Incentivize the sustainable use of the country's rich natural heritage and the opportunities it generates for eco-innovation and the development of new economic sectors.
- Continue strengthening information systems, education, participation and justice in environmental matters with a view to raising awareness of sustainable development throughout the country.

This review has been prepared by the Economic Commission for Latin America and the Caribbean (ECLAC) and the Organisation for Economic Co-operation and Development (OECD) and it benefited from the constructive dialogue between Peru and the countries participating in the OECD Working Party on Environmental Performance. This joint effort helps to build awareness of the situation in different countries and facilitates continuing collaboration both among countries and with ECLAC and OECD, especially in the current framework of the 2030 Agenda for Sustainable Development and the Paris Agreement on climate change, which urge the international community to work decisively towards sustainable development and the common well-being of all people.

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## Chapter I

**BACKGROUND AND KEY ENVIRONMENTAL TRENDS****INTRODUCTION**

This chapter presents some of the environmental trends observed in Peru between the years 2003 and 2013, the core period analysed in this assessment. It also highlights the main achievements and remaining challenges on the road to green growth and sustainable development. This chapter is based on indicators from national and international sources, and takes as its point of reference the Green Growth Strategy of the Organization for Economic Cooperation and Development (OECD, 2011). After a brief description of Peru's physical features and its socioeconomic context, the chapter outlines the principal environmental tendencies and, in particular, the progress that has been made in the efficient use of energy and natural resources and in enhancing environmental quality. This chapter is intended to establish a baseline for the subsequent chapters, which will evaluate whether the application of environmental policies in Peru has succeeded in influencing these trends, and whether their objectives have served to create economic opportunities. It also sets in context the main conclusions and recommendations.

While Peru's economy is the seventh largest in the region, in recent years it has demonstrated a dynamism that has made it the region's second fastest-growing economy over the years 2003-2013. The main engines driving this growth are the combination of domestic macroeconomic policies and favourable external conditions linked primarily to rising commodity prices.

The socioeconomic progress of recent decades has been reflected both in per capita incomes, which have risen by more than 60%, and in the poverty rate, which fell from 52% to 24% in 2013.<sup>1</sup> Yet the country still faces a great challenge in terms of various dimensions of well-being, which betray persistent inequality and widespread labour informality. Moreover, the growing middle class is placing new pressures on public services such as education, health and transport (OECD, 2015).

Peru's environmental performance must be analysed from the viewpoint of a middle-income country that is experiencing significant economic growth based on the exploitation of renewable and non-renewable natural resources such as fisheries, metal mining and hydrocarbons. Along with its great wealth of mineral deposits, the country has abundant water resources (although distribution is uneven) and a broad biodiversity that places it among the world's leading megadiverse countries. It has the second largest forested area in Latin America, abounds in ecosystems, species and genetic resources and has a rich cultural heritage.

Over the last decade the country's environmental institutions have been strengthened through the adoption of the General Environment Act of 2005 and subsequent creation of the Ministry of the Environment (MINAM), the Peruvian National Protected Areas Service (SERNANP) and the Agency for Environmental Assessment and Enforcement (OEFA) in 2008. Also to be noted is the establishment of the National Service of Environmental Certification for Sustainable Investments (SENACE) in 2012.

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<sup>1</sup> See Economic Commission for Latin America and the Caribbean (ECLAC), CEPALSTAT database.



## Box I.1

**Peru: physical, economic and social context****Physical context**

Peru has the third largest land area among South American countries, covering 1,285,215.6 km<sup>2</sup> in the western part of the region and to the south of Ecuador. It has 7,062 km of land boundaries, including those to the north with Colombia and Ecuador (1,494 km and 1,529 km respectively), to the east with Brazil (2,659 km), to the south-east with Plurinational State of Bolivia (1,212 km) and to the south with Chile (168 km). To the west lies the Pacific Ocean, with a coastline of 2,414 km. The country is exposed to various risks associated with natural phenomena such as earthquakes, tsunamis, flash flooding, landslides and volcanic activity.



**Note:** The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations or OECD.

The country's relief is highly varied, with zones of difficult accessibility. The three main geographical regions are: (i) the coastal region, covering 12% of the territory, characterized by extensive plains with dry and sandy soils; (ii) the Sierra, covering 28% of the territory, which has a sharply accentuated and varied relief dominated by the Cordillera of the Andes, where the highest point of elevation is the Nevado Huascaran (6,768 metres above sea level); and (iii) to the east, the Amazon *Selva* or forest zone, which covers 60% of the national territory, divided into the *Selva Alta* (High Forest) and the *Llano Amazónico* (Amazon Lowlands), and is characterized by its slopes and plains.

There are three major watersheds or hydrographic regions: the Pacific, the Amazon, and the endorheic or closed basin of Lake Titicaca. These regions embrace 159 hydrographic basins (lakes, lagoons, rivers and swamps). The Amazon watershed contains around 98% of the available surface water. The rivers of the coastal region are characterized by their steep slope and short length, their heavy transport of sediments and their irregular discharges. The rivers of the Sierra are located in narrow valleys, with heavy erosion in the basins and with the potential for hydrological development, while the rivers of the Selva are wide and mighty, with little incline and with long and winding courses. The longest rivers are the Camaná (375 km) and the Chira (334 km), while those with the greatest flow are the Santa (177 m<sup>3</sup> per second) and the Tumbes (123 m<sup>3</sup> per second).

## Box I.1 (continued)

Peru has tropical and subtropical climates, and microclimates influenced by the presence of the Humboldt Current, the Cordillera of the Andes and the Amazon River. The prevailing climate of the coastal zone is arid. The Sierra presents a varied climate, due to its different levels of elevation, with low temperatures frequent in the heights of the Andes. The climate in the Amazon basin is hot and humid with abundant rainfall.

The country has numerous ecosystems that are distributed across the length and breadth of the land. The main continental ecosystems are the tropical forests, the dry forests and the fragile ecosystems. This variety has produced conditions whereby Peru is considered one of the 17 megadiverse countries. At least 20,375 species of flora have been counted, along with 523 mammals, 1,847 birds, 446 reptiles and 1,070 marine fish. The country also contains 84 of the planet's 117 life zones.

### **The economy**

The Peruvian economy is the seventh biggest in Latin America and the Caribbean, and its great dynamism makes it the second fastest-growing in the region. GDP rose at an annual pace of 6.4% between 2003 and 2013, above the average for the OECD and for Latin America and the Caribbean. Per capita GDP rose on average by 5% over the same period.

Per capita income was, on average, one quarter of the OECD level for the period 2003-2013. The income gap has diminished, thanks to higher labour productivity and higher employability rates for a growing workforce (World Bank, 2011).

Peru's growth has been steady, with a slight slowing in the year 2009 due to the global economic crisis. During the period of analysis GDP nearly doubled. GDP growth for 2015 is estimated at 3.6%, driven primarily by the mining industry (ECLAC, 2015a).

The manufacturing share of GDP rose from 33% in 2003 to 37% in 2012, above the OECD average of 24%. The share of services in GDP is 56%, and agriculture represents 7%. The agriculture sector accounted for 25.5% of the economically active population in Peru in 2013 (ECLAC, 2013).

One of the biggest contributors to the economy is the oil and mining sector, which accounted for 12.1% of GDP in 2013. More specifically, crude oil and gas extraction and related services contributed 2.7%, and mining and related services 9.4% (INEI online statistics).

Trade in goods and service rose from 37% to 49% of GDP, and while it remains below the OECD average it has reached proportions similar to the average for Latin America and the Caribbean. Peru's most important trading partners are the United States and China. The principal export products are copper and gold, which together represent 40% of the value of Peruvian exports. The main imports relate to commodities and intermediate goods such as fuels, lubricants and pharmaceutical chemicals. Imports of capital goods such as industrial machinery are also significant.

Total investment averaged 22% of GDP over the period under analysis. Private investment is very high and represents 17% of GDP (World Bank, n/d).

Between 2003 and 2013 net foreign direct investment flows to Peru rose by 619%, and Peru is currently the fourth largest recipient of FDI in Latin America and the Caribbean.

Peru's total external debt declined considerably during the period, from 50.4% of GDP in 2003 to 30.3% in 2013.

Total public debt, external and domestic, dropped from 48.7% of GDP to 19.6% over the period 2003-2013. The main component of this debt at the beginning of the twenty-first century was with the external sector (38.4% of GDP). However, this amount has shrunk to 8.8% of GDP.

Central government current revenue rose gradually between 2003 and 2013, from 15.4% of GDP to 18.9% of GDP, while total expenditure remained relatively stable, recording a slight increase from 17.3% of GDP to 18.6% of GDP.

At the municipal level, revenues and expenditures have risen sharply, by 86% and 105% respectively. In the last year municipal revenues reached 4.3% of GDP and non-financial expenditures 4.5% of GDP.

Revenues from "green taxation" are dominated by the excise tax on fuels, which in 2012 produced 2.6% of central government revenues. Public spending on the environment reached 0.4% of GDP in that year.

### **Society**

The 2013 population of Peru is estimated at 30.5 million (INEI online statistics). According to the 2007 population census some 25% of the population is indigenous, concentrated primarily in the Sierra zone. Population density is low: in 2013 there were 24 persons per square kilometre. This figure is below the averages for the OECD and for Latin America and the Caribbean.

The population is relatively young: around 56% is under 30 years of age. However, the population is expected to grow at steadily slower rates while life expectancy will increase, pointing to a gradually ageing population.

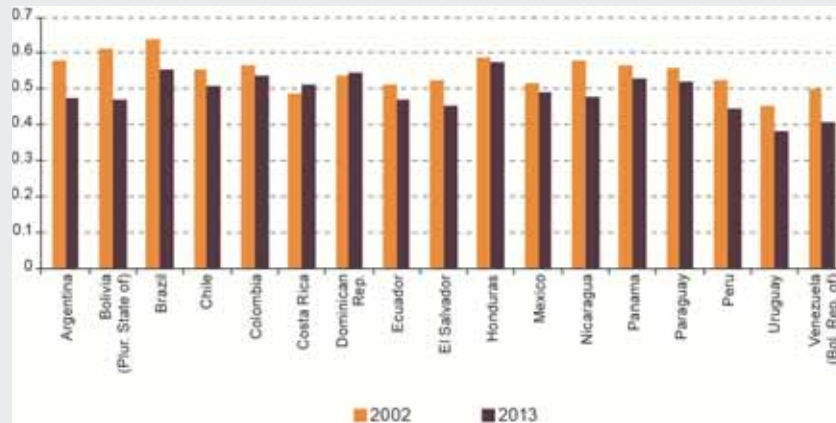
The majority of the population lives in the coastal zone, with more than 31% in the Department of Lima. Over 75% of the population lives in urban areas, and this proportion is expected to increase over time.

## Box I.1 (concluded)

The unemployment rate is below the OECD average (around 8%), and has fallen over the last decade from 10% in 2003 to 4% in 2013. Informal non-farm employment has also declined, dropping from 75.2% of the economically active population in 2004 to 68.6% in 2012, thanks to economic growth and institutional factors (ILO, 2014).

With a Gini index of 0.44 for the year 2012, inequality in Peru is greater than that in most OECD countries (with the exceptions of Chile and Mexico), but less than in the majority of Latin American countries. The highest income decile receives around 34% of all income generated in the country, while the share of the poorest decile is only 1.4%.

**Latin America (17 countries): income inequality, 2002 and 2013**  
(Gini index)



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), *Desigualdad, concentración del ingreso y tributación sobre las altas rentas en América Latina*, J.P. Jiménez (ed.), ECLAC Books, No. 134 (LC/G.2638-P), Santiago.

The percentage of the population living below the national poverty line has declined significantly from 52.5% in 2003 to 23.9% in 2013. At the present time, rural poverty stands at 48% and urban poverty at 16%.

Life expectancy at birth is 74.8 years, below the OECD average (80 years) but similar to the average for Latin America and the Caribbean.

Expenditure on health rose slightly from 4.7% to 5.3% of GDP over the period 2003-2013. This percentage is less than half the average figure for the OECD, which is 12.3% of GDP, and it is below the average for Latin America and the Caribbean (7.7% of GDP).

Although the infant mortality rate remains high in comparison with OECD countries, it has dropped considerably over the period, from 24.1 to 14.2 deaths per thousand live births. There is a wide geographical variation in this indicator: for example, in 2011 the figure was 9 in the department of Tacna, while in Puno it was 40.

Chronic malnutrition among children under 5 years of age has been declining steadily, from 28.5% in 2007 to 17.5% in 2013. In that latter year, the rural rate was 32.3% and the urban rate was 10.3%.

Spending on education falls short of the OECD average, and remains at around 3% of GDP and 15% of government spending.

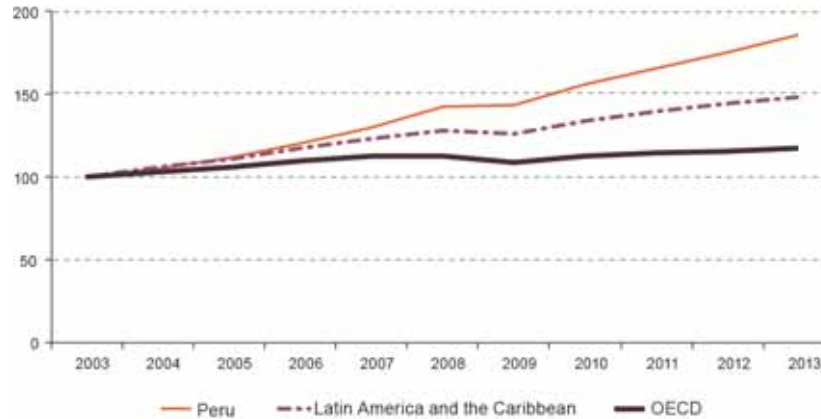
As to the quality of education, the census evaluation of 2013 conducted by the Ministry of Education shows that 16.8% of grade 2 pupils in primary school performed adequately in mathematics, and 33% in reading comprehension. In the latest (2012) testing under the Programme for International Student Assessment (PISA) of the OECD, Peru ranked last among the 66 countries participating.

The illiteracy rate among the population aged 15 years and over declined from 10.5% to 6.2% over the period 2003-2013. However, there are still discrepancies between zones: the rural rate is 15.8% and the urban rate is 3.5%.

**Source:** Economic Commission for Latin America and the Caribbean (ECLAC) on the basis of World Bank, *Perú en el umbral de una nueva era: lecciones y desafíos para consolidar el crecimiento económico y un desarrollo más incluyente*, vol. I, 2011 [online] <http://documents.worldbank.org/curated/en/2011/03/14180496/peru-en-el-umbral-de-una-nueva-era-lecciones-y-desafios-para-consolidar-el-crecimiento-economico-y-un-desarrollo-mas-incluyente>; Economic Commission for Latin America and the Caribbean (ECLAC), *Economic Survey of Latin America and the Caribbean, 2015* (LC/G.2645-P), Santiago, 2015; *Statistical Yearbook for Latin America and the Caribbean, 2013* (LC/G.2582-P), Santiago, December, 2013; CEPALSTAT database; National Institute of Statistics and Informatics (INEI), “Estadísticas” [online] <https://www.inei.gov.pe/>; World Bank, World Development Indicators (WDI) [online] <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators#>; and International Labour Organization (ILO), “Trends in informal employment in Peru: 2004-2012”, *Notes on Formalization, 2014* [online] [http://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/documents/publication/wcms\\_245891.pdf](http://www.ilo.org/wcmsp5/groups/public/---americas/---ro-lima/documents/publication/wcms_245891.pdf).

The significant economic growth of recent decades, however, has imposed various pressures on the environment, and these have been exacerbated by the degree of informality in the economy and by certain illicit activities (such as illegal mining and logging) which have made it difficult to increase the degree of environmental monitoring and control in areas remote from urban centres.

Figure I.1  
**Peru: GDP performance, 2003-2013**  
*(Index: 2003=100)<sup>a</sup>*



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of World Bank, International Comparison Program.

<sup>a</sup> Index of relative change based on GDP valued in international dollars at constant 2011 prices at purchasing power parity.

Energy production has evolved in line with economic growth. A comparison with OECD countries shows that the total primary energy supply per capita is low, and an analysis of energy intensity per unit of output suggests room for efficiency gains. The energy mix has shifted substantially over the last decade, due to the sharp increase in natural gas production. The renewable energy component of the mix is greater than that for the OECD, and the share of biofuels and solar energy together amounts to 9% of domestic supply. The transport sector accounts for the largest share of energy consumption and of emissions from combustion, and it has been growing apace with GDP.

While the country's contribution to global emissions of greenhouse gases is low, nationwide emissions caused by deforestation and changes in land use are significant. In recent years, carbon emissions per capita have risen slightly, but they remain below the OECD average, and emissions per unit of GDP have remained stable.

Aggregate estimates for the country show increases in emissions of particulate matter and nitrogen oxides, together with a slight reduction in emissions of sulphur dioxide. Air quality measurements in Lima-Callao point to a decrease in concentrations of polluting materials, explained primarily by the improved quality of fuels, something that also seems to be happening in other densely populated cities of the country. Sources of pressure on air quality include the growing size of the automotive fleet, the use of fossil fuels, and certain other large-scale productive activities.

The Atlantic (or Amazonian) watershed has an abundant availability of water, in contrast to the Pacific slope, which has a water shortage and which moreover contains a high percentage of the

population. Over the last decade, the national water supply has remained steady, thanks to the increased extraction of water from subterranean sources. The heaviest demand for water consumption comes from agriculture, followed by the demand for drinking water. In terms of non-consumption uses, the energy sector is especially important. The proportion of the population using improved drinking water sources is estimated at 86%, and the proportion of those using improved sanitation facilities at 75%. These percentages are sharply lower in rural areas: water access coverage in many zones is only partial and water is delivered for only a few hours a day.

Although the last decade has seen significant progress in water monitoring, quality and treatment, there is still much room for improvement. As a result of various public policies and evolving environmental pressures, some types of illnesses have declined over time, such as acute respiratory diseases and acute diarrhoea in children. Nevertheless, the prevalence of diarrhoea among the population remains high. Isolated cases of heavy metal poisoning have also been reported.

The available data suggest an increase in the productivity of domestic material consumption per unit of output. In Peru, per capita waste production is lower than the average for the OECD: there are 11 sanitary landfills for the treatment and final disposal of solid waste, and nearly half of municipalities have developed comprehensive plans for the environmental management of solid waste.

Climatic conditions allow the cultivation of numerous and varied crops. Agricultural production for export is concentrated in the coastal zone and, despite the scarce availability of water, the zone is home to plantings of cotton, coffee, mangoes, lemons, asparagus, grapes, avocados and oranges, among other crops. The Sierra region is characterized by dry-land farming, where the typical crops are cereals, vegetables, garden produce and tubers. Agriculture in the Selva is dominated by plantations of coffee, cocoa, palms, fruits and timber-yielding species. The use of nitrogen- and phosphate-based fertilizers per hectare of arable land has risen apace with the volume of agricultural output. For the year 2012, this indicator is below that for the OECD and below the average for Latin America and the Caribbean.

The land area covered by forests amounts to more than half of the national territory, and is located for the most part in Amazonia. The greatest part of the forest is of the tropical type (54% of land area), followed by dry forest (3%) and Andean forest (0.2%). Peru has the second largest expanse of Amazonian forest, and the services provided by its ecosystems are of great economic, social and cultural importance. During the years 2003-2012, the land area covered by forest declined by just under 2%: the Amazonian region was most affected by the process of deforestation, reflecting the conversion of land to farming and livestock uses by small-scale producers. Clearing of the country's humid Amazonian forest exceeds 113,000 ha per year, and has occurred primarily in unclassified forests where there is no system of administration or protection.

Peru's marine resources are diverse, and there are many species of fish, molluscs, crustaceans and algae to be found all along the coast. The high productivity of the country's marine resources can be attributed to the Humboldt Current, which increases and distributes nutrients and food for fish and invertebrates. Peru has the world's largest fishery based on a single species, the anchovy, and it is one of the biggest producers in terms of catch, although this has been declining over the last decade. Among the greatest pressures on the marine ecosystem are the growing percentage of industries and of population along the coast, the introduction of exotic species, by-catch, and illegal fishing.

The country has abundant non-renewable resources that are an important source of foreign exchange. Exploitation of crude petroleum and natural gas reserves has given the country energy self-sufficiency. Domestic demand for oil is not fully covered by domestic production, and around 60% of oil

processed in the country is imported. However, domestic output of natural gas has risen sharply over the last decade, bringing about important changes in the composition of the energy mix which has shifted from petroleum-intensive to a natural gas base. Peru also has large reserves of metallic ores, and is among the leading world producers of copper, gold, zinc, silver, lead and tin. Mining output has been growing steadily over time, and in 2013 mineral exports represented 61% (US\$ 25.545 billion) of the country's total exports.

## **A. PROGRESS TOWARDS SUSTAINABLE DEVELOPMENT: MOVING TOWARDS A LOW-CARBON ECONOMY AND ENERGY AND RESOURCE EFFICIENCY**

### **1. Carbon and energy intensities**

#### **(a) Greenhouse gas emissions**

According to figures from the World Resources Institute (WRI), total emissions of greenhouse gases (including changes in land use) in Peru amounted to 0.34% of global emissions, and 3.5% of emissions in Latin America and the Caribbean. If changes in land use and deforestation processes are excluded, greenhouse gas emissions would be in the order of 0.2% of worldwide emissions, and 2.5% of the region's emissions. During 2012, emissions from changes in land use and deforestation represented 46% of total greenhouse gas emissions in Peru, and over the period 2003-2012 these rose by 60%.

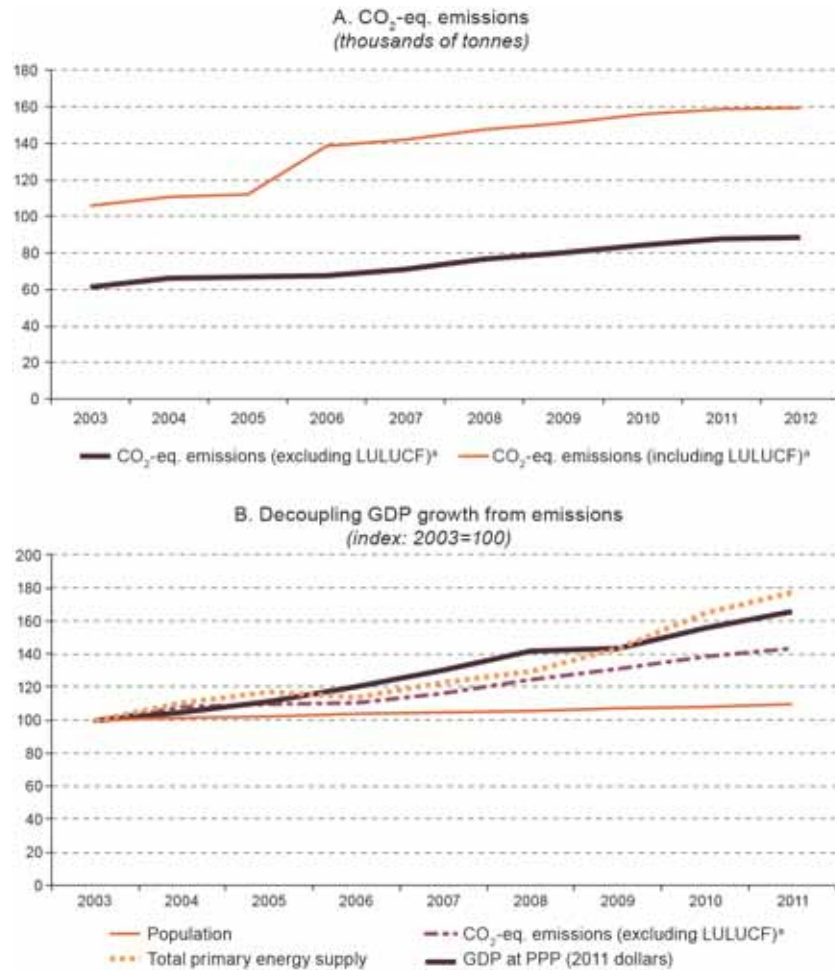
The International Energy Agency (IEA) reports that in 2012 Peru's CO<sub>2</sub> emissions from fossil fuel combustion —without including those from land use change— represented 0.14% of worldwide emissions, and they have increased by 82% since 2003.

A sector breakdown of emissions from fossil fuel consumption reveals that 39% derive from transportation, and 25% from electricity and heat generation. These proportions differ from the OECD average, where 28% of emissions are associated with transportation and 40% with power and heat generation (IEA/OECD, 2014). The lower proportion of emissions from electricity and heat generation reflects the fact that Peru's energy mix consists to a high degree of natural gas and hydropower.

The IEA also reports that, between 2003 and 2012, Peru's per capita emissions of CO<sub>2</sub> increased by 65%, while emissions per unit of GDP remained stable. The intensity of emissions in 2012 was 1.53 tonnes of CO<sub>2</sub> per capita, which is 16% of the average per capita intensity in the OECD. Currently, 0.15 tonnes of CO<sub>2</sub> is being emitted for every US\$ 1,000 of GDP (in terms of 2005 purchasing power parity), well below the average for the OECD (0.31 tonnes) and for Latin America and the Caribbean (0.23 tonnes).

The ratio between CO<sub>2</sub> emissions and primary energy supply has been declining over time. Over the period 2003-2013 this indicator fell by 1.6%, in line with the OECD trend, which dropped by 3.5%. Nevertheless, the ratio between CO<sub>2</sub> emissions and final energy consumption rose by 14%, while it declined across OECD countries by 3.6%.

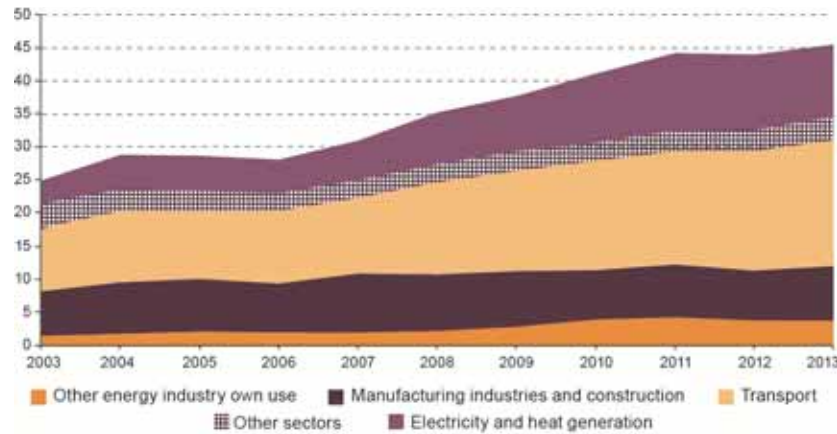
Figure I.2  
Peru: emissions of carbon dioxide equivalent (CO<sub>2</sub>-eq) and decoupling GDP growth from emissions, 2003-2013



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Carbon Dioxide Information Analysis Center (CDIAC) and World Resources Institute (WRI), CAIT Climate Data Explorer, 2015 [online] <http://cait.wri.org>.

<sup>a</sup> Land use, land-use change and forestry.

Figure I.3  
**Peru: energy-related carbon dioxide emissions by sector, 2003-2013**  
*(Thousands of tonnes of CO<sub>2</sub>)*



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of International Energy Agency (IEA), “CO<sub>2</sub> emissions by product and flow”, IEA CO<sub>2</sub> Emissions from Fuel Combustion Statistics [online] [http://www.oecd-ilibrary.org/energy/data/iea-co2-emissions-from-fuel-combustion-statistics\\_co2-data-en](http://www.oecd-ilibrary.org/energy/data/iea-co2-emissions-from-fuel-combustion-statistics_co2-data-en).

### (b) Energy intensity

Total energy production grew by 128% during the period of analysis. At the beginning of this century, a third of the energy was imported, but this tendency reversed itself in recent years, and since 2011 Peru has become a net exporter of energy.

Primary energy production in Peru grew at a rate similar to that of GDP, measured in 2005 prices at purchasing power parity (PPP), and over the period 2003-2013 it recorded cumulative growth of 86%.

Energy intensity measured as the supply of primary energy with respect to real GDP showed no change between 2003 and 2013, and remains at 0.17 tonnes of oil equivalent (toe) per thousand dollars (2005 prices at PPP). This intensity is 31% greater than the average index for OECD countries (0.13 toe per thousand dollars at PPP), demonstrating that there is room for improvement in Peru’s energy efficiency.

Primary energy supply per capita rose by 66% to 0.71 toe per capita in 2013, or 17% of the value recorded for the OECD (4.2 toe per capita).

The sector that consumes the most energy is transportation, with 41% of domestic energy consumption, followed by the manufacturing sector (29%). The sectors that have shown the greatest increase in consumption during the period are services (457%) and transportation (115%).



According to figures from the National Institute of Statistics and Informatics (INEI), Peru's production of electricity increased by 79% over the period 2003-2012, reaching 41,036 gigawatt hours (GWh). The number of power supply customers stands at 5.83 million, up by 56% over the same period.

**(c) The energy mix**

The National Energy Balance prepared by the Ministry of Mines and Energy indicates that the domestic primary energy supply doubled in the period 2003-2013. Moreover, the energy mix has shifted significantly, with a growing share for natural gas, which jumped from 10% of domestic supply in 2004 to 57% in 2013 (MINEM, 2013).

Cumulative growth in the domestic supply of natural gas was 998%. This stands in contrast to the 9% fall in the oil supply over the same period, the share of which in domestic primary energy supply was 13% in 2013.

While there has been an increase in the provision of hydropower and coal, their share in the domestic primary energy supply fell to 8% and 3%, respectively, in 2013. Biofuels and solar energy have also lost domestic supply share, and together they now represent 9%.

It should be noted that in 2013 the supply of natural gas, liquefied natural gas and hydropower was domestically sourced. By contrast, 52% of oil and 84% of coal was imported from abroad.

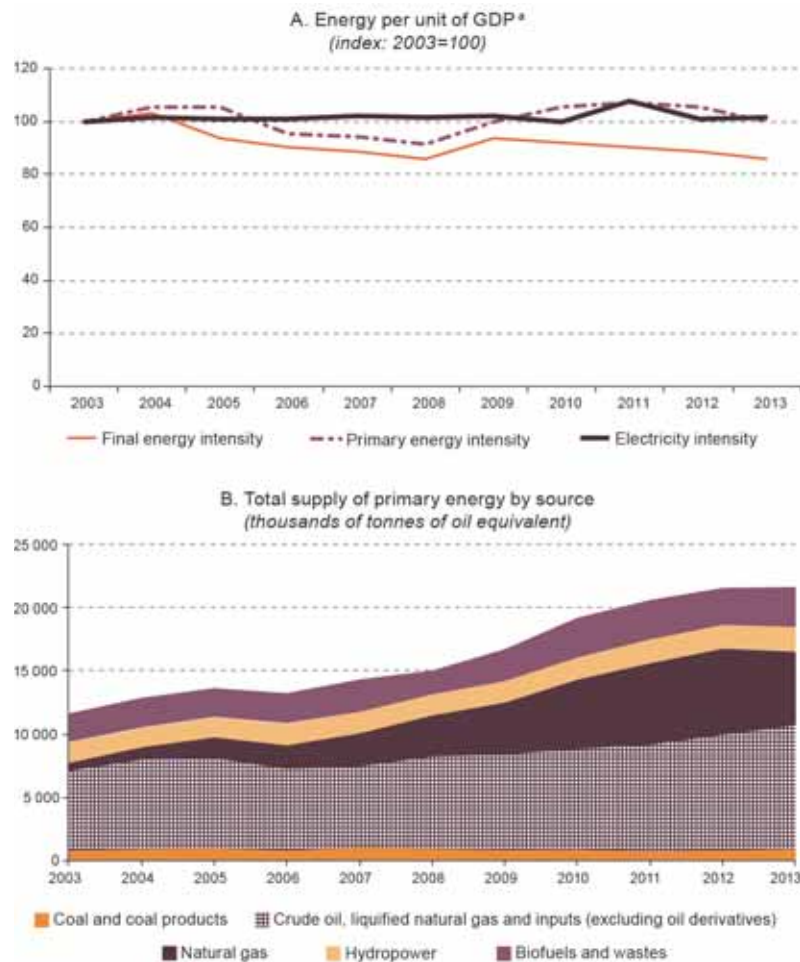
By way of comparison, the IEA shows that the proportion of renewable energy within the total primary energy supply in Peru is 2.6 times greater than that for the OECD, owing primarily to the use of hydropower and biofuels. At the same time, Peru consumes relatively less coal but relatively more oil and natural gas (including liquefied natural gas).

The sector with the greatest final energy consumption during 2013 was transportation, at 41%, followed by the residential, commercial and public sectors, and manufacturing and mining, both at 27%.

Growth in the transportation sector has tracked fluctuations in GDP, and since 2008 it has been growing continuously.

According to the Ministry of the Environment (MINAM, 2014a), the rate of automobile use has doubled, and the market for cheap used cars has grown. In addition, traffic flow has expanded by an annual average of 7% in the last five years. The number of vehicles per 1,000 inhabitants rose by 42% during the period 2003-2012, from 50 to 71, a figure that is still far below that for OECD countries.

Figure I.4  
Peru: energy intensity and primary energy supply by source, 2003-2013



Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of International Energy Agency (IEA).

<sup>a</sup> GDP at constant 2005 prices and purchasing power parity.

## 2. Efficiency in the use of inputs and in waste generation

### (a) Material productivity

According to a study by the United Nations Environment Programme (UNEP, 2013), Peru's domestic material consumption (DMC) increased by 37% over the period 2003-2008, and stood at 512 million tonnes in 2008.

The growth rate of domestic material consumption is lower than the rate of real GDP growth (at purchasing power parity and 2005 prices), denoting an increase in material productivity.

Domestic material consumption on a per capita basis in Peru rose by 29% in the period 2003-2008, and in the latter year stood at 17.8 tonnes per capita, slightly lower than the OECD average of 18.1 tonnes per capita. Domestic consumption per capita is in fact 31% higher than the average for Latin America, and 74% above that for the rest of the world (UNEP, 2013).

Metallic ores and industrial minerals constitute the largest component of domestic material consumption, accounting for 37% of DMC in 2008, followed by construction minerals (7%), biomass (7%) and fossil fuels (1%).

In terms of growth by component, over the period 2003-2008, cumulative consumption of construction minerals rose by 93%, followed by fossil fuels (38%), metallic ores and industrial minerals (34%), and biomass (14%).

**(b) Waste generation and treatment**

According to the Ministry of the Environment (MINAM, 2014b), 664 districts (24.5% of the total) reported data on waste in 2012. This figure represents a major increase from 2011, when 214 districts reported such information.

Based on various official extrapolations, it may be inferred that municipal solid waste in Peru amounted to 6.2 million tonnes in 2012, of which 4.6 million tonnes represented domestic waste and 1.6 million tonnes commercial and other waste, for a rate of 0.583 kg per person per day. A disaggregation by geographical zone reveals that the greatest generation of waste per capita occurs in the Selva (0.599 kg per person per day), followed by the Coast (0.597 kg) and the Sierra (0.527 kg).

Municipal solid wastes in Peru in 2012 consisted primarily of organic material (50.9%), plastics (10.1%) and hazardous waste (8.5%). In 2012, non-municipal solid waste amounted to 11.03 million tonnes nationwide, of which nearly 98% came from the agriculture sector, with smaller proportions from the housing and health sectors.

Hazardous solid waste in 2012 represented 8.5% of total waste reported at the municipal level. Beyond the municipal level, hazardous solid waste consists primarily of contaminated containers (41.4% of the sector's hazardous waste) in the manufacturing industry; oil residues in the fisheries sector (52.5%); waste contaminated with oil and water mixtures and emulsions in the communications sector (65.7%); oil residues in agriculture (57.4%); septic tank sludge, wastewater and run-off from cleaning equipment in the construction and sanitation sectors (99.7%); and metallic residues (38.05%) in the transportation sector.

The country currently has 11 sanitary landfills for the treatment and final disposal of solid waste. In 2011, 45% of provincial municipalities had developed comprehensive plans for the environmental management of solid waste, and there is a growing trend among municipalities to adopt such plans.

**(c) Fertilizer consumption**

Over the period 2003-2012, the volume of agricultural output rose by 127%, while the equivalent figure for the livestock sector was 45% (INEI, n/d).

The use of nitrogen- and phosphate-based fertilizers per hectare of arable land rose by 27% over that period (World Bank, n/d).

In comparative terms, the indicator of fertilizer consumption per hectare of arable land stood at 104 kg in 2012. This figure is below that observed in the OECD (122 kg per hectare) and below the average for Latin America and the Caribbean (126 kg per hectare).

## B. IMPROVEMENT IN ENVIRONMENTAL LIVING CONDITIONS

### 1. Air quality

Peru has made significant progress in achieving the objectives of the Montreal Protocol, and substances that deplete the ozone layer are being eliminated at a significant and accelerating pace. Over the years 2003-2013, the release of such substances declined from 191 tonnes to 22 tonnes per year (UNEP, 2013).

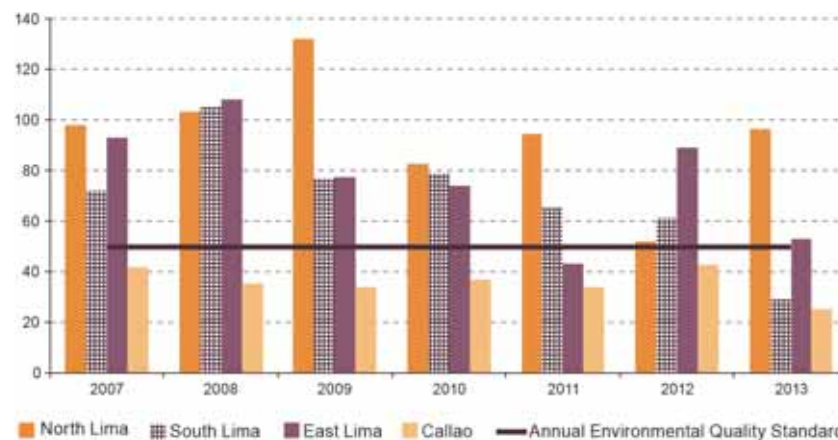
The main source of pressure on air quality is associated with the growing size of the automotive fleet and the use of fossil fuels. Other sources of pressure identified for various zones of the country are brickworks, mineral extraction and smelting, the fishing industry and power generation (MINAM, 2014a).

Over the years 2003-2012, the automotive fleet grew from 50 to 71 vehicles per 1,000 inhabitants. The departments of Lima-Callao and Tacna stand out in particular, with 135 vehicles per 1,000 inhabitants in 2012 (MINAM, 2014a).

Estimates for the country show that, over the period 2003-2012, particulate matter emissions rose by 14%, reaching 77,500 tonnes. Nitrogen oxide emissions were up as well, by 72% to 114,600 tonnes. By contrast, sulphur dioxide emissions declined by 11%, to 45,700 tonnes (INEI, 2015).

In 2012, sulphur dioxide (SO<sub>2</sub>) and coarse particulate matter (PM<sub>10</sub>) emissions were the subject of monitoring exercises in 13 cities of the country, and monitoring was conducted in 15 cities in 2013. Lima and Callao have been systematically measuring various air quality parameters since the beginning of 2000: during the period 2007-2013 there was a decline in concentrations of PM<sub>10</sub>, fine particulate matter (PM<sub>2.5</sub>), SO<sub>2</sub> and nitrogen dioxide (NO<sub>2</sub>) (MINAM, 2014a).

Figure I.5  
Peru: average concentration of coarse particulate matter (MP<sub>10</sub>) in the Lima Metropolitan Area<sup>a</sup>  
(Micrograms per cubic metre)



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of National Institute of Statistics and Informatics (INEI).

<sup>a</sup> Annual Environmental Quality Standard value of 50 micrograms per cubic metre (ug/m<sup>3</sup>), established in D.S. N° 074-2001-PCM. PM<sub>10</sub> has been monitored since July 2007.

## 2. Water supply and sanitation

In 2013, the proportion of the population using improved sources of drinking water in Peru was estimated at 86%, up from 81% in 2003. The urban coverage rate was 91%, and in rural areas it was around 67%. The proportion of the population using improved sanitation facilities rose from 66% in 2003 to 75% currently (urban 81% and rural 50%).<sup>2</sup>

In terms of households with access to basic services, 92.1% had access to water via the public network and 77.8% had access to improved sanitation services in 2013 (INEI, 2013).

Although access to water has increased in Peru, in many cases the service is not continuous. Lack of access to water is primarily a problem in the central and north-eastern regions of the country. The regions with the greatest percentage of dwellings without water access are Huancavelica (59.9%) followed by Pasco (55.2%), Huánuco (52.5%), Amazonas (48.3%) and Loreto (42.4%). Intermittent service for less than six hours a day is frequent in coastal regions, such as Ica, La Libertad and Ancash.

It is important to note that the percentage of unbilled water exceeded 40% in 2008, due primarily to leaks and apparent losses explained by clandestine withdrawals, inactive connections and faulty metering (Rojas-Ortuste, 2010).

The Ministry of Environment (MINAM, 2014a) reports that in 2012, 32% of wastewater was being treated in the country as a whole, up from 21% in 2003. There is still significant room for improvement, as there is as yet no treatment of wastewater in the departments of Amazonas, Apurímac, Huancavelica, Huánuco, Loreto, Madre de Dios, Pasco, San Martín and Ucayali.

Water quality is monitored in 98 of the country's 159 hydrographic basins. However, more than 40% (41 of 98) of the basins monitored do not meet environmental quality standards (ANA, 2015). The main factors behind the decline in water quality are the lack of wastewater treatment, industrial and mining pollution, and the use of agrochemicals.

Available information shows that over the period 2003-2013 the environmental quality of coastal waters declined to varying degrees, depending on the zone. In particular, high concentrations of pollutants associated with industrial and domestic discharges have been detected in the bays of Huacho, Callao, Chancay and Chimbote, among others. Callao and Chimbote have total and thermotolerant coliform counts in excess of the country's quality standards.

## 3. Health impacts

During the period 2003-2013, the number of children aged under 5 years suffering from acute diarrhoeal disease dropped from 693,000 to 225,000. The departments that currently have the greatest numbers of affected children are Lima (13% of all cases), Cajamarca (11%), Cusco (8%) and Loreto (8%). In per capita terms, the incidences are highest in the departments of Amazonas, Loreto, Cajamarca, San Martín and Cusco (INEI, 2015).

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<sup>2</sup> The statistics come from the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) Joint Monitoring Programme for Water Supply and Sanitation [online] <http://www.wssinfo.org/>.

There is still a persistent risk of contracting acute diarrhoeal diseases among the school-age population: in 2013, 13.7% of urban education institutions and 56.1% of rural schools were not connected to the public drinking water network (Ministry of Education, 2013).

The number of children aged under 5 years being treated for acute respiratory infections declined by 32% over the period of analysis, from 3.5 million to 2.4 million (INEI, 2015).

Available information shows that acute respiratory diseases in Lima and Callao declined during the years 2008-2012 from 142 to 102 cases for every 10,000 inhabitants, reflecting the reduction in the concentrations of particulate matter measuring less than 10 micrograms ( $\mu\text{m}$ ). Nevertheless, there are episodes that exceed the environmental quality standards for  $\text{PM}_{10}$  and  $\text{PM}_{2.5}$  (MINAM, 2014a).

During 2012, there were 1,252 cases of heavy-metal poisoning identified, the majority of them in the departments of Junin and Pasco. Such cases are associated for the most part with lead and its compounds (MINAM, 2014a).

Emissions and releases of mercury from artisanal and small-scale mining are a matter of great national concern.

Because of its geographical characteristics, Peru is particularly vulnerable to climate change and to the risk of natural disasters. According to information from the International Disaster Database (EM-DAT), the extreme natural events and disasters that have had the greatest impact on the Peruvian population are those associated with earthquakes, flash flooding and extreme temperatures. During the years 2003-2013, at least seven major earthquakes were recorded, affecting a total of more than 675,000 people. In climatological terms, more than 2.3 million people were affected by flooding (18 events) and nearly 5.2 million by extreme temperatures (9 events).

Among other natural phenomena there has been an increase in frost emergencies, which rose from 73 in 2003 to 413 in 2013 (INEI, 2015). The population affected by this phenomenon varied from 25,708 in 2003 to 280,930 in 2013. The people hit hardest were those living in the high Andes.

## **C. USE OF THE NATURAL RESOURCES BASE**

### **1. Biodiversity and ecosystems**

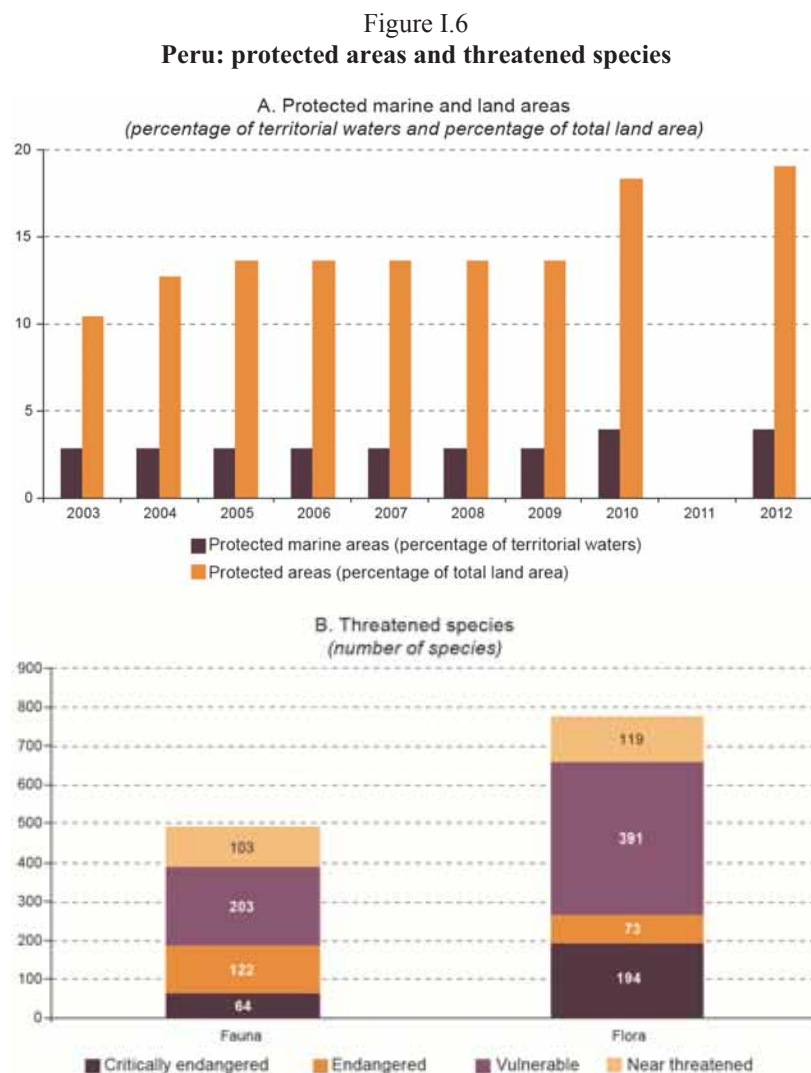
Peru is ranked among the 17 megadiverse countries. However, pressures on ecosystems are such that the country has 492 species of fauna and 777 species of flora that are listed as threatened, of which 64 and 194, respectively, are in critical danger (MINAM, 2014c). The registry of threatened species of fauna dates from the year 2014 (Supreme Decree 004-2014 of the Ministry of Agriculture), while that for threatened species of flora was initiated in 2006 (Supreme Decree 43-2006-AG).

In 2012, protected land and marine areas represented 18.3% of the national territory, a figure slightly lower than the average for Latin America and the Caribbean (20.8%), but higher than the OECD average (13.6%). The period 2003-2012 saw these areas expand by 82%, a rate higher than that recorded for the region and for OECD countries (World Development Indicators based on United Nations Environment Programme and the World Conservation Monitoring Centre).

A disaggregation by type reveals that protected land areas currently constitute 19.1% of the national territory, while protected marine areas cover only 3.9% of territorial waters, far below the average for the region and for countries of the OECD (World Development Indicators based on United Nations Environment Programme and the World Conservation Monitoring Centre).

The National System of Protected Natural Areas (SINANPE) has experienced steady growth: the number of protected natural areas under national administration rose from 40 in 2003 to 64 in 2015.

Peru has demonstrated its commitment to achieving the Aichi Biodiversity Targets by establishing a correlation between its National Biological Diversity Strategy to 2021 (MINAM, 2014c) and the goals of the Convention on Biological Diversity, which it expects to meet by 2021.



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of the United Nations Environment Programme (UNEP); World Conservation Monitoring Centre (WCMC) and Ministry of the Environment (MINAM), *Estrategia Nacional de Diversidad Biológica al 2021. Plan de Acción 2014-2018*, Lima, 2014.

## 2. Renewable resources

### (a) Water resources

Peru's water supply amounted to 2,482.3 billion cubic metres (m<sup>3</sup>) in 2012, placing it among the countries with the greatest water availability (INEI, 2015).

The water supply is distributed unevenly across the country: 98.2% of the volume corresponds to the Atlantic (or Amazonian) watershed, the Pacific watershed contains 1.5% and the Titicaca basin the remaining 0.3% (INEI, 2015). This distribution, together with seasonal variation, produces a high degree of aridity in the southern portion of the Pacific watershed, with moderate stress in the northern Pacific, and an abundance of water in the Atlantic watershed.

The three watersheds supply both surface water and groundwater. In 2012, more than 22% of the water supply from the Atlantic watershed was derived from underground sources, while the equivalent figures for the Titicaca and Pacific basins were 9% and 8%, respectively.

Over the period 2003-2012, the water supply expanded by 21%, from 2,046 billion m<sup>3</sup> to 2,482 billion m<sup>3</sup>. During this time there was an appreciable increase in the groundwater supply, from 2,739 million m<sup>3</sup> to 546,730 million m<sup>3</sup>.

An analysis of the hydric balance by watershed shows that: (i) the Pacific watershed presents a generalized water deficit, due primarily to the fact that most of the precipitation in the region takes place in the upper part of the catchment area; (ii) the Lake Titicaca watershed shows surface water availability, except during occasional dry years; and (iii) the Atlantic watershed shows a significant water surplus, owing primarily to the level of precipitation. Nevertheless, deforestation in this last zone could cause changes in the water cycle variables (UNESCO, 2006).

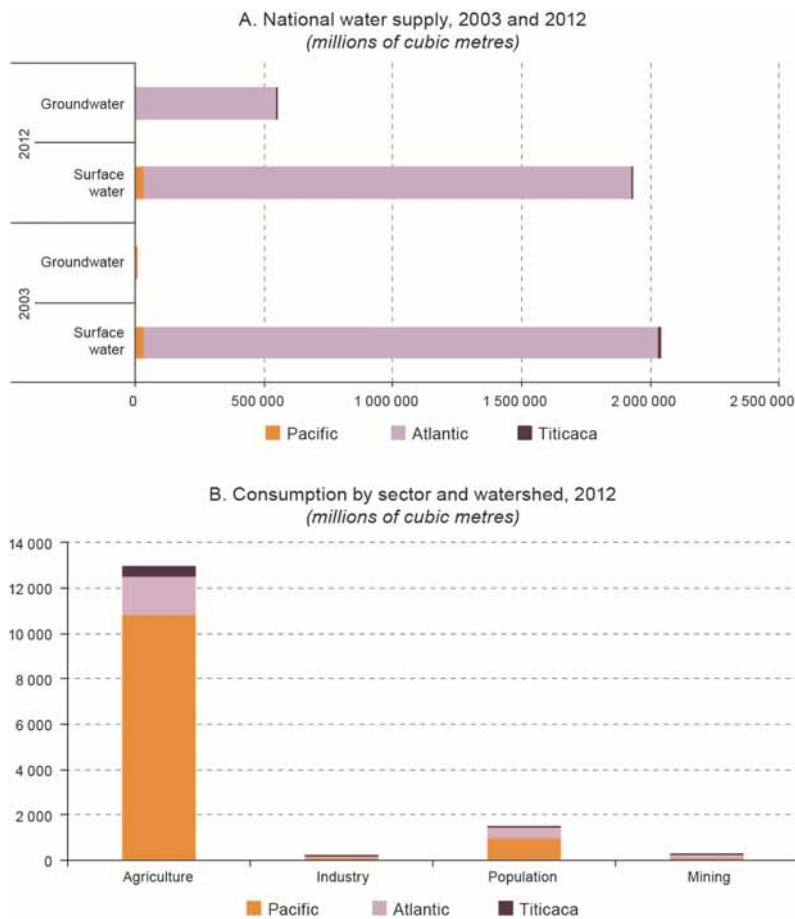
Because of the water deficit and the fact that 63% of the country's population lives in the Pacific watershed, this is the zone that is experiencing the greatest pressures on water availability.

According to information from the Food and Agriculture Organization of the United Nations (FAO, n/d), in 2013 the per capita domestic availability of fresh water amounted to 53,688 m<sup>3</sup>. This figure far exceeds average water availability in Latin America and the Caribbean (22,615 m<sup>3</sup> per capita) and in the OECD (8,286 m<sup>3</sup> per capita).

In terms of water use, agriculture is the largest consumer, accounting for 87.7% of the total, followed by demand for human consumption (9.9%), the mining industry (1.5%) and manufacturing (0.9%). For uses other than consumption, the principal demand comes from the energy sector (99.1%) (MINAM, 2014a).



Figure I.7  
Peru: water resources



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of National Institute of Statistics and Informatics (INEI).

### (b) Forest resources

According to a 2009 map of Peru's vegetation cover, the forested area amounts to 74.2 million hectares. Of this total, 69.9 million hectares corresponds to humid Amazonian forests, 4.1 million hectares to dry forests, and 211,000 hectares to Andean forests (MINAM, 2014a).

According to FAO information, the land covered by forests represented 52.9% of the national territory in 2012. This figure is greater than the averages for Latin America and the Caribbean (46.9%) and the OECD (30.5%) (World Bank, n/d).

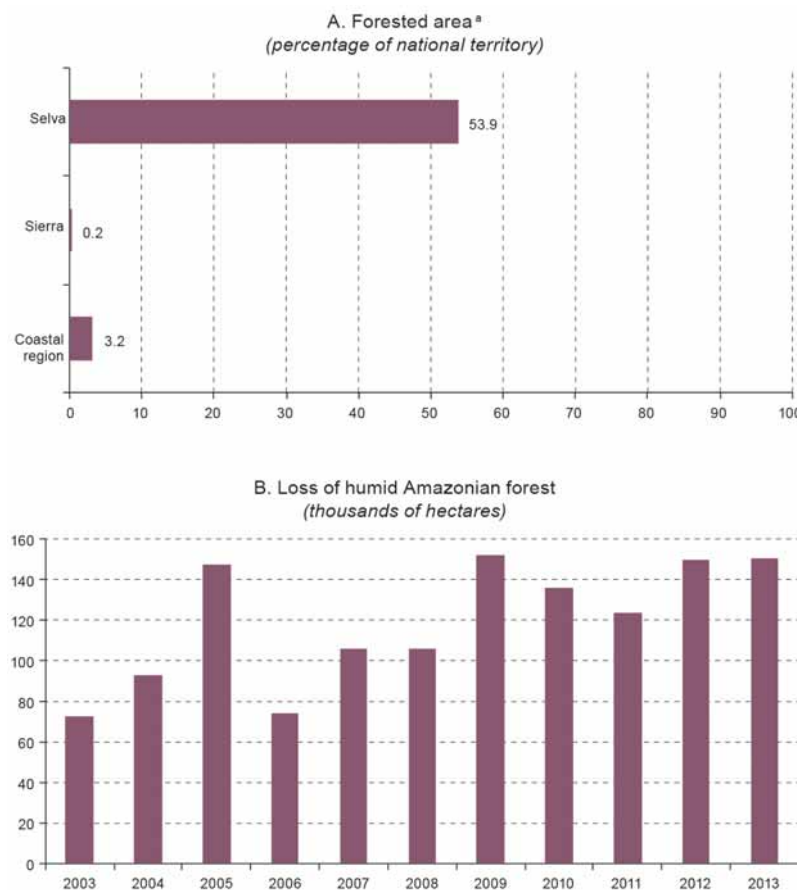
During the period 2003-2012, the forested area declined by 1.86%, according to the World Development Indicators (on the basis of FAO data). According to the National Forest Conservation Programme of the Ministry of the Environment, deforestation in the country's humid Amazonian forest amounted to an annual average of 113,056 hectares between 2000 and 2013.

The Amazonian region is the most affected by deforestation, caused by changes in land use brought about by small-scale farmers in search of larger areas for agriculture and livestock raising. The departments with the greatest cumulative loss of forest cover in the period 2000-2011 were San Martín (277,333 hectares), Loreto (219,671 hectares) and Ucayali (177,630 hectares) (MINAM, 2014a).

The activities that exert the greatest pressure on forest conservation are related to agro-industry, export agriculture, and livestock raising. There is also a significant impact, however, from illicit narcotics cultivation, deforestation due to the lumber industry (both legal and illegal), the opening or improvement of highways and various forms of exploitation of tropical forests (MINAM, 2014a).

The greatest level of deforestation has occurred in forests that do not correspond to any official category, and which therefore have no authority responsible for their administration or care (National Forest Conservation Programme). Unclassified zones in fact accounted for the majority of total cumulative losses of forest cover between 2000 and 2011 (MINAM, 2014a).

Figure I.8  
Peru: forested area and deforestation in the Amazonian zone, 2003-2013



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Ministry of the Environment (MINAM), *Hacia una Estrategia Nacional sobre Bosques y Cambio Climático. Documento preliminar*, 2015 [online] [http://www.bosques.gob.pe/archivo/enbcc\\_documento.pdf](http://www.bosques.gob.pe/archivo/enbcc_documento.pdf).

<sup>a</sup> On the basis of the 2007 National Census.

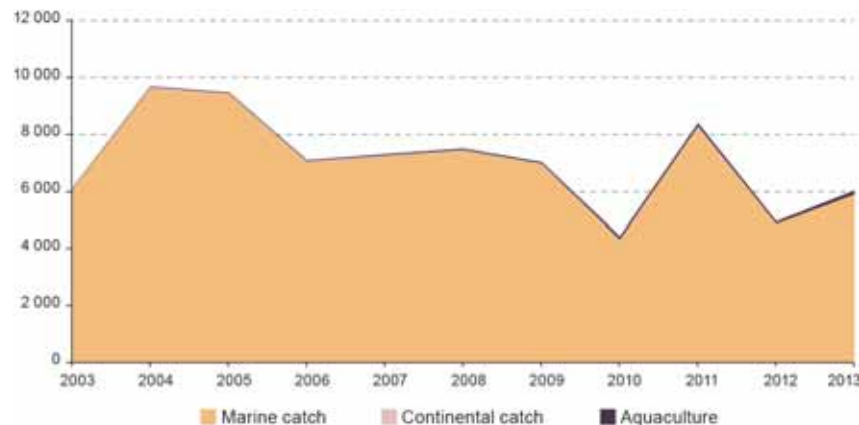
### (c) Fishery resources

The seas off the Peruvian coast are highly productive, thanks to the complex set of currents that give rise to a recirculation system that cools the waters and boosts their nutrient content, thus increasing the availability of food for fish and invertebrates (Tam and others, 2008). However, this ecosystem is subject to major periodic disturbances caused by the El Niño phenomenon.

In 2003, Peru was the world's third-largest fish producer, accounting for 6.3% of the world catch, after China (17.6%) and Indonesia (6.6%). Its catches have since declined, with a cumulative reduction to 2013 of 3.5%, from 6,061,000 tonnes to 5,849,000 tonnes (FAO online statistics). Peru has the world's largest fishery based on a single species, the anchovy (FAO, 2007). The anchovy catch has been shrinking, however, leading to reduced exports of fish meal and fish oil. Peru is much less engaged in aquaculture, accounting for only 0.2% of global aquaculture production (FAO online statistics).

The greatest pressures on the coastal marine ecosystem have been identified as stemming from the growing percentage of industry and population concentrated along the Peruvian coast, which leads to over-exploitation of marine resources and changes in the quality and properties of marine and terrestrial waters. The situation is exacerbated by inadequate infrastructure for the unloading and preservation of catches, and a deficient marketing system that tends to pollute marine and coastal surface waters. Other sources of pressure on fishery resources include the introduction of exotic species, as well as by-catch and illegal fishing (undeclared and unregulated), where fishing methods are inappropriate and unsustainable (MINAM, 2014a).

Figure I.9  
Peru: fisheries production, 2003-2013  
(Thousands of tonnes)



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Food and Agriculture Organization of the United Nations (FAO).

## 3. Non-renewable resources

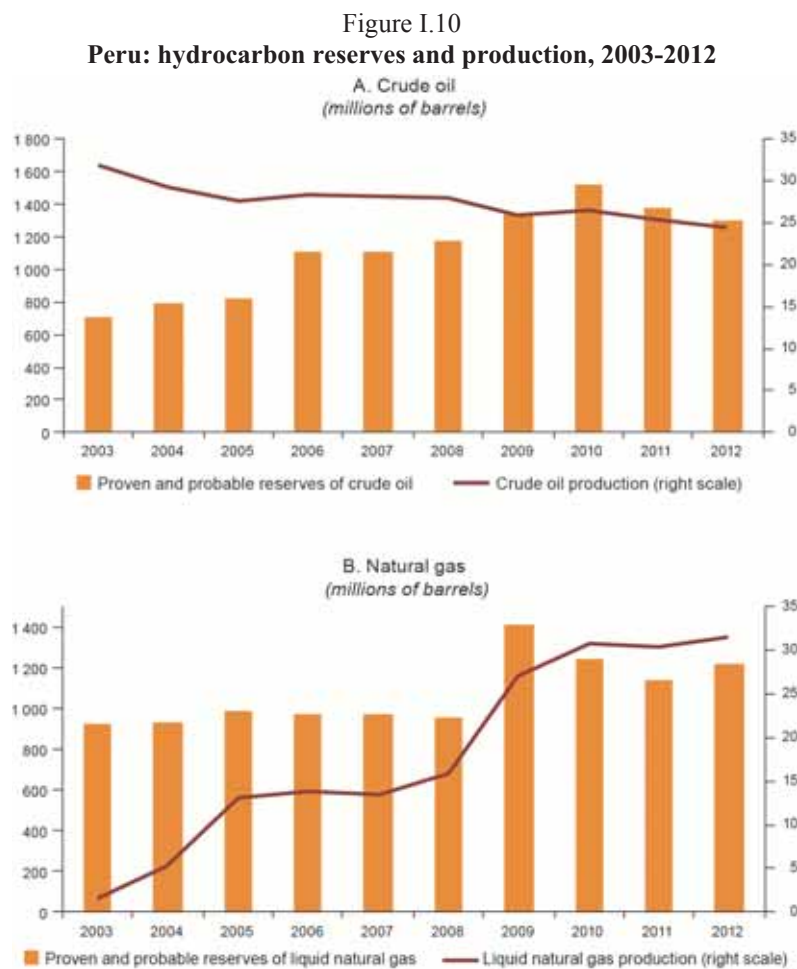
### (a) Fossil fuels

In 2012, proven reserves of crude oil amounted to 632.9 million barrels, distributed geographically among the Selva (43%), the Costa Norte (37%) and the Zócalo (21%). Liquid natural gas reserves were 789.8 million barrels, and were found almost exclusively in the Selva zone (98%) (INEI online statistics).

Production of liquid hydrocarbons reached 56 million barrels in 2012. There were some significant changes in the composition of production during the period 2003-2012. In 2003, 96% of hydrocarbon output corresponded to crude oil: this share fell to 44% in 2012, owing to the considerable increase in liquid natural gas.

During the period 2003-2012, hydrocarbon output recorded a cumulative increase of 68%, led by the sharp jump in the production of liquid natural gas (which went up by 2,049%), while oil production dropped by 23%.

During the period 2003-2011, the value of hydrocarbon exports rose by 658%, from US\$ 621 million to US\$ 4.704 billion. In 2011, exports of oil and derivatives represented 7.4%, and natural gas exports 2.8%, of the country's total exports by value.



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Ministry of Energy and Mines (MINEM), 2015.

## (b) Metal mining

Peru has large reserves of numerous metallic ores. In 2011, proven and probable ore reserves included 69,890,000 metric fine tonnes (MFT) of copper; 60,362,000 fine ounces of gold; 24,103,000 MFT of zinc; 2,790,345,000 fine ounces of silver; 7,494,000 MFT of lead; 1,082,423,000 MFT of iron; and 91,000 MFT of tin (INEI online statistics).

In 2013, copper production was nearly 1.4 million MFT; zinc, 1.4 million MFT; gold, 5.0 million fine ounces; silver, 116 million fine ounces; lead, 266,000 MFT; iron, 6.7 million MFT; tin, 24,000 MFT; and the molybdenum, 18,000 MFT (MINEM, 2014).

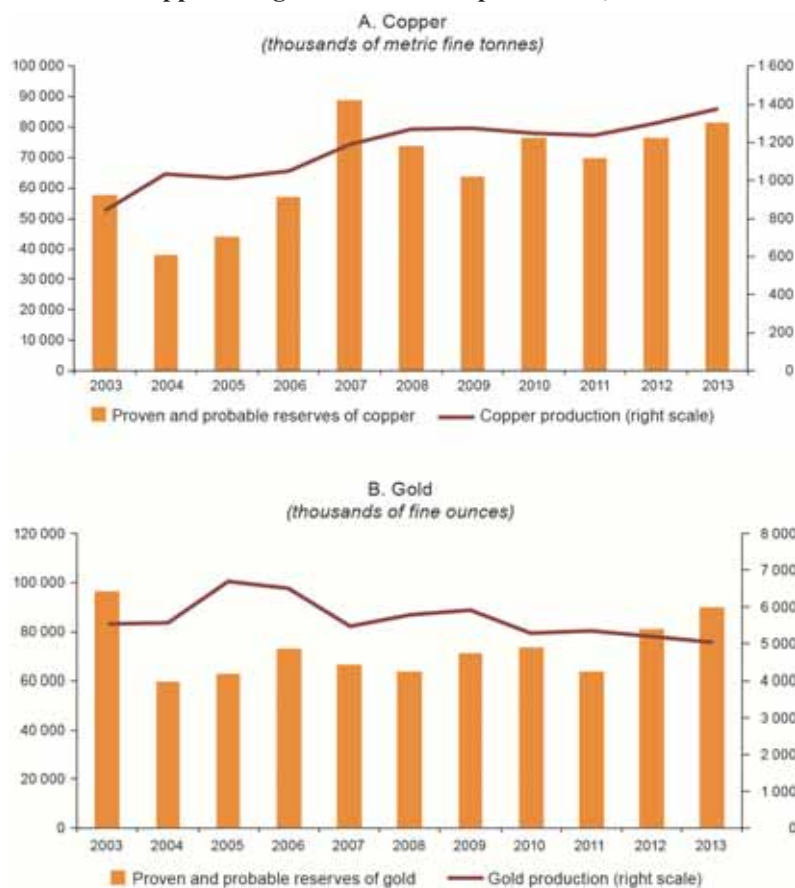
The volume of metallic ore production over the period 2003-2012 reveals significant cumulative growth for several metals: iron 92%, molybdenum 75%, copper 54%, and silver 19%. By contrast, there were declines in the volume of production of other metals: tin -35%, lead -19%, zinc -7%, and gold -6% (INEI online statistics).

The principal mining regions include Ancash (copper, silver and zinc), Arequipa (copper), Cajamarca (gold), La Libertad (gold) and Pasco (silver, lead and zinc) (MINEM, 2014).

In 2011, metallic ore exports accounted for more than 59% of the country's total export value. The main metallic exports are copper (23.2% of total export value), followed by gold (21.8%), lead (5.2%), zinc (3.3%) and iron (2.2%) (INEI online statistics).

Around 15% of the national territory is covered by mining rights, and 63.6% of the territory is in areas that are closed to mining activity (MINEM, 2014). Nevertheless, there is still a wide margin for further expansion of the area under mining concessions.

Figure I.11  
Peru: copper and gold reserves and production, 2003-2013



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Ministry of Energy and Mines (MINEM), 2015.

## Chapter II

**CONCLUSIONS AND RECOMMENDATIONS****Part I****Progress towards sustainable development** **Policymaking environment***Conclusions*

The period under evaluation has seen significant progress in the legal and institutional framework for environmental policy in Peru. That progress has involved movement on two fronts: (i) the bulk of environmental responsibilities, which had been in the hands of the sector authorities, were transferred to a new environmental institution, the Ministry of the Environment, created in 2008; and (ii) as part of the decentralization process, environmental responsibilities were transferred from the national government to the subnational and local authorities. The effect of these reforms has been to modernize environmental policy and to promote a better balance between Peru's sustainable development objectives and its sectoral and territorial aspirations.

A number of new technical agencies specialized in environmental issues have been created. These include the National Water Authority (*Autoridad Nacional del Agua*, ANA), the Supervisory Agencies for Investment in Forestry and Wildlife Resources (*Organismo Supervisor de la Inversión en Recursos Forestales y Fauna Silvestre*, OSINFOR), the National Forestry and Wildlife Service (*Servicio Nacional Forestal y de Fauna Silvestre*, SERFOR), the National Service for State-Protected Natural Areas (*Servicio Nacional de Áreas Naturales Protegidas por el Estado*, SERNANP), the National Service of Environmental Certification for Sustainable Investments (*Servicio Nacional de Certificación Ambiental para las Inversiones Sostenibles*, SENACE), and the National Institute for Research on Glaciers and Mountain Ecosystems (*Instituto Nacional de Investigación en Glaciares y Ecosistemas de Montaña*, INAIGEM). Within the Ministry of the Environment, there has been a noticeable strengthening of policies and of institutional arrangements for coping with climate change.

As part of the decentralization process, the sector authorities have transferred their environmental and territorial governance functions to the regional and local governments. The Ministry of the Environment coordinates these bodies, primarily through the Regional and Municipal Environmental Commissions, which serve as a forum for dialogue and coordination among State entities and civil society for addressing environmental issues of regional or municipal concern. The assumption of responsibilities by subnational and local bodies has yielded uneven results, depending on regional and local capacities and resources. Some regional governments have been very pro-active in developing environmental and territorial governance tools, while others have lagged behind. For this reason, it is essential to foster a better territorial balance by supporting those regional governments most in need of strengthening in their technical and financing capacities.

In the context of transferring environmental responsibilities from the sectors, two important institutions have been created in key areas of environmental management: SENACE is the environmental

certification agency, combining the granting of environmental permits with environmental assessments, while OEFA conducts environmental audit and enforcement activities.

There are three types of environmental assessment, depending on the impact of investment projects: the Environmental Impact Statement (*Declaración de Impacto Ambiental*, DIA), the Semi-Detailed Environmental Impact Study (*Estudio de Impacto Ambiental Semidetallado*, EIAsd), and the Detailed Environmental Impact Study (*Estudio de Impacto Ambiental Detallado*, EIAd). In each case there are legally determined time limits for completing the assessment process. SENACE was created in December 2012 and, as an integral part of its mandate, it evaluates the environmental impact of larger-scale projects, i.e. those that require an EIAd. The transfer of assessment functions from the sector authorities is still a work in progress. In this transition stage it is very important to carry over technical know-how, good practices and lessons learned from the institutions that previously had responsibilities in this area.

This institutional change, according to which environmental certification is now handled at a one-stop window, encourages intersectoral coordination. Nevertheless, the accelerated processing of environmental certification to promote investment and economic growth must not be allowed to jeopardize the objective of environmental protection pursued by the Environmental Impact Study system. Environmental certification time limits, participatory processes for environmental assessments, and amendments to the Environmental Impact Studies should all be the subject of detailed examination, taking into account the objectives of green growth as well as the outcomes of the assessments under way.

In recent years Peru has made a significant effort to strengthen environmental enforcement through the OEFA, which is the lead body in the National Environmental Assessment and Oversight System (*Sistema Nacional de Evaluación y Fiscalización Ambiental*, SINEFA), the purpose of which is to ensure the enforcement of environmental legislation. The OEFA supervises compliance with environmental regulations directly in four sectors: (i) medium and large-scale mining, (ii) hydrocarbons and electricity, (iii) commercial fisheries and large-scale aquaculture, and (iv) the brewery, papermaking, cement and tannery industries. It also supervises the 12 environmental enforcement entities of national scope, the 25 entities of the regional governments and the local entities (1,838 provincial and district municipalities). The environmental enforcement budget rose from US\$ 16 million in 2012 to US\$ 71 million in 2015, allowing for a significant increase in the direct auditing of firms in the four sectors of its responsibility, as well as supervision of the other environmental enforcement entities. The maximum level of fines for noncompliance has also been increased threefold.

Official government policies include a commitment to promote a strategic, integrated, effective and efficient process of territorial governance and management which will ensure human development and the sustainable use of the territory. There are many references to territorial governance of a political, legal and technical nature that have their roots in the Constitution itself and in the 2002 constitutional reform that opened the way to decentralization.

Territorial governance makes use of tools such as Ecological and Economic Zoning (*Zonificación Ecológica-Económica*, ZEE), a technical tool for characterizing territories, in particular their physical and biological aspects, and Specialized Studies (*Estudios Especializados*, EE), which can identify and analyse social and economic dynamics, changes in land-use and population. The integration of ZEE with EE constitutes an Integrated Diagnostic Territorial Assessment (*Diagnóstico Integrado del Territorio*, DIT). This chain of technical instruments has been planned with a view to preparing Territorial Governance Plans (*Planes de Ordenamiento Territorial*, POT) that will identify the potentials and limitations of a territory and its natural resources.

Yet there are a great many legal rules relating to territorial governance, which apply to different fields and overlap, making it difficult to understand their legal scope and force. Those legal rules include the Bases for Decentralization Law (*Ley de Bases para la Descentralización*), the Organic Laws for Regional Governments and Municipalities (*Leyes Orgánicas de Gobiernos Regionales y Municipalidades*), the General Law on the Environment (*Ley General del Ambiente*), the regulations to the Framework Law on the national environmental management system (*Ley Marco del Sistema Nacional de Gestión Ambiental*), as well as provisions governing domestic and foreign investments. With respect to policies, there is the National Environmental Policy (*Política Nacional del Ambiente*), the Policy Guidelines for Territorial Governance (*Lineamientos de Política para el Ordenamiento Territorial*) and the Proposed National Strategy for Ecological-Economic Zoning (*Propuesta de Estrategia Nacional de Zonificación Ecológica y Económica*). There are also guidelines of a technical nature.

Among the issues concerning effective application of territorial governance are: (i) legal dispersion, which creates uncertainty as to the true legal scope of the Territorial Governance Plans, especially when they are seen as obstacles to investment projects; (ii) the leadership of the environmental authority has been key in driving the processes, but there needs to be closer articulation with other areas of the national government and with subnational and local bodies, as development planning processes are involved that go well beyond the environmental perspective; (iii) problems with the delimitation of responsibilities and coordination between the national government and the subnational and local authorities. There has been significant progress: 13 of the 24 regions and the Province of Callao have already approved their ZEE. Nevertheless, there is a need to define clearly a national territorial governance strategy and to devise a law which will integrate many of the issues that today seem dispersed, which will clarify its legal force vis-à-vis other government policies, with broad institutional backing, and which will allow articulation both among sectors and with the subnational governments.

Some of the most pressing environmental problems, such as deforestation (between 2003 and 2013 some 1.3 million hectares were lost in Amazonia) and soil degradation, are directly related to the lack of formalized ownership of the land. This lack of legal certainty increases the likelihood of predatory behaviour in search of immediate profits, eschewing long-term investments that would boost productivity while conserving natural capital. It is also a source of disputes and occasionally of violence.

According to the Peruvian Agricultural Census, in 2012 there were around 1 million farmers (45% of the total), 1,000 indigenous communities and 800 rural communities without land title. The Sierra and Selva regions are home to the majority of farmers in this situation.

The process of formalizing land title has seen some important institutional changes since 1991, including the creation of an umbrella institution associating the Special Project for Land Title (*Proyecto Especial de Titulación de Tierras*, PETT) and the National Superintendency of Public Registries (*Superintendencia Nacional de Registros Públicos*, SUNARP). Responsibilities for issuing land titles were shifted to the Housing Ministry (2007) and subsequently to the local governments (2010), prior to creation (in 2014) of the Directorate for Rationalization of Agrarian Property and Rural Land Registry (DSPACR) within the Ministry of Agriculture. At the present time the third stage of the Cadastre, Titling and Registration of Rural Lands in Peru (*Catastro, Titulación y Registro de Tierras Rurales en el Perú*) is under way, with the objective of enhancing rural landholding security in the Selva and in targeted zones of the Sierra.



The Ministry of the Environment is the body responsible for administering the National Environmental Information System (SINIA). The SINIA embraces the regional and the local environmental information systems (SIAR and SIAL, respectively), administered by the respective government bodies at the regional and local levels. The legal rules provide that public institutions that generate information at the national, regional and local levels must provide relevant information for the SINIA to the Ministry of the Environment. Other agencies also contribute to the SINIA: these include the National Water Authority, which is responsible for the National System of Information on Water Resources (SNIRG) and the SENAMHI, responsible for hydrometeorological information. The creation of the National Institute for Research on Glaciers and Mountain Ecosystems (IANIGEM) has been an important step, considering the strategic nature of these natural features the context of climate change. As well, data from the OEFA are interoperable with the SINIA. Peru has begun to implement the Pollutant Release and Transfer Register (RETC) and is developing a national system, known as *Infocarbono*, to prepare greenhouse gas inventories. Information from the SINIA is used to prepare an annual report on environmental figures, entitled *Cifras Ambientales*, covering a number of environmental variables, and the Peruvian government publishes a National Report on the State of the Environment every two years.

There are still however some major information gaps, and these constitute an obstacle to the design and implementation of policies. An example is the system for monitoring air quality in zones where there are atmospheric pollution problems. There is also much room for greater collaboration with the sector spheres, which generate useful information from the environmental viewpoint and which can play a more active role in supplying information to the SINIA.

Access to environmental information is guaranteed by the Law on Transparency and Access to Public Information, established in 2003 and binding on all public institutions. At the regional and local levels, with support from the Ministry of the Environment, efforts are under way to create and implement regional environmental information systems (SIARs) and local environmental information systems (SIALs). At the end of 2013, a total of 21 regional governments (out of 24 plus the Constitutional Province of Callao) had begun to implement regional environmental information systems, although only 25 local governments (out of around 2,000) had taken steps to implement their local environmental information systems. Despite the existence of mechanisms that promote information transparency, the district and provincial municipalities have implemented very few measures to ensure transparency and access to public information. According to a report published by the Office of the Ombudsman (*Defensoría del Pueblo*), more than half (55%) of complaints filed against municipalities are for lack of transparency in information.

## IMPORTANT MILESTONES OF ENVIRONMENTAL POLICY AND INSTITUTIONS

Year	Milestone
1920 <sup>a</sup>	Creation of the Geophysics Institute of Peru ( <i>Instituto Geofísico del Perú</i> , IGP)
1969 <sup>a</sup>	Creation of the National Meteorology and Hydrology Service ( <i>Servicio Nacional de Meteorología e Hidrología</i> , SENAMHI). It covered several sectors: Ministries of Aeronautics, Agriculture, and Development and Public Works
1981 <sup>a</sup>	Creation of the Institute for Research in the Peruvian Amazon ( <i>Instituto de Investigaciones de la Amazonía Peruana</i> , IIAP)
1990	Environment and Natural Resources Code ( <i>Código de Medio Ambiente y de los Recursos Naturales</i> )
1992	Peru signs the United Nations Framework Convention on Climate Change (UNFCCC)
1993	The National Commission on Climate Change is created
1994	Peru ratifies Convention No. 169 of the International Labour Organization (ILO) on Indigenous and Tribal Peoples. <i>Resolución Legislativa N° 26253</i>
	Creation of the National Environment Council ( <i>Consejo Nacional del Ambiente</i> , CONAM)
1996	The first National Environmental Action Agenda is adopted (1997-1999)
2000	The General Law on Solid Wastes is adopted
	Approval of the Law creating the National Environmental Impact Assessment System
2001	First National Communication on Climate Change
	First regulation concerning national air quality standards
	Creation of the National Commission for Territorial Governance ( <i>Comisión Nacional para el Ordenamiento Territorial</i> )
	Regulations to the Law on conservation and sustainable use of biological diversity
	The first National Strategy for Biological Diversity is adopted
2002	State Policy on Environmental Management under the <i>Acuerdo Nacional</i>
	Law constituting regional governments ( <i>Ley Orgánica de los Gobiernos Regionales</i> )
	Peru ratifies the Kyoto Protocol
2003	The first National Strategy on Climate Change is adopted
	Regulations on ecological and economic zoning ( <i>Reglamento de la Zonificación Ecológica y Económica</i> , ZEE)
	Approval of environmental quality standards relating to noise ( <i>Estándares de Calidad Ambiental de Ruido</i> )
2004	Law N° 28245 creating the National Environmental Management System ( <i>Sistema Nacional de Gestión Ambiental</i> )
	National Food Security Strategy 2004-2015
2005	General Law on the Environment ( <i>Ley General del Ambiente</i> ), Law N° 28611
	Environmental Quality Standards for nonionizing radiation are adopted
2007	Energy Efficiency Law

Year	Milestone
2008 <sup>a</sup>	<p>Creation of the Ministry of the Environment (<i>Ministerio del Ambiente</i>, MINAM). <i>Decreto Legislativo</i> N° 1013.</p> <p>Creation of the Environmental Assessment and Enforcement Agency (<i>Organismo de Evaluación y Fiscalización Ambiental</i>, OEFA)</p> <p>Creation of the National Service for Government-Protected Natural Areas (<i>Servicio Nacional de Áreas Naturales Protegidas por el Estado</i>, SERNANP). Prior to creation of the MINAM, these fell under the jurisdiction of the Ministry of Agriculture through the National Institute for Natural Resources (<i>Instituto Nacional de Recursos Naturales</i>, INRENA).</p> <p>Environmental Quality Standards for Water are adopted</p>
2009	<p>Approval of the agenda for scientific research on climate change</p> <p>Approval of the National Environmental Policy</p> <p>The Master Plan for Protected Natural Areas (<i>Plan Director de Áreas Naturales Protegidas</i>, ANPs) is adopted</p> <p>Law N° 29325 National System of Environmental Assessment and Enforcement (<i>Sistema Nacional de Evaluación y Fiscalización Ambiental</i>)</p>
2010	<p>Action Plan for Climate Change Adaptation and Mitigation (<i>Plan de Acción de Adaptación y Mitigación frente al cambio climático</i>, PAAMCC)</p> <p>Second National Communication on Climate Change</p>
2011	<p>National Environmental Action Plan, 2011-2021 (PLANAA)</p> <p>Law N° 29763 on Forestry and Wildlife</p> <p>Creation of the National System for Disaster Risk Management (<i>Sistema Nacional de Gestión del Riesgo de Desastres</i>, SINAGERD). Law N° 29664.</p>
2012 <sup>a</sup>	<p>Adoption of the Strategic Pillars of Environmental Management approved by the Council of Ministers, on the basis of the Report of the Multisectoral Commission created by RS N° 189-2012-PCM and responsible for preparing regulatory and policy proposals to improve the environmental and social conditions in which economic activities, especially those of the extractive industries, are performed</p> <p>Creation of the National Service of Environmental Certification for Sustainable Investments (<i>Servicio Nacional de Certificación Ambiental para las Inversiones Sostenibles</i>, SENACE)</p> <p>Adoption of the National Policy on Environmental Education</p>
2013	<p>Adoption of the 2013-2016 Multi-year Sectoral Strategic Plan (<i>Plan Estratégico Sectorial Multianual</i>, PESEM) for the environmental sector</p> <p>Adoption of formalization rules and prohibition of illegal mining</p> <p>Adoption of regulations governing the 10-year ban on the import and production of genetically modified organisms</p> <p>Adoption of regulations for management and handling of waste electrical and electronic devices</p> <p>National Environmental Action Agenda 2013-2014</p> <p>The first Environmental Quality Standards for soils are adopted</p> <p>Law N° 30215 on the mechanisms of payment for ecosystem services</p>
2014 <sup>a</sup>	<p>Creation of the National Institute for Research on Glaciers and Mountain Ecosystems (<i>Instituto Nacional de Investigación en Glaciares y Ecosistemas de Montaña</i>, INAIGEM)</p> <p>National Environmental Action Agenda 2015-2016</p> <p>Adoption of the second National Strategy on Biological Diversity</p> <p>The twentieth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP20) is held in Lima</p>

<sup>a</sup> Creation of bodies under the Ministry of the Environment.

*Recommendations*

1. Based on the existing mandates and legal obligations, implement the horizontal and vertical institutional coordination necessary to improve the country's environmental policy and management towards sustainable development, incorporating partial and sector-based perspectives. Strengthen the subnational and local agencies with environmental responsibilities in the areas of funding and technical capacities.
2. Continue the process of strengthening and implementing the National Service of Environmental Certification for Sustainable Investments (SENACE) so it can facilitate efficient and independent environmental management through a one-stop window system and serve as a technical reference point for environmental impact assessment (EIA) studies. Ensure its financial sustainability (e.g., through licensing fees) and incorporate the technical know-how, best practices and lessons learned of the institutions that previously had responsibilities in that area.
3. Consolidate and further the oversight and control over activities that impact the environment and people's health and quality of life. Ensure the financial and operational sustainability of the Agency for Environmental Assessment and Enforcement (OEFA) and the National Environmental Assessment and Oversight Service (SINEFA), and improve their coordination with the public prosecution service and the judiciary.
4. Continue with the Ministry of the Environment's efforts to pursue the processes of Ecological and Economic Zoning and Specialized Studies to direct them towards Integrated Diagnostic Territorial Assessments and Territorial Governance Plans; enact a territorial governance law that consolidates the institutional framework and the existing instruments and incorporate those processes to align the economic, sociocultural and environmental potential of territories with the use made of them. Complete the pending territorial governance processes and enforce the existing governance instruments. Ensure coordination with the basin management plans of the National Water Authority.
5. Step up efforts to rationalize the growth of cities through binding urban development master plans, preventing the illegal occupancy of conurbated land and ensuring coordination with transport planning at the local (urban traffic) and national (infrastructure) levels.
6. Address the problems of the informal sector, bearing in mind its impact on the ability to correctly manage the conservation and protection of the environment and natural resources. Capitalize on the potential of activities related to the environment and the sustainable use of natural resources for job creation and increased formality.
7. Continue strengthening the construction of the environmental information system and its use in public policy. Ensure the continuous, representative and obligatory reporting of basic environmental information with adequate and internationally standardized coverage (for example, records of pollutant emissions and transfers, levels of emissions and quality of media, biological indicators). Ensure the public's timely and transparent access to published environmental information in the public domain, in compliance with existing legislation.

## **Economy and the environment**

### *Conclusions*

During the period of analysis, the Peruvian economy has grown at an average rate exceeding 6%, thanks to macroeconomic stability, open trade, and inflows of foreign investment attracted by the potential for natural resource exploitation. Together with measures to assure the conditions necessary for private investment in various productive sectors, the country has strengthened its environmental institutional framework as well as its legislation governing environmental management and conservation of natural resources, although it has not succeeded in breaking the link between the process of environmental degradation, with its associated costs, and economic growth.

The costs of environmental damage were estimated at the beginning of the period under analysis at some 4% of GDP, and 70% of those costs were associated with the effects on health from waterborne diseases, atmospheric pollution in the cities, exposure to lead, and contamination in the home. There are also estimates of water pollution from mining activities, which varied between 0.4% and 0.7% of GDP in the middle of the first decade of this century. Although the information is very sketchy, there are signs of a reduction in some environmental costs post-2006, especially those associated with atmospheric pollution. On the other hand, the amounts required to offset mining liabilities, which amounted to nearly 2% of GDP at the beginning of the period, have been growing apace with the number of contaminated sites identified by the Ministry of Energy and Mines, of which there were more than 8,600 in 2015.

Peru ranks third in Latin America and the Caribbean and first in South America in terms of the costs associated with natural disasters, as estimated over the period 1970-2010 by ECLAC. The El Niño/La Niña phenomena of 1982/83 and 1997/98, taken together, would represent nearly half of GDP for the year 2000 —hence the fear over the effects that the current season's event could have. During the years 2000-2005, the annual costs of natural disasters exceeded half a percentage point of GDP, and were associated primarily with losses in the agriculture sector. In the future, the additional GDP losses caused by climate change could amount to 15% for the period 2010-2100, and would be concentrated in the farming, high-Andean livestock and fisheries sectors.

Peru is well aware of its economic dependence on natural resources and the welfare effects of environmental costs, and has been laying the basis for adhering to the Declaration on Green Growth of the Organization for Economic Cooperation and Development (OECD), through discussion of a national strategy for green growth and adoption of the intended nationally determined contributions (INDC) relating to the reduction of greenhouse gas emissions, among other things. Yet there is still a lack of consistency between development policies, plans and strategies, on one hand, and environmental targets; there are failures of coordination, both horizontal and vertical, among the various government institutions; and there are problems in reconciling investment promotion measures with efficiency and effectiveness in environmental policies.

Moreover, although Peru has abundant legislation for effective protection of the environment, and although the General Law on the Environment recognizes the principle of internalizing costs, the enforcement of that legislation has relied essentially on “command and control” measures, with limited use of economic instruments and no specific provisions in the area of environmental taxation. In the absence of effective enforcement and penalties concomitant with damage, this strategy may be of limited effectiveness in achieving a better environmental performance. In practice, the fines levied bear no relation to the economic costs of the associated environmental damage, even though, with the creation of the OEFA, there was an increase in the number and amount of fines levied toward the end of the period

under analysis. Peru also allows for discounts on fines as an incentive to invest in compliance with environmental regulations.

Government expenditure on the environment, while growing, amounted to barely 0.4% of GDP at the end of the period under analysis (slightly more than 2% of total government spending), and of this amount only 27% was funded from general tax revenues. The majority of resources earmarked for environmental issues originated in utility rates and fees and taxes at the municipal level, which accounts for 75% of public environmental spending.

Generally speaking, the “user pays” principle has been applied to natural resource development and ecosystem services in the form of charges levied by the State (Law N° 26821 - *Ley Orgánica para el Aprovechamiento Sostenible de los Recursos Naturales*, among others) for the use of water and the dumping of waste water, royalties on the exploitation of forest resources, entry fees to natural areas, and various taxes on the mining industry. The fees paid directly to the State as well as the rates charged for concessioned water and solid waste services do not typically cover the costs of their provision, and they tend to lose value in real terms. Nevertheless, the contributions associated with mining and hydrocarbons exploitation (in their various forms: taxes and special levies, royalties, etc.) have been growing, averaging 1.5% of GDP, although they have fluctuated widely under the impact of the international economic cycle. These proceeds are allocated primarily to the regions where they originate, with no relationship to regional development indicators or environmental protection needs. It must also be recognized that tax evasion associated with illegal and informal mining amounts to US\$ 305 million a year: various estimates for the period under analysis indicate that cumulative evasion in the gold mining industry may have reached one percentage point of GDP in 2014. Recent years have seen the development of systems of payment for ecosystem services, the effectiveness and incentive value of which have yet to be evaluated.

When it comes to applying the “polluter pays” principle, the situation is less encouraging. Legislation to promote private investment and tax stability is making it difficult to undertake a green tax reform. Nevertheless, Peru's low level of tax pressure, at around 16% of GDP, offers an opportunity to align environmental incentives with the need to raise greater revenues. Taxes associated with the generation of externalities (imposed on energy products and automobiles) represented about 0.6% of GDP in 2010, below the level in all OECD countries with the exception of Mexico. Revenues from the fuel tax (part of the consumer excise tax) remained relatively stable during the period under analysis until, in 2014, gasoline taxes were cut by 30%. In addition, the municipalities apply taxes on vehicle ownership and road use (levied on fuel importers and refiners, who pass them on to consumers). There is no clear relationship with the degree of harmfulness of combustion-produced emissions, fuel quality, or the vehicle's environmental characteristics. Moreover, there are exemptions from the fuel excise tax in 350 districts of eastern Peru, located for the most part in the departments of Amazonas, Loreto, Ucayali, San Martín and Madre de Dios, and along the northern frontier there is a good deal of fuel smuggling.

While no information is available on private spending on environmental protection activities, Peru has developed some meaningful initiatives with public-private partnerships to foster investments in the public interest, including investments in water and sanitation and in the treatment and processing of wastes. However, there are no indicators that would make it possible to encourage environmentally friendly investments or to discriminate among proposals for the same project. The “tax-funded works law” (*Ley de obras por impuestos*), which provides incentives for regional and local public investment with private sector participation, allows firms to finance and implement public projects as a charge to their tax liability, while these subnational authorities can obtain financing backed by their revenues from royalties and fees. The mechanism, which has served to finance investment in solid waste treatment, sanitation and other areas, will demand a great deal of transparency and on-going reassessment, as local

and regional institutions are progressively strengthened. Peru has no system for “green” public procurement, and public incentives for clean production and technologies are scarce and dependent on international cooperation. There are some incipient initiatives at extended producer liability (Supreme Decree No. 001-2012-MINAM).

Peru’s great natural wealth offers an opportunity for eco-innovation and the development of new productive sectors and niches of international competitiveness. Nevertheless, R&D investment falls short of the average for Latin America and the Caribbean, and is far below the level in OECD countries. Although the intention is to boost such investment by a factor of five, from its 0.15% of GDP at the end of the period under analysis, and while tax benefits are being awarded for innovation and the National Strategy for the Development of Science, Technology and Innovation gives priority to programmes for biotechnology and for environmental science and technology with an emphasis on climate change, among other things, much more remains to be done to support a green growth strategy. The National Programme to Promote Bio-Trade was launched in 2003. Estimates suggest that exports of bio-trade products rose over the previous decade, amounting to more than US\$ 300 million in 2010, and that Peru is becoming one of the leading exporters of such products.

#### *Recommendations*

8. Complete the Green Growth Strategy in Peru, taking into account the role of environmental policies as a catalyst for economic growth. Include environmental policy goals in the plans for national development and productive diversification, in the framework for budget planning and in sectoral policies and plans. Strengthen coordination between the National Centre for Strategic Planning, the Ministry of the Economy and Finance, the Ministry of Production, the Ministry of the Environment and other competent agencies to ensure the effective implementation of low-carbon green growth by defining specific, measurable and consistent environmental objectives.
9. Incorporate environmental considerations into the tax system by encouraging the introduction of environmental taxes, as applicable, and gradually eliminating environmentally harmful systems of exemptions and subsidies. Further the full enforcement of environmental criteria in taxes on fuel and vehicles, in light of their contribution to emissions and their impact on health. Replace public financial support with systems that require payment for environmental services, as applicable, thereby ensuring efficiency in the use of tax revenues and effectiveness in environmental protection.
10. Include environmental impact assessments in economic policies, in particular spending and public investment policies. Expand the strategic environmental assessments (SEA) of energy policy and transport plans, in particular for the Lima-Callao metropolitan area and other mid-sized cities, as a tool for long-term planning.
11. Develop a green public procurement system and include environmental considerations in the programme of incentives for improving municipal management.
12. Bolster regular-budget funding for the environmental institutional framework in order to streamline the formulation of environmental policy and the oversight of compliance with its objectives. Promote the economic evaluation of environmental policies, plans and programmes, using tools such as cost-benefit and cost-effectiveness analyses and the establishment of objectives and goals with timetables and compliance indicators. Strengthen the use of management oversight tools to ensure compliance with those objectives.

13. Bolster the role of the private sector in the development of eco-innovation, energy efficiency, nonconventional renewable energy sources, the waste recycling, reuse and treatment sectors and other environmental policy objectives through economic incentives, credit supports and soft loans, public-private partnerships and/or clean production agreements, etc. Include the eco-innovation component in R+D policy and ensure that funds from royalties foster the development of knowledge centres associated with environmental protection, the sustainable use of natural resources and the creation of new environmentally friendly competitive niches. Leverage the expanded responsibility of producers to encourage formalization processes and strengthen eco-labelling systems in order to facilitate consumer awareness and good private sector behaviour on the basis of the benefits of reputation.
14. Expand and deepen economic information related to the implementation of environmental policy instruments (integrated economic and environmental accounting systems, environmental spending, public financial support, direct regulation, environmental taxes, market creation mechanisms, service fees, voluntary systems, information systems) using cost-effectiveness analyses and following international methodologies and standards.

## **Society and the environment**

### *Conclusions*

Because of its geographical conditions, its socioeconomic structure and activities and its population distribution, there is an important relationship in Peru between environmental conditions and environmental health and the quality of life. The variations and changes experienced in the environment affect living conditions and economic and productive activities of all kinds. Environmental pollution is having a major impact on the prevalence of acute diarrhoeal diseases and acute respiratory ailments. To this must be added the increase in emergencies caused by natural phenomena, which rose by 54.6% between 2003 and 2013 and were related to climatic variability.

While the poverty rate has dropped sharply (from 52.5% in 2003 to 23.9% in 2013), inequality as measured by the Gini index has improved much more slowly (from 0.49 in 2004 to 0.44 in 2013). The poverty rate among the rural population is five times that in urban areas. Furthermore, in rural areas basic services are in short supply and water is consumed under inappropriate conditions and from unsafe sources. This persistent inequality is accentuated with respect to the rural population, and is even worse among vulnerable social groups such as indigenous peoples (primarily the Quechua and Aymara groups and those of Amazonian origin) who are also most exposed and vulnerable to environmental conditions, especially natural events. In effect, the country exhibits severe social and living-standard disparities, due in particular to geographical isolation, and these, together with Peru's investment dynamics and a growth model heavily reliant on natural resource exploration and exploitation, have sparked migration by rural and semi-urban dwellers to the coastal cities, which offer better expectations in terms of living conditions and infrastructure.

On the education front, the Ministry of the Environment has been working with the Education Ministry to promote the environmental culture, education and citizenship component of the National Environmental Policy. Education in eco-efficiency has been encouraged since 2011 through the Environmental Education Project, the purpose of which is to ensure that educational institutions develop knowledge, values and practices in harmony with the environment. Efforts in this area are supplemented by the National Prize for Environmental Citizenship, introduced in 2009, and by other efforts at the university level. Notwithstanding these initiatives, there are some important challenges to be met before



the country has an education policy that incorporates environmental contents in a programmatic and permanent way into the formal education systems. There is also a need to mount actions in the area of non-formal education with a view to building an environmentally more responsible citizenry that is aware of the role the environment plays in the quality of life. This is particularly true for social groups that are vulnerable to the externalities of works or projects, or to climate change. Information and communication technologies can play a key role in raising social awareness of this issue.

Peru has made important efforts to facilitate access to information in the hands of the State and to ensure its transparency and, in particular, to generate, systematize and make available information of an environmental nature. Law 27806 of 2003, on transparency and access to public information, which is binding on public institutions of the Peruvian State, has expanded the conditions for citizen oversight and accountability, as well as laying the basis for transparency in public affairs. With specific reference to the environment, the National Environmental Management System (*Sistema Nacional de Gestión Ambiental*, SNGA), created by law in 2004 together with the National Environmental Information System (SINIA), has served to facilitate access to environmental information, freely and without charge: this service is provided primarily via the Internet. The number of visits to the system has been growing steadily since its creation, although it is little recognized or used among the general public. At the regional and local level, steps have also been taken to create and implement environmental information systems with the support of the Ministry of the Environment. However, those efforts have been insufficient.

Environmental understanding, awareness and involvement on the part of the general public is impeded by the lack of information in some cases, and the fact that what is available is provided only irregularly and in a non-standard and non-comparable format, and must be sought from scattered sources. Problems of access to environmental information, especially for people affected by projects and works and those vulnerable to climatic impacts, can be blamed on many factors: lack of technology, the communication language used in a multilingual country, the capacity of the public to assimilate technical information, and territorial isolation, among others. The system therefore needs to be strengthened at the three levels of government administration —national, regional or departmental and local— so as to facilitate citizen participation, on one hand, and to raise the degree of awareness about the prevention of pollution, environmental degradation, and natural disasters. The capabilities of the district and local governments also need to be strengthened, as they account for the bulk of complaints over lack of information and transparency.

Peru has also adopted legislative and administrative measures to enhance citizen participation in decisions that have environmental implications. Of particular note is the Prior Consultation Law (Law 29785) adopted in 2011, which regulates the process of consulting indigenous communities about activities in their territories, reflecting the provisions of the Indigenous and Tribal Peoples Convention No. 169 of the International Labour Organization (ILO). To date, 22 prior consultations have been held or are under way, and most of them relate to the energy sector and the environment. At the executive level, recognizing the sharp increase in socioenvironmental conflicts (up by 300% over the period 2010-2015, according to the Office of the Ombudsman), the Ministry of the Environment created the Advisory Office on Socioenvironmental Matters (*Oficina de Asesoramiento en Asuntos Socioambientales*) in 2011, with a view to managing, preventing and transcending socioenvironmental conflicts by creating spaces for dialogue among the parties to the disputes and proposing strategies for resolving them. That Office is supplemented by the National Office for Dialogue of the President of the Council of Ministers (*Oficina Nacional de Diálogo de la Presidencia del Consejo de Ministros*), which seeks to foster coordination and dialogue among sectors and across levels of government for dealing with various social conflicts.

Despite these efforts, citizens still have only limited opportunities to influence environmental decisions. The existing mechanisms for participation in conventional instruments such as the environmental impact assessment and territorial governance processes need to be strengthened and broadened to ensure that the opinion of the potentially affected social groups will be heard before a project or activity is undertaken. The quantity, frequency and intensity of socioenvironmental conflicts, the diversity of stakeholders involved in them, and the resulting economic and social effects (which increased significantly during the period under analysis) are also a reflection of a set of unmet needs that go beyond the strictly environmental and are rooted in the country's great inequalities.

With respect to the application of environmental justice in Peru, Law 29263 of 2008 amended the list of environmental offences, increasing the penalties for each offence and aligning the legal terminology with modern definitions relating to environmental protection. To apply that legislation, the Peruvian government created a Specialized Prosecution Office for Environmental Offences (*Procuraduría Especializada en Delitos Ambientales*), which since 2010 has had the role of defending the interests of the State in environmental crime investigations and proceedings. This move has served to overcome a piecemeal, sector-based approach to environmental protection that impeded the proper and effective enforcement of environmental justice. The environmental justice system has been further improved with the establishment of Specialized Environmental Prosecutors (*Fiscalías Especializadas en Materia Ambiental*) within the Attorney General's Office (*Ministerio Público*) and the creation, in 2013, of two Preparatory Investigation Courts (*Juzgados de Investigación Preparatoria Especializados*) specialized in environmental offences, although their remit covers only two districts of the country (Piura and Cusco). It is also noteworthy that the entities that make up the National System of Environmental Assessment and Oversight have played a positive role in promoting the enforcement of environmental legislation.

Despite changes in the country's institutions and legal framework, there are still some major gaps in environmental justice and enforcement. The fact that many projects and works have no social licence, linked with the empowerment of society in defending and protecting the environment and natural resources, has led to a growing number of legal challenges, through both the administrative and the judicial routes, with the consequent need to improve the capacities of those responsible for applying and enforcing environmental legislation in both instances. Issues relating to technical expertise or the burden of proof in court proceedings, for example, continue to pose challenges for the administration of justice.

### *Recommendations*

15. Draft a national environmental health action plan in pursuit of: (i) improved basic sanitation, particularly in rural areas and municipalities, (ii) health and safety in the workplace and (iii) reduced exposure to poor sanitary conditions (air, drinking water, wastewater, residues, dangerous substances and all types of pollution and environmental liabilities).
16. Bolster and further formal and informal education and the awareness of the public and the business sector regarding environmental issues, placing priority on the most polluting industries and on the communities that are the most exposed and vulnerable to risks associated with external factors arising from economic activities and climatological conditions, in order to: (i) improve awareness of rights and duties and their exercise, (ii) contribute to behavioural changes and the adoption of environmentally friendly practices and (iii) facilitate active and constructive participation in the design and implementation of policies, programmes, strategies and projects with an impact on the environment.

17. Improve the effectiveness of citizen participation mechanisms in the environmental impact assessment system, in plans, standards and programmes and in other forums for social interaction; continue to promote and further the conditions for the implementation of the prior consultation mechanism provided for in the Indigenous and Tribal Peoples Convention of 1989 (No. 169) of the International Labour Organization, particularly in major investment projects by the mining and energy sectors.
18. Expand the capacities of the judiciary, public prosecution service and other agencies of the justice system responsible for law enforcement in addressing environmental topics, and assess the creation of specialized environmental courts. Expand, within the Judiciary School and other facilities for the training of judges, mechanisms for the environmental education and training of the judicial branch; improve technical and scientific support for the tasks of administering justice and law enforcement, and strengthen the police agencies that specialize in environmental offences.

## Cooperation and international commitments

### *Conclusions*

The National Environmental Policy of 2009 reflects in its wording both the Rio Declaration on the Environment and Development and the Millennium Development Goals, as well as the international conventions and treaties to which Peru is a party. That policy mentions the ratification of international treaties at the multilateral, regional and bilateral levels, and cites the free trade treaties as a strategy for integration.

On the strength of the international commitments adopted at the United Nations Conference on Environment and Sustainable Development (from Stockholm, 1972, to Rio de Janeiro, 2012), Peru has promoted the incorporation of environmental management instruments that will facilitate their fulfilment. In light of Programme 21, a significant number of municipalities strengthened their institutions by developing local environmental management capacities for the purpose of adopting action plans for local sustainable development. The results were uneven, due to lack of a strategy for promoting that agenda. In response, a Strategy for Strengthening Decentralized Environmental Performance was developed. In 2013, Peru reported auspicious progress toward achieving the Millennium Development Goals.

Peru has ratified the United Nations Framework Convention on Climate Change as well as the Kyoto Protocol. It presented its first Communication on Climate Change in 2001, its second in 2010, and is currently working on its third report. Its greenhouse gas emissions represent slightly more than 0.3% of the world total, with a heavy component attributable to land-use change and deforestation, and growth coupled with the evolution of the economy. Over the last decade there has been systematic progress in the normative and institutional framework relating to climate change. Peru has also developed regional strategies on climate change. It is among the countries that comprise the Cartagena Dialogue for Progressive Action (*Diálogo de Cartagena para la Acción Progresiva*), a discussion forum that is seeking areas of international convergence toward a solution to climate change. It is also a member of the Independent Alliance of Latin America and the Caribbean (AILAC), a group of seven countries dedicated to concrete progress under the Convention. At the fourteenth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP14), Peru undertook to preserve 54,000,000 hectares of forest as a contribution to mitigating greenhouse gas emissions. At the fifteenth session of the Conference of the Parties (COP15), it pledged to reduce to zero the net deforestation rate in its tropical forests by the year 2020. On the basis of these commitments, it has developed the National Programme of Forest Conservation for Mitigating Climate Change, which in 2014 covered a total of

542,000 hectares of protected forest land. After hosting the twentieth session of the Conference of the Parties (COP20) in 2014, Peru presented its intended nationally determined contributions (INDC) at the twenty-first session (COP21), in which it undertook to reduce its emissions by 30% from the base scenario. The forestry sector will account for 60% of the expected reduction.

Peru is recognized as one of the world's 17 megadiverse countries. In 1993 it ratified the Convention on Biological Diversity; it has been a signatory to the Cartagena Protocol on Biosafety since 2004; and in 2014 it became party to the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization. In 2014 it presented the National Strategy for Biological Diversity and its Action Plan, both of which are consistent with the Aichi targets. Although that strategy has achieved a degree of synergy with the National Strategy on Climate Change, in general terms national policies in the energy, agriculture, water, fisheries and other areas bear no direct relationship to the targets, with the exception of the National Environment Policy. In 2015, the Organization of Latin American and Caribbean Supreme Audit Institutions produced a positive assessment of progress in compliance with the agreement established by AICHI Target 11, although mobilizing the required financial, human and institutional resources remained a challenge. In 1991 Peru ratified the Convention on Wetlands of International Importance, also known as the Ramsar Convention, and at the beginning of 2015 it adopted a National Wetlands Strategy to promote the conservation and sustainable use of such ecosystems.

In 1995 Peru ratified the Convention to Combat Desertification: the proportion of its surface area in dry lands (around 40%) is in fact one of the highest in South America. In its fourth National Communication, Peru reports that a third of its surface area was in some state of desertification. The main instances of desertification are to be found along the Costa Árida ("Arid Coast"), in the semi-arid Sierra and in Amazonia. An anti-desertification strategy 2008-2018 has been adopted, covering various initiatives by governments, research institutions and NGOs at the national, regional and local levels. It is estimated that US\$ 225 million has been committed in 46 programmes and projects.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was ratified in 1975. The CITES Secretariat has ranked Peru in category 1, meaning that its legislation meets the requirements for application of the Convention and the country has sufficient administrative, scientific and supervisory authorities to control trade in species covered by the Convention. Peru has two forest species of great commercial interest, mahogany and cedar. In the 1980s and 1990s the mahogany trade enjoyed a great boom, with the consequent increase in illegal logging as a result of which the species was listed in CITES Appendix II in 2002. The restriction on marketing this wood came into force in November 2003. It must be noted, however, that Peru is one of the main exporters of biotrade products, and product controls and traceability must therefore be maintained.

Peru is also party to a series of international conventions for the protection and conservation of the marine environment. These include the International Convention for the Prevention of Pollution from Ships (1973); the Action Plan for the Protection of the Marine Environment and Coastal Area of the Southeast Pacific; the Protocol for the Protection of the Southeast Pacific against Pollution from Land-Based Sources; the International Convention for the Safety of Life at Sea (1974), the Convention for the Protection of the Marine Environment and Coastal Area of the Southeast Pacific; the Supplementary Protocol to the Agreement on Regional Cooperation for Combating Pollution of the Southeast Pacific from Hydrocarbons and Other Harmful Substances; the Protocol for the Conservation and Management of Protected Marine and Coastal Areas of the Southeast Pacific; the Protocol on the programme for the regional study on the El Niño phenomenon in the Southeast Pacific; the International Convention on Oil Pollution Preparedness, Response and Cooperation; and the 1992 Protocol amending the International

Convention on Civil Liability for Oil Pollution Damage. It is also a party to the Latin American Agreement on Port State Control of Vessels, signed in 1992 with a view to maintaining an effective inspection system to guarantee that foreign vessels visiting a country's ports meet the standards established in the international conventions. The objective is that the respective maritime authorities will inspect at least 20% of all foreign vessels entering their ports each year. According to figures for 2013, Peru inspected 27% of the vessels entering its ports, thereby complying with the objective of this agreement.

In 2009 the FAO approved the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. While Peru has signed that agreement, it has not yet ratified it. Peru has also had legislation since 1996 prohibiting the catching of dolphins and small cetaceans. Given the existence of a shark fishery, in 2014 Peru adopted the National Action Plan for the Conservation and Management of Sharks, Rays and Related Species, known as *PAN Tiburón Perú*. Peru is also a party to the International Convention for the Regulation of Whaling and the Agreement on the International Programme for the Conservation of Dolphins. It is a member of the Inter-American Tropical Tuna Commission, the Permanent Commission for the South Pacific, the Latin American Organization for Fisheries Development, and the Amazon Cooperation Treaty Organization, through which it has adopted initiatives to protect, conserve and manage its resources. In addition to the foregoing, Peru ratified the Convention on the Conservation of Migratory Species of Wild Animals in 1997 and the Inter-American Convention for the Protection and Conservation of Sea Turtles in 1999. In its last report, dated 2014, it described a series of activities aimed at conservation of the species. Notwithstanding those efforts, a study conducted in three Peruvian ports estimated that some 5,900 turtles were being taken as by-catch each year.

Peru has been a member of the World Trade Organization (WTO) since 1995, and its commitment to the multilateral system is reflected in the presentation of various proposals in such areas as special and differentiated treatment, agriculture, fisheries subsidies, market access, biodiversity, traditional knowledge, genetic resources, trade facilitation, and environmental goods and services. Peru has an open and diversified economy, and it has pursued international trade as a component of its growth. Few imports and exports are subject to restrictions or bans, and these are imposed only for reasons of health and safety, to protect the environment, and to comply with international commitments given by the country. Peru has 17 trade agreements in force. At the regional level, it is a founding member of the Andean Community and the Pacific Alliance, and it has a free trade agreement with the Southern Common Market (MERCOSUR). In addition, it has signed trade agreements with the European Free Trade Association and the European Union, as well as with the Bolivarian Republic of Venezuela, Canada, Chile, China, Costa Rica, Japan, Republic of Korea, Mexico, Panama, Singapore, Thailand and the United States. It has concluded two trade agreements (not yet in effect) with Guatemala and Honduras, and is negotiating others with El Salvador and the Trans-Pacific Partnership. The trade agreements that address environmental matters are those signed with the United States, Canada, Republic of Korea and the European Union, although their provisions vary in depth and scope. In the context of these trade agreements, Peru has developed cooperation with the United States on forestry, for example, and with Canada on climate change mitigation in the housing sector. A new project is now being developed on conservation of biodiversity.

When it comes to bilateral and regional cooperation, Peru is an active member of the Forum of Ministers of Environment of Latin America and the Caribbean. It is also a party to the Amazon Cooperation Treaty Organization (ACTO), comprising the Plurinational State of Bolivia, Brazil, Colombia, Ecuador, Guyana, Suriname and the Bolivarian Republic of Venezuela. ACTO has launched a project for monitoring deforestation, logging and land-use change in the Pan-Amazonian forest, the purpose of which is to ensure participatory monitoring of forest cover in Amazonia and to strengthen the

existing regional coordination mechanisms for forest management. In addition, Peru has a series of bilateral cooperation agreements with countries of the region, including Argentina, Brazil, the Plurinational State of Bolivia, Chile, Colombia, Costa Rica, Cuba, Ecuador, Honduras, Mexico and Panama. With those countries it has been developing an environmental agenda dealing with, among other matters, illegal logging and cross-border pollution, especially from the artisanal gold mining industry. Peru is promoting the Andean Strategy for Integrated Water Resource Management, being developed under the auspices of the Andean Community. In the Pacific Alliance, Peru is working with Colombia, Chile and Mexico to develop a research network of climate change scientists, who have already produced and published a report on opportunities for collaboration in research on climate change in the countries of the Pacific Alliance (*Oportunidades de Colaboración en Investigación sobre Cambio Climático en los países de la Alianza del Pacífico*).

According to OECD data, in 2013 Peru received official development assistance (ODA) in a gross amount of US\$ 532.1 million, and a net amount of US\$ 367 million. The OECD also reports that annual development cooperation between 2005 and 2009 averaged US\$ 425 million. Since its adherence in 2006 to the Paris Declaration on Aid Effectiveness, Peru has been working to make more effective use of the resources it receives in the form of ODA. During 2011, Peru conducted an assessment of achievements in terms of cooperation effectiveness. According to that evaluation, there had been progress with respect to aid predictability and coordination of local capacity building, but further work was needed on making the national development strategy operational. International cooperation has played a fundamental role in a number of environmental projects, accounting for around 3% of public spending on the environment in Peru. The country has been an active participant in South-South cooperation, primarily within the region, and this has included environmental activities.

### *Recommendations*

19. Continue strengthening synergies between the strategies for climate change, biodiversity and desertification; bolster coordinated collaborative efforts in those areas to continue making progress with meeting international commitments.
20. As a megadiverse country, continue efforts to protect underrepresented land ecosystems and to increase the marine areas under protection in order to progress towards meeting Aichi Biodiversity Target No. 11. Ensure that all Peru's marine ecosystems are duly represented, bearing in mind the proposal for Ecologically or Biologically Significant Marine Areas (EBSA) in the Convention on Biological Diversity. For continental ecosystems, consider increasing the representation of aquatic habitats in the protected natural areas system.
21. Continue strengthening capacities for controlling the illegal trade in endangered species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
22. Strengthen the management of waste products, chemicals and hazardous substances in accordance with international treaties, in particular the Stockholm Convention on Persistent Organic Pollutants, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Take actions for the implementation of the recently ratified Minamata Convention on Mercury, in particular those aimed at the environmentally sound storage and management of mercury wastes in mining and the elimination of the use of mercury and trading in it.

23. Continue the efforts to meet Peru's international environmental commitments in order to reflect the country's growing role in the economy of Latin America and its potential for membership of the Organization for Economic Cooperation and Development (OECD). Continue to make progress with the development of effective and efficient international cooperation that is geared towards the country's environmental needs; seek out synergies between activities and, to the extent that is possible, assess ways to ensure that the achievements obtained through cooperation are sustainable over time, with their own capacities and resources.
24. Conduct environmental assessments of trade and investment agreements to identify their adverse repercussions. Continue with the international cooperation activities associated with commercial treaties, in particular those intended to prevent environmental harm caused by the extractive sector's production of export goods. Promote compliance with the OECD Guidelines for Multinational Enterprises and with the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.

## **Part II**

### **Environmental quality of life**

#### **Air**

##### *Conclusions*

Peru has experienced major economic, social and institutional changes during the past decade, and these have brought with them increased pressures on the environment as well as new approaches to environmental management. The country has made progress in consolidating a management system that has tools for preventing and controlling pollution through specialized institutions, which have also served to eliminate conflicts with respect to the promotion of productive activities. The regulatory framework now in place for managing air quality can be considered comprehensive: it involves environmental quality standards (EQS), maximum permissible limits (MPL), and instruments for restoring environmental quality such as the Action Plans. In addition, air quality is supported by tools such as the environmental impact assessment system, the clean production agreements, information and environmental education.

Peru has air quality information dating back to the year 2000 for Lima-Callao, a large metropolitan area with a population of some 10 million (31% of the national population) according to figures from the National Statistics and Information Institute (INEI) for the year 2015. Other cities for which systematized information is available are Cajamarca, Tacna, Arequipa, Huaraz and Ilo, where there are monitoring networks of varying size and time in operation. In the remaining cities, especially those where action plans have been implemented, there is information available from isolated monitoring campaigns, but this cannot be used to assess EQS compliance. In some cases the available information makes it possible to infer that these standards are not being met, especially the daily EQS. Studies of morbidity and mortality attributable to air pollution in metropolitan Lima, conducted by the Ministry of the Environment (2014, using the AIRQ methodology) estimated that there would be 1,220 deaths attributable to PM10 pollution in that city, of which 468 would be caused by respiratory diseases and 165 by cardiovascular diseases. The economic cost of these and other health impacts analysed by the study amounts to US\$ 806 million, of which US\$ 802 million corresponds to mortality.

The available information on emissions of pollutants into the atmosphere is incomplete: it does not cover all pollutants, it considers only certain activities (although these include the most important ones), it extends over only a portion of the assessment period, and it is estimated in most cases on the basis of activity reports from the sectors concerned. The basic information used to make these estimates does not always represent local conditions, leading to potentially significant distortions that cannot however be quantified. These problems limit the authorities' capacity to pinpoint the sources responsible for the pollution and to design corrective measures.

Transportation has been identified as one of the main causes of air quality problems. In the 31 Priority Attention Zones (ZAP) that have an action plan, transportation appears as the first or second source of pollution. Peru's vehicle fleet is old and poorly maintained. The country allows the import of used vehicles, although restrictions has recently been imposed, including a five-year vehicle age limit. Vehicle emissions are controlled through the MPLs. These have been in existence since 2001, and they regulate emissions of CO, NOx, SOx, HC, PM and other pollutants. Observance of these limits is verified by the Vehicle Inspection Centres created in 2008 by Law 29237. Background information in various action plans suggests that this obligation is not observed everywhere. Emission controls for diesel vehicles have been deferred until such time as fuel is available with characteristics that meet the MPL. The fuel now in use has



a high sulphur content, except in the departments of Lima, Arequipa, Cusco, Puno, Madre de Dios and the Provincia Constitucional del Callao, where there is a ban on the use and marketing of diesel with more than 50 ppm of sulphur. Recently, Supreme Decree No. 009-2015-MINAM extended a similar ban to the departments of Junín, Tacna and Moquegua, as of 1 January 2016. Diesel sold in the rest of the country has a sulphur content of 2,000 ppm, and as high as 5,000 ppm.

In 2005 a timetable was adopted, setting 1 January 2010 as the date at which diesel with 50 ppm sulphur must be available nationwide. That date has been postponed due to various factors, including the need to upgrade the country's main refineries, and this fuel improvement is now being introduced gradually at the regional level. However valid its justification may be, this delay is surely excessive, considering the public health impact of poor fuel quality. That poor quality also limits the possibility of importing vehicles with more advanced technologies and lower emissions. At the present time, the vehicle emissions standard is Euro III, which can be considered out-dated. The incorporation of natural gas into the country's energy mix has made an important contribution to pollution reduction and prevention, as its use in power generation, industry and transportation has spread. Roughly 8% of the vehicle fleet is gas-powered. Peru has had since 2003 a law promoting biofuels (Law 28054) which sets a minimum ethanol content of 7.8% in gasoline, and a minimum biodiesel content of 5% in diesel fuel. It is being gradually implemented by region, with the intent of supporting the entire productive chain. After an initial boom in local production, a large proportion of these products is now being imported. Public transportation is provided for the most part informally, with obsolete and poorly maintained rolling stock, except in Lima where efforts are being made to improve the system. Transit routes and frequencies are not planned, and service providers (small firms or individual vehicle owners) compete among themselves for passengers in the cities. For these reasons, the public transit system is deficient and of poor quality.

The vehicle ownership rate is low in Peru, compared with other countries of the region: 73 vehicles per 1000 inhabitants in 2013 (including heavy vehicles). However, most of the major cities have traffic congestion problems. As the Peruvian economy grows, this indicator can be expected to rise. At this stage it is important to try to prevent an uncontrolled increase from exacerbating the problems of pollution and mobility. The authorities must provide alternatives to automobile use through efficient transportation systems, adequate road infrastructure, and control over unplanned urban sprawl. On this point, Lima is making important efforts with construction of a Metro within the city and the Metropolitano, a transit system with segregated rights-of-way and high-capacity rolling stock that is backed by local feeder routes. Both initiatives are taking a comprehensive approach to the transportation problem, and they have done much to alleviate transit problems in the capital. However, implementation timetables have been delayed by problems with financing.

There are 31 ZAPs located in an equal number of atmospheric basins that have Action Plans, an instrument designed to reverse or prevent atmospheric pollution problems. For a zone to be declared a ZAP, it must have populated centres or towns with more than 250,000 inhabitants or a population density per hectare that justifies its priority attention, or there must be socioeconomic activities with a significant influence on air quality. This definition does not imply that a zone must be noncompliant with some standard in order to be declared a ZAP, and this encourages implementation of preventive measures. The lack of systematic information on air quality has meant that in most of these zones compliance with the EQS cannot be reliably verified. In some cases it can be said that they are in default on certain daily standards, and that by inference they are noncompliant with the annual EQS. The measures contained in these Action Plans cover a range of aspects that include improving information on air quality and emission sources, delivery of information to the public and environmental education, improving fuels, combustion processes and technology, primarily in transportation, urban planning, again focused on transportation, among other matters. In some cases they contain measures to ensure compliance with other

standards, such as technical inspection of vehicles. In many cases the measures are presented in general terms, without indicating any specific targets to be met or the manner of implementing them, and background information on their financing is not always available. Measures are not subjected to any economic assessment of the cost-benefit or cost-effectiveness type. The effectiveness of this instrument could be substantially enhanced by improving the information on air quality and emissions in the respective localities, and encouraging the design of more effective measures and better arrangements for their financing.

Peru's emissions of greenhouse gases are low, both in per capita and in total terms, and they represent only 0.3% of global emissions. Roughly half of the country's emissions come from activities related to land use, changes in land use, and deforestation. The 2010 emissions inventory reports 124,109 GgCO<sub>2</sub>eq, and cites as the main sources deforestation and degradation of tropical forests (35.1%), the energy sector (32.7%), primarily through growth in the automotive fleet, the agriculture sector (21%), wastes (6.2%) and industrial processes (5.1%). The Second National Communication forecasts steady growth of emissions in all sectors. Emissions from energy and agriculture will triple to 2050, while those related to land use will rise by 137%. The incorporation of natural gas into the energy mix has displaced the consumption of oil in manufacturing and transportation, and has prevented further carbon-intensity in power generation. In this last case there has also been a slowing of hydroelectricity development, with a differentiated impact on global and local pollutant emissions. The Planning for Climate Change (*Planificación ante el Cambio Climático*, PlanCC) project is a government initiative launched in 2012, the first phase of which was completed in 2014. It involved an update of Peru's greenhouse gas emissions inventory to 2009 and the production of qualitative and quantitative evidence on possible climate change mitigation scenarios for the years 2021 and 2050, applying 77 mitigation measures in the energy, agriculture, forestry and transportation sectors, waste management and industrial process. Phases II and III involve political discussion of measures and their implementation, respectively.

### *Recommendations*

25. Strengthen the infrastructure of air-quality monitoring networks to ensure compliance with environmental quality standards (EQS). Increase the coverage of air-quality measurements in cities with histories of possible pollution problems. Expand the scope of the measures included in the Air Quality Improvement Action Plans by, for example, including measures that take residential emissions into account; assess the cost-effectiveness ratio of the existing measures and explore the possibility of improving them.
26. Improve the coverage and estimates of emissions from different sources in the Priority Attention Zones (ZAPs). Make progress with the preparation of emissions inventories using local data to identify sources and assess the cost-effectiveness ratio of the measures applied. Make progress with setting Maximum Permissible Limits for those sectors that do not yet have them. Complete the implementation of the Pollutant Release and Transfer Registers (PRTRs) to facilitate the preparation of inventories and the design of decontamination measures.
27. Extend the use of cost-benefit analyses of emissions and quality standards and of the measures contained in the Action Plans, using local information. Assess the incorporation of emissions offset schemes into new projects implemented in ZAPs with atmospheric pollution problems, ensuring that the offsets are made within the affected area.

28. Invest in the design and construction of efficient public transport systems and promote the use of means of transport other than automobiles. Make efforts to improve fuel quality, approaching standards close to those of the OECD countries. Promote economic incentives based on the principle of making polluters pay to reduce vehicle emissions and atmospheric pollution. Further restrict imports of used vehicles and establish stricter entry requirements for new vehicles. Oversee compliance with vehicle emission standards and technical inspections of in-use vehicles. Promote the scrapping of old vehicles still in use as a way to reduce NOx emissions.

## Management of waste and chemicals

### Waste

#### *Conclusions*

The daily per capita generation of waste in Peru, at 0.58 kg, is low compared to other countries. The infrastructure in place for the disposal of domestic wastes is however inadequate. According to available information, there are currently only 11 supervised sanitary landfills, four of which are located in the city of Lima. This is clearly inadequate to handle the volume of wastes in the country, and produces a situation where 46.2% of wastes are disposed of improperly in unsupervised dumps, or are thrown into the rivers or the sea, or incinerated without controls. There are some major discrepancies among regions with respect to the infrastructure available for final disposal of wastes and the availability of municipal trash collection services. These shortcomings can be explained to some extent by the high rate of municipal tax arrears, which denies municipalities the revenues needed to collect and process wastes.

An important step has been taken with implementation of the Solid Waste Management Information System (*Sistema de Información para la Gestión de los Residuos Sólidos*, SIGERSOL). Since 2009 municipalities have been required to report data on waste generation and management, for inclusion in this system. Prior to that time, the information base was the Solid Waste Management Plans (*Planes de Gestión Ambiental de Residuos Sólidos*, PIGARS). In 2007 the available information came from the 51 PIGARS reported for that year, the number which rose to 55 in 2008 and to 58 in 2009, when it was supplemented by information from the 246 districts that reported to SIGERSOL. The number of districts reporting to SIGERSOL increased to 251 in 2010, 447 in 2011, 664 in 2012, and 666 in 2013. In November 2015 the country had 1,857 districts, and consequently the system's coverage is still sparse. The lack of information is a more acute problem when it comes to the generation and management of non-municipal wastes, including hazardous wastes.

The legal framework for waste management is comprehensive and lays the basis for the national policy in this area. The General Law on Solid Wastes (Law 27314-2000 and its amendments) and the regulations to the law (Reg. 057-2004-PCM) seek to ensure proper management and handling of wastes, both municipal and non-municipal, in ways that will prevent health risks and will protect and promote environmental quality, health and personal well-being. The law makes the provincial municipalities responsible for managing solid wastes of domestic and commercial origin, and similar wastes from other activities. On the other hand, the district municipalities are responsible for the collection and transportation of these solid wastes, as well as for the cleaning of streets and public spaces and monuments. The law also provides that all solid wastes must be conveyed directly to the treatment plant, or to the final disposal site designated by the provincial municipality. This obligation today goes widely unobserved. In addition to this generic rule, there is a law regulating the activity of recyclers (Law 29419-2009) and its regulations

(DS 005-2010-MINAM), designed to promote the protection, training, social and vocational development of recyclers, and to encourage them to form associations and formalize their work.

In the case of non-municipal wastes, the sector authorities are responsible for enforcing the General Law, the Regulations and other standards. The sectors covered here include manufacturing, agriculture, agro-industry and construction. In this context, specific regulations have been recently approved, such as those governing the management and handling of wastes from construction and demolition activities (DS 003-2013-VIVIENDA), and there is a specific standard for wastes consisting of electric and electronic devices, whereby liability extends to the manufacturers of these products. There is also a specific standard regulating the production, storage, packaging, transport and transit of hazardous wastes, as well as their management and final disposal.

The Ministry of the Environment is the competent body for approving the National Solid Waste Policy and for promoting the preparation and application of comprehensive solid waste management plans (PIGARS) and the solid waste handling plans (*Planes de Manejo de Residuos Sólidos*, PMRS) at the provincial and district levels. Despite the obligation to prepare such plans at the regional and local levels, only a low percentage of districts nationwide have these management tools at the present time.

A number of steps have been taken to improve waste management in Peru. The Ministry of the Environment has launched a series of programmes and investment projects that include various aspects of comprehensive waste management. Highly positive initiatives undertaken in recent years include the Municipal Modernization Programme (PMM) (in conjunction with the Ministry of Economy and Finance), the Segregation-at-Source Programme, and the Programme for Formalization of Recyclers. The Segregation-at-Source Programme, which involves the selective collection of solid wastes from urban dwellings across the country and was launched in 2011, should be accompanied by incentives and expanded to embrace more regions and municipalities.

The specific legislation governing comprehensive management of solid wastes at the national level dates from 15 years ago, and the Ministry of the Environment is currently working to revise and update that legislation. The National Environmental Action Plan (*Plan Nacional de Acción Ambiental*, PLANAA 2011-2021), for its part, made it a priority target for 2021 to have 100% of municipal solid wastes managed, recycled and disposed of adequately. In addition it calls for the following: (a) 100% of reusable solid wastes are to be recycled; (b) there is to be a 20% reduction in the generation of hazardous wastes in relation to the baseline; (c) 100% of hazardous wastes are to be properly treated and disposed of in appropriate facilities; and (d) 100% of waste electrical and electronic devices are to be recycled and disposed of adequately. These are ambitious goals that will be difficult to meet without the necessary investments, without better information and coordination among the sectors, and without further assistance to local and regional governments.

### *Recommendations*

29. Create a favourable climate for attracting investments in infrastructure for the correct management of municipal solid waste, including its final treatment (controlled landfills) and facilities to allow the recovery of reusable waste, including compostable materials for organic fractionation. Continue with the plan of state incentives for improved management and modernization as a temporary measure towards the full enforcement of the user-payer principle. Ensure adequate investment in infrastructure for the treatment of hazardous wastes and their correct final disposal (including secure deposits). Carry out actions to identify, close and reclaim locations where there are illegal and abandoned dumps. Formally treat them as contaminated sites.
30. Maintain Peru's low rate of per capita waste creation by promoting activities to raise public awareness about reducing the generation of waste, at-origin separation, reuse of materials, recycling, etc. Provide education and training for managers of local entities to improve their understanding of solid waste management.
31. Design user fees that cover the real total cost of providing municipal waste collection, transportation, treatment and final disposal services and that observe the principle of internalized costs or polluter-payer (e.g., by progressing towards user fees based on the amount and toxicity of domestic waste). Design mechanisms to ensure they are collected and that address affordability (e.g., discounting a part of their monthly waste generation from the beneficiaries of social assistance programmes).
32. Ensure that the institutions responsible for managing non-municipal waste, chiefly industrial and hazardous wastes, liaise with the Ministry of the Environment to coordinate their management policies, allowing environmental considerations a greater presence in regulatory policies.
33. Improve the traceability of and the available information on the generation and management of non-municipal waste, such as construction and electronic wastes and, in particular, hazardous industrial wastes. Increase the level of reporting to the Ministry of the Environment of the agencies responsible for the management of sectoral waste.

### Chemical substances

#### *Conclusions*

The use of chemical substances in Peru has expanded significantly in recent years. This has been due primarily to imports linked to growth in certain industries such as pharmaceuticals, cosmetics and bottle manufacture, although information is available only for those chemicals covered by a specific tariff heading. Domestic production of chemicals has risen slightly from the levels observed between 2007 and 2012.

Peru currently has no single system for recording data on imported products and substances that are not covered by a specific tariff heading, and there is room for improvement in this area. For some time now the government has been implementing a Pollutant Release and Transfer Register (*Registro de Emisiones y Transferencia de Contaminantes*, RETC), which will provide better information for managing chemical substances.

Peru's National Environmental Policy is the primary framework for managing chemical substances and hazardous materials, and its observance is mandatory for all economic sectors. It

establishes six policy guidelines that promote the lifecycle approach, with a view to reducing the risks associated with final disposal and highlighting the need to communicate the risks associated with each stage of that cycle. It also stresses the dissemination of good practices in the handling of chemical substances, and consideration of health criteria and the protection of fragile ecosystems in the process of formulating contingency plans for the use and management of those substances. These two management approaches—life cycle and risk-based—are spelled out in the Environmental Health Policy 2011-2020 and in the National Policy for Disaster Risk Management, respectively. More specifically, Peru has the following instruments for managing chemical substances: the General Health Law 26842/1997, the General Environmental Law 28611/2005, and Legislative Decree 1059 approving the General Law on Agricultural Health, of 2008. These laws make it possible to classify hazardous substances and products, to limit their toxicity and their harmful effects on health, to hold firms accountable for exercising effective control over hazardous materials and substances inherent to their activities, in this way controlling the negative environmental impacts they may generate, and to manage agricultural inputs such as chemical pesticides that can have harmful effects on natural resources and on the environment in general. It is important to note that Peru does not have a chemical substances management policy as such: rather, this is governed by policies of a general nature that incorporate some form of chemicals management, primarily from a risk focus. This approach is less effective in terms of the environmental management of such substances, as there is no specific action plan.

Peruvian legislation governs the management of chemical substances through their use, and this poses a challenge for effective coordination among the authorities. This situation complicates the subsequent implementation of the objectives pursued in the strategic instruments, and the plethora of objectives and targets in each sector results ultimately in less effective and more bureaucratic management. As for pesticides, these are classified in terms of agricultural, industrial or domestic use, or public health. In the agricultural area, the tightest restriction applies to the persistent organic pollutants covered by the Stockholm Convention, as well as other pesticides recognized internationally as hazardous. In the industrial sector, there is a regulation governing substances that deplete the ozone layer, which was adopted in the context of the Vienna Convention and the Montreal Protocol.

Supreme Decree DS 015-2005-SA establishes allowable limits of exposure to chemical agents in the workplace, and those limits can be updated and new chemical substances added in light of scientific and technological progress. The provision regulates chemical substances only and not their blends, which complicates their monitoring and control. While formal businesses have instruments such as contingency plans and workplace safety systems for preventing and responding to chemical accidents, informal businesses present greater risks, and the resulting lack of information may impede response by the emergency services (fire brigades and police). With the adoption of environmental measures in the principal markets (especially the European Union) that export hazardous or controlled chemical substances to Peru, it is becoming common practice to apply for a health authorization for the import of chemical substances. It would be very useful to supplement this action with control infrastructure in the ports, and communication with the authorities involved.

Emissions and releases of mercury from small-scale mining activity constitute the main national concern with respect to this substance, which is difficult to regulate and may moreover be linked to illicit activities. Peru has developed a strategy for rationalizing small-scale and artisanal mining, and one of its priority targets for 2016 is to reduce the use of mercury in mining operations, with special measures for small-scale gold extraction and processing activities.

### *Recommendations*

34. Enhance the regulatory framework to improve the handling of chemicals throughout their life cycle. Assess the usefulness of creating specific instruments for chemical management, including combinations of chemicals, with a preventive approach and tied in with risk management, and with an action plan that includes specific measures and timeframes. Strengthen oversight activities and links between the services in charge of contingency plans in the event of accidents and emergencies.
35. Review the effectiveness and efficiency of the institutional arrangements for managing risks related to the use of chemical substances, including coordination mechanisms. In the area of activity licences, establish an information system that provides guidelines for new chemical industry facilities, with a focus on preventing and managing risks and accidents. Strengthen coordination between the agriculture and health sectors to improve oversight of pesticide use.
36. Increase the human and financial resources of the public services responsible for chemical management, chiefly in the areas of the environment, health and agriculture, in order to implement a qualified and effective institutional framework for the implementation of regulations and actions to minimize risks in the handling of chemical substances, including the protection of workers' health.
37. Devise a single, consolidated system for recording information on imported hazardous chemical products and substances that do not have a tariff heading, expanding the identification and registration criteria, creating new headings for new products, identifying their countries of origin and including locator maps of those companies involved in importing and marketing the products and substances so identified.
38. Improve the port control infrastructure for the proper management and oversight of imported goods, facilitating inspections and compliance with the regulations in order to prevent environmental and health risks.

## **Water**

### *Conclusions*

In order to reduce the growing demand for water in Peru, the National Water Resources Plan (*Plan Nacional de Recursos Hídricos*, PNRH 2015-35) calls for increasing the crop area under mechanized irrigation from the current 2% to 24% by the year 2035, pursuing the installation of water meters in homes, and at the same time improving the water distribution canals, reforesting upstream areas of watersheds (to avoid sedimentation in the reservoirs), and more than doubling the reuse of treated urban wastewater for irrigation. On this last point, it will be important to ban the use of untreated wastewater for irrigation, as this would pose a risk to health and the environment. Since 2010, environmental quality standards (EQS) have been established for natural watercourses. Acute diarrheal illnesses in children under five years have declined, thanks to efforts to improve the coverage of drinking water services. The percentage of urban wastewater that is treated has risen to 50% (by volume) and the treatment method has evolved toward the use of more advanced techniques. However, the overloading of wastewater treatment plants is such that their treated effluents frequently exceed the maximum permissible limits (MPL). The PNRH calls for proper purification of 99% of the wastewater generated by the target population (urban and rural population of the Pacific Hydrographic Region and the urban population of the Amazonas and Titicaca hydrographic regions) by 2035. The number of activities that must comply with MPLs for effluents has increased, and the National

Environmental Action Plan (PLANAA 2011-21) requires that 100% of permits must comply with the MPLs by the year 2021. The introduction of progressive tariffs for higher consumption blocks provides incentives for water conservation.

Recent years have seen a significant increase in investments in wastewater treatment infrastructure, although their level has not been sufficient to reduce the environmental impacts. As an intermediate step toward the long-term goal of total cost recovery, a combination of consumption-based tariffs, public financial support and transfers from official development assistance may help to close the financing gaps and open the way to reimbursable aids.

The new Water Resources Law (*Ley de Recursos Hídricos*, 2009) and the accompanying National Water Resource Management System establish multisectoral (integrated) management by watershed, an approach that was reiterated in 2012 with the State Policy on Water Resources (Policy 33). The deconcentrated bodies of the National Water Authority, which oversees the system, are determined as a function of the watersheds. The Water Resources Law introduces user participation in decision-making and planning through the *Consejos de Recursos Hídricos de Cuenca* (watershed boards). To date, Peru has six such boards in place, with binding plans approved. The watershed plans must include ecological flows based on specific studies for each stretch of the river. However, the watershed boards exclude some stakeholders, such as the economic sector and non-governmental organizations.

Approved in July 2015, the PNRH establishes activities and targets for meeting water demand and improving water quality, and it also promotes a “water culture” and adaptation to climate change. With entry into force of the Water Resources Law, charges for water consumption and dumping have been introduced. The rates have been evolving as information on water resources becomes available: for consumption, the rate varies according to water availability, reflecting the scarcity of the resource, while for dumping, the rate considers the EQS, reflecting the quality of the recipient watercourse.

Recognizing the growing demand for water, the deficit in the watersheds (already at 10%) and the fact that nearly 30% of aquifers are overexploited, the PNRH calls for a 50% increase (by volume) in transfers from Amazonia to the Pacific and in water reservoirs for consumption purposes, by the year 2035. Special attention will have to be paid to the possible adverse environmental effects of these transfers and reservoirs, such as alterations to aquatic ecosystems.

More than 40% of the monitored watersheds do not comply with the EQS, and it will therefore be very difficult to meet the (very ambitious) target of the PLANAA whereby all watercourses must be EQS-compliant by the year 2021. The main obstacles relate to improperly treated domestic wastewater, untreated dumping from informal mining activities, the increasing extraction of sand from rivers to supply the construction industry, the use of agrochemicals in intensive agriculture, and environmental liabilities that continue to pollute the adjacent rivers. Gold mining and oil production are also contributing to the decline in water quality in the Amazon hydrographic region. There are high levels of noncompliance with the EQS in the Titicaca hydrographic region. There has been no assessment of water quality monitoring in the aquifers.

In half of the 24 regions more than 30% of the population has no access to safe drinking water and sewage services. Moreover, the quality and the continuity of the water supply are often very deficient. For the year 2035, the PNRH calls for achieving total water and sewage coverage for the target population. There is no treatment of urban wastewater in nine of the 24 regions, all of them located in the Amazonas hydrographic region. The entities providing sanitation services are for the most part financially bankrupt, and are consequently subject to evaluation and recovery under the Law on Modernization of Sanitation Services (2013). The percentage of unbilled water exceeds 40%, due to leaks and apparent losses.



There is a cross-subsidy from industrial users to domestic users and from wealthy households to poor households, via the “social tariff” or rate. If the social tariff, which reduces incentives to save water, were replaced by a mechanism that would fully compensate only a portion of the poorest households’ water consumption, this would improve affordability without distorting price signals. The system of charges for consumption and dumping is designed to finance the operating costs of the National Water Authority: such an earmarking of levies for specific purposes is problematic. The base and the rate of the charge should not vary with the use made of the water but should be geared to the cost of the environmental externalities involved. No charge is levied for subterranean waters.

In many regions of Peru water security is under threat from the growing demand for water, hydric stress, and the ever more numerous sources of water pollution. In 2013 alone, 25 cases originating in 13 departments were registered with the National Tribunal for the Settlement of Water Disputes. Risks relating to water shortage, flooding and water quality need to be better managed, as does the risk of damaging the resilience of the water bodies. If it adopts a vision that highlights explicit management of water-related risks, Peru is more likely to achieve its economic, environmental and social objectives as they relate to water, without imposing excessive costs on Peruvian society.

### *Recommendations*

39. Introduce a new risk-based approach into water resource management, including the risks of water shortages, flooding, inadequate water quality and the risk of harming the resilience of bodies of water; to that end, develop a knowledge base on those four risks and strengthen participation mechanisms for all the stakeholders involved in defining, accepting and jointly managing risks.
40. Align the rates (fees paid) for consumption and for disposal into the environment, regardless of the use made of water; and, in this way, create appropriate incentives for adjusting consumption and promoting better irrigation techniques and facilitate compliance with maximum permissible limits and environmental quality standards. Expand the fee base for underground water.
41. Continue efforts to ensure universal access to drinking water and to improved sanitation infrastructure. Create a favourable climate for reimbursable assistance to speed up the closure of the funding shortfalls in the provision of drinking water and sanitation; to this end, implement a combination of usage fees, public financial support and transfers from official development assistance, while pursuing the long-term objective of total cost recovery through consumption fees. Combat payment evasion, reduce losses on the network and evaluate the creation of incentives for the conservation of drinking water in urban areas by replacing the social rate with compensation schemes that offset a portion of the monthly consumption of that rate’s beneficiaries, following the example of Chile.
42. Expand the coverage, parameters and frequency of water quality monitoring in order to meet environmental quality standards and extend those standards to situations and areas at risk from the failure to treat wastewater, pollution from industry and mining and the intensive use of agrochemicals.
43. Continue to expand, in line with the National Water Resources Plan, the coverage of wastewater treatment plants. Prohibit the reuse of untreated wastewater for irrigation, in light of the risk it poses for health and the environment.
44. Consolidate the operation of interinstitutional coordination forums such as the National Water Resources Management System, the board of the National Water Authority and the Watershed Councils, together with their ties with the National Environmental Management System.

## Biodiversity

### Conclusions

Peru is one of the world's 17 countries recognized for their megadiversity: its eco-regions range from the coastal desert to the tropical Amazonian forest. Of the 117 types of biomass recognized in the world, Peru has 84. Of its nearly 129 million hectares of land, slightly over 73 million hectares (57%) are occupied by forests. The loss of original forest ecosystems has continued into this century. In Amazonia, an average of 119,000 hectares was lost every year during the period 2003-2013, equivalent to 1.8% of the Amazon forest. The bulk of that loss is due to conversion on properties of less than 5 hectares. Peru has two main marine ecosystems: tropical and temperate-cold. The first has a great diversity of species, but in small volume, while the second has little diversity but great volumes per species. Along its 3,080 km of coastline, Peru has important fisheries, of both an industrial and an artisanal scale. Anchovies constitute the most important fishery.

The main pressures on land-based ecosystems arise from changes in land use, primarily through deforestation for lumber, expansion of the agricultural frontier through traditional or modern farming, livestock raising, real estate and industrial projects, and the construction of large infrastructure works. Also significant is the overexploitation of flora and fauna through illegal hunting and trading. Recently, remote sensing technologies have shown that forest loss through selective cutting is a serious problem, together with the advance of the agricultural frontier. Among the chief causes of deforestation are the lack of property rights and the absence of land-use planning; the low market value of forest land compared to other land uses; sector development policies that run counter to the preservation and sustainable use of biodiversity; large-scale highway, hydroelectric or mining projects that lead to changes in land use and to the influx of settlers; and shortcomings in governance capacities.

Agriculture occupies around 38.7 million hectares (30% of the territory), comprising 2.2 million farms, almost all of them with fewer than 10 hectares which are occupied only to the extent of 25%. The great majority of farmers are small-scale and grow traditional crops. Only 28.8% of farmers have ownership title to their land, while the remainder farm communal lands or are tenants or squatters. The land has been occupied in a disorderly manner, exemplified both in subsistence farming, which is practised in areas that should be set aside for forestry or watershed protection, and in export agriculture, which is heavily practised in water-deficit zones that cannot guarantee its sustainability. Peru's agro-biodiversity is among the richest in the world, and represents one of its most valuable natural and cultural assets. Of the four most important crops for human consumption —wheat, rice, maize and potatoes— Peru has great genetic diversity in the latter two. It also has 128 species of domesticated native plants, and its domesticated animals include the alpaca, the llama and the native duck (*pato criollo*). The country's cultural diversity, found primarily in Amazonia, represents an important reservoir of knowledge about the uses and properties of flora and fauna species, as well as the use of genetic resources (4,400 plants of known uses, and thousands of varieties). However, this diversity has been shrinking over time. Policy efforts to promote agro-biodiversity will be put to the test by the heterogeneous nature of the agriculture sector, in terms of technological differences, market linkages, and access to financial services, as well as by the country's geographical and climatic diversity.

Development of the forestry sector falls far short of its potential in terms of surface area and biological diversity. Peru is in fact a net importer of forest products, thanks to the low levels of industrialization and value added. The area under commercial plantation is still very low, and less than half of the exploitable forest area is under operating concession. The scope of changes in land use is reflected in the high level of greenhouse gas emissions under this heading. Peru also exhibits seven of the

nine characteristics of vulnerability recognized by the United Nations Framework Convention on Climate Change, and it will be exposed to even greater losses of biodiversity as this problem becomes more acute.

The Political Constitution of Peru declares natural resources to be a National Heritage and makes the State responsible for setting environmental policy and determining the sustainable use of those resources. The State is explicitly obliged to see to the conservation of biological diversity and of protected natural areas, and to promote the sustainable development of Amazonia. In 1993 Peru ratified the Convention on Biological Diversity and to date has presented five national reports under the Convention. Within the Ministry of the Environment, the Biological Diversity Branch of the Vice-Ministry for Strategic Development of Natural Resources is responsible for policies on biodiversity. There is also a National Commission on Biological Diversity (CONADIB), an advisory and coordination body on the sustainable use of biodiversity, charged with monitoring fulfilment of the commitments emanating from the Convention and related treaties (the Ramsar Convention, CITES, Convention on the Conservation of Migratory Species of Wild Animals, etc.), as well as the design, update and implementation of the National Strategy on Biological Diversity (ENDB). Pillar 1 of the National Environmental Policy deals with the conservation and sustainable use of natural resources and biological diversity. Under the Law on Conservation and Sustainable Use of Biological Diversity and its Regulation, the ENDB (which runs to 2021) and its 2014-2018 Action Plan of November 2014 is the primary instrument for managing biodiversity in Peru, for halting the loss and deterioration of the components of biological diversity, improving their management, and boosting opportunities for sustainable use and fair and equitable distribution of their benefits.

With a view to conserving and make rational use of the country's mega-biodiversity, as well as placing due value on traditional knowledge, the ENDB sets out six general objectives for environmental policy with targets for the year 2021. The National System of State-Protected Natural Areas (*Sistema Nacional de Áreas Naturales Protegidas por el Estado*, SINANPE) has been steadily expanded, and in June 2015 it embraced a total of 64 Protected Natural Areas (ANP), versus 40 in 2003, covering 16.6 million hectares (17% of the national territory). There are also 17 regional conservation areas administered by the regional governments, and 82 private conservation areas. Of the 16.6 million hectares included in the ANPs, 97.6% are on land and only 2.4% in marine zones. Conditions are improving, as can be observed in the fact that, while in 2003 only 33 ANPs were staffed and 17 had master plans for their management, in 2015 61 are staffed and 41 have master plans. Nevertheless, of the country's 21 terrestrial eco-regions (CDC-WWF MINAM) only 12 are represented in the ANPs and the master plans do not necessarily ensure governance for their sustainable use. Eco-tourism has been growing in importance, and in 2013 there were more than 1.3 million visits to the ANPs of the national system.

Most of the funding for the conservation of biodiversity comes from the Public Treasury: that contribution rose by 500% between 2004 and 2010, but still falls short of needs. A study by the Universidad del Pacífico points to an annual budget shortfall of 115 million nuevos soles, or roughly US\$ 35 million. Supplementary contributions come from the private sector, from international cooperation, and from projects that involve payment for ecosystem services. The conservation and sustainable use of biodiversity and natural resources and the integrated and sustainable management of ecosystems ranked second and third among environmental expenditure items for the period under analysis, and together accounted for roughly a third of the total. The economic instruments applied include the entry fee to protected natural areas, the proceeds of which are reinvested to the extent of more than 70% in their conservation, and the incipient introduction of a system of payments for ecosystem services. There are also direct transfers to indigenous and rural communities for forest conservation.

*Recommendations*

45. Step up efforts to improve, update, and manage scientific knowledge about ecosystems and species (inventories of flora and fauna, endangered species) and on the genetic diversity of domesticated species of flora and fauna, in order to contribute to the better design of policies for the protection and sustainable use of biodiversity and to the monitoring of and regular reporting on its status.
46. Strengthen the interministerial coordination mechanisms, such as the National Commission for Biodiversity, so they can contribute to the effective incorporation of the sustainable use of biodiversity into economic and sectoral policies. Support the full consideration of the impact on land and marine biodiversity in EIA and SEA processes, in the granting of environmental permits and in territorial governance, through the development and use of technical guides.
47. Establish a clear legal framework for access to genetic resources and traditional knowledge in order to encourage research into biodiversity and a greater understanding of it and to allow possible commercial developments with transparent mechanisms for the distribution of benefits, in accordance with the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. Set the foundations for scientific and biotechnological developments related to the sustainable use of biodiversity within the established legal framework.
48. Strengthen the technical and financial capacities of the National System of Protected Natural Areas (SINANPE) and develop an integrated view of the complementary roles of public and private protected areas, for the development of an interconnected and coherent network of core areas, buffer zones and biological flows and corridors.
49. Assign political priority and the necessary means for the implementation of the National Strategy and Plan of Action for Biodiversity Towards 2021 (EPANDB) as a key tool for the conservation and sustainable use of biodiversity in Peru, including agrobiodiversity. Complete the Regional Biodiversity Strategies and Action Plans (EPARDBs) that are still pending and ensure their implementation with the necessary technical and financial support.
50. Continue with the existing efforts to capitalize on the economic potential of the sustainable use of biodiversity and agrobiodiversity, through such activities as ecotourism, biocommerce, fine dining, establishment of world-class research centres, traditional medicine, etc. Develop the regulations to the Law on Payments for Ecosystemic Services to strengthen the provision of those services (regulation of water in basins, the maintenance of biodiversity, carbon sequestration, scenic beauty, soil formation and the provision of genetic resources) and, as applicable, sustainable related economic activities.

### **Part III**

#### **Use of the natural resources base**

#### **Farming and forestry sectors**

##### *Conclusions*

Inter-agency coordination and governance have improved, but there are still shortcomings in environmental monitoring within these sectors, and environmental degradation has worsened. Coordination between the Ministry of the Environment and the Ministry of Agriculture has improved, especially with relation to forestry issues and water management (particularly following the creation of the National Water Authority) and as a result governance of water and forestry resources has been strengthened. Growing environmental concerns have exerted pressure for policy agendas, and have promoted greater involvement on the part of relevant players, including the Ministry of Finance. The land-use management focus has also served to strengthen articulation in issues of decentralization. Yet despite such progress, there are still major gaps in terms of oversight infrastructure and indicators, and these mean that monitoring of environmental regulations in the agriculture sector is deficient. There is also a widespread perception that the lack of monitoring has contributed to on-going degradation of soils and forests, improper use of water resources, and pollution through wastewater. Management of hazardous wastes is another persistent problem. According to data from the latest agricultural census, only 4.9% of farmers attempt any form of hazardous waste management (storage in special containers, return, triple washing), and this problem is particularly severe in the Sierra (3.6%).

Policies for the protection and conservation of agro-biodiversity have been strengthened, but the resources devoted to protecting genetic resources of agro-biodiversity are still inadequate. Under the National Biodiversity Strategy, the policy for rescuing agro-biodiversity has been strengthened: this is an essential consideration, as Peru was one of the “centres of origin” for farming in the Americas. Other encouraging signs are the growing demand for organic farm products and payment for environmental services, as well as initiatives on sustainable forest management, a reduction in deforestation, and the restoration of degraded areas. However, policy initiatives for the protection of agro-biodiversity have yet to bear fruit. There is still scant support for the development of germplasm banks of native crops, and there is too little research on native and introduced species alike from the viewpoint of adaptation to climate change. Funding is also inadequate for the protection of biodiversity, including agro-biodiversity. By way of example, the Andean zone is the second most important centre of maize diversification: Peru currently has 66 recognized varieties of maize, versus 69 in Mexico. In general, the country has a wealth of native plants for consumption that utilize C4 and CAM metabolic processes and are particularly efficient in their use of water: they are thus of strategic importance as sources of genetic material for adapting agriculture to climate change.

Institutions and instruments for environmental management have been created within the agriculture sector, but deforestation continues along with land-use changes, owing to the expansion of farming. Conflicts sparked by lack of land titles also persist. During the period under analysis some important progress was made in creating institutions and generating instruments for environmental management in agriculture. The principal milestones include the creation of the National Water Authority, the Regulation on Environmental Management of the Farming Sector, the creation of environmental regulatory tools, and the strengthening of agricultural and sectoral policies. However, the expansion of farming in Amazonia remains the main direct cause of deforestation in the country: it is estimated that more than 90% of deforestation is due to the expansion of agriculture by approximately

3.3 million hectares over the last two decades. This process has resulted from the uncontrolled expansion of industrial crops for export, rising levels of migration, and in general an unplanned approach to occupation of the territory. It has been further facilitated by weak institutional arrangements for halting deforestation, and the low value placed on the standing forest and on the environmental services it provides. Moreover, there is virtually no research on the adaptation of crops introduced in the regions where they were previously not grown. There are also continuing conflicts on indigenous lands, due to the lack of ownership titles. This is sparking the spread of social environmental conflicts, limiting the efficient exploitation of agro-forestry resources, and holding back research because of legal insecurity. There are as well shortcomings in territorial governance and in economic and ecological zoning, which are important for promoting the orderly development of farming and extractive activities. The shortcomings in terms of clarity of land rights, a comprehensive rural cadastre and territorial governance are recognized as indirect causes explaining the advancing frontier of deforestation in Amazonia. It is estimated that 95% of deforestation in Amazonia is due to slash-and-burn techniques for converting forest to farmland, mainly in scattered and small-scale (less than 5 ha) operations.

Climate change presents an opportunity to improve environmental management in agriculture, but the farming sector still exhibits very little in the way of an “environmental culture”. It is estimated that the Land Use, Land-Use Change and Forestry (LULUCF) component is the biggest contributor to greenhouse gas emissions, accounting for 35% at the national level, due primarily to deforestation (cutting and burning of forests) for the expansion of farming, particularly in Amazonia. This is seen as an opportunity to improve environmental management in agriculture, both through adaptation efforts to enhance resilience, and through mitigation and synergies between adaptation and mitigation. Peru’s nationally determined contribution under the UNFCCC cites as priorities the agriculture and fisheries sectors/systems, together with water, health and forests. Within agriculture, it gives priority to small-scale farmers and subsistence farmers, because they are the most vulnerable. Yet farmers still have little understanding of environmental issues, and they are therefore unlikely to internalize those issues in their productive decisions. Poverty and low education levels among farmers, together with the absence of comprehensive agricultural extension services and technical assistance, are exacerbating the environmental problem in the sector. Within the public sector, there are other factors that also constrain the development of an environmental culture in agriculture: these include the shortage of technical personnel from relevant institutions in the field and the lack of alignment between sectoral policies and between the different levels of government.

### *Recommendations*

51. Bolster forestry governance and improve the capacity for the sustainable management of natural resources (particularly forestry resources) and soil recovery and conservation, through: (a) greater coordination between the Ministry of the Environment and the Ministry of Agriculture in the definition and execution of environmental policy for the farm sector, (b) strengthening the role of national institutions in assisting regional and local governments, (c) building formal coordination mechanisms and greater interconnections between different sectoral initiatives (e.g., agriculture and the forestry sector, agriculture and water, agriculture and agrobiodiversity) and the different levels of government and (d) strengthening instruments for the adoption of decisions with integration potential, such as the forestry land registry, zoning studies, land-use records and, in general, georeferenced information systems on the use and current conditions of natural resources.
52. Strengthen agricultural research and extension, considering the challenges posed by climate change to Peru’s different agricultural systems, particularly those with the highest levels of family and small-scale farmers. Promote greater alignment in research priorities and greater interconnections

within work programmes. Ensure the incorporation of ancestral knowledge and practices in research and agricultural extension processes in order to rescue and preserve the country's agrobiological wealth and genetic resources.

53. Evaluate the harmful environmental effects of productive incentives. Align non-productive incentives (direct payments per hectare) with the environmental protection objectives. Prevent the dispersion of funding projects in the forestry and agroforestry sectors and of those targeting environmental objectives in the agricultural sector; promote the incorporation of environmental criteria into agricultural credit assessments, in order to encourage adaptation and mitigation actions and greater productive diversification to help increase resilience; bolster agricultural insurance, as a adaptation measure for dealing with climate change; and progress towards the inclusion of payments for environmental services among suppliers and users.
54. Strengthen environmental quality monitoring in the farm sector and the technical capacities for diagnostic assessments, particularly at the regional and local levels; improve mechanisms for disseminating and communicating the proper handling of pesticides and the efficient use of water resources; ensure that laboratories are adequately equipped; promote the inclusion of members of the public in environmental quality monitoring (for example, monitoring networks); and bolster environmental education.
55. Strengthen the institutions responsible for land titles and speed up the titling process, particularly in indigenous territories, in order to promote a more ordered development of agriculture and a proper management of forestry and biodiversity resources.

## **Fisheries sector and hydrobiological resources**

### *Conclusions*

Fishing and aquaculture activities in Peru are characterized as much by their natural variability (from maritime to Amazonian fisheries) as by their economic diversity (from industrialized to subsistence fishing). The Pacific Ocean along the Peruvian coast is one of the world's most productive seas. These conditions have favoured the establishment of an industrial-scale maritime fishery, focused primarily on pelagic species —anchovies account for 86% of the catch, although mackerel, horse mackerel and squid are also fished. Peru is the world's leading producer of fishmeal and fish oil, although production is affected by the great environmental variability, as the anchovy biomass fluctuates sharply with water temperature, which varies dramatically at times of El Niño and La Niña. Output fell from 6 million tonnes in 2006 to 3.3 million tonnes in 2013, although this was offset by higher prices for fishmeal (US\$ 810 per tonne in 2007 versus US\$ 1,360 per tonne in 2013). Aquaculture is now developing as an activity, focused on scallops and prawns along the coast and on trout, tilapia, *gamitana* or black pacu, and paiche or arapaima in inland waters. A new Aquaculture Law was recently approved to promote this sector, given its importance in terms of food security.

The artisanal maritime fishery involves multiple species, low-tech methods, and is destined primarily for direct human consumption. There are landing and storage facilities all along the coast, but control and monitoring is less extensive. The most important inland fishery is in Amazonia. It is typically artisanal, and mainly for self-consumption. Much of the human diet in Amazonia relies on fish, and although the catch amounts to more than 80,000 tonnes the supply falls short of demand, with aquaculture

now seeking to fill that gap. There is a Regulation on Fisheries Management in Amazonia, which is now under review.

Despite better inter-agency coordination on marine issues, fisheries policy still has a sectoral rather than an ecosystem approach. Responsibilities for the ocean are divided among many agencies (Ministry of Production, regional governments, Ministry of the Environment, OEFA, SERNAMP, SENACE, DICAPI, National Water Authority, SANIPES), and they have little representation in the only existing coordinating body (COMUMA, the Multisectoral Commission for Management of the Marine Environment). There is no comprehensive plan for the anchovy fishery that would establish a single science-based quota, nor is there any arrangement for joint stock management with Chile, which shares the fishery. For most of the remaining fish species, no catch quotas or maximum limits have been set. The protection of marine and inland aquatic species is clearly inadequate: there are no lists of threatened species, no conservation plans, no specific measures to minimize illegal fishing or by-catch, and no control over environmentally harmful fishing methods. Some enclosed bays are being polluted by industrial activity, domestic effluents, etc. Studies conducted in Amazonia show alarming concentrations of heavy metals in fishery products for human consumption. One problem with relation to inland fisheries has to do with ornamental species, for which there are no data on stocks nor any effective supervision of catches. Peru's protected marine areas cover a total of 401,556 hectares, representing 2% of its total marine surface. These areas belong to the San Fernando, the Paracas and the *Sistema de Islas, Islotos y Puntas Guaneras* ["Islands, Islets and Guano Capes"] National Reserves which, while very well managed, are insufficient to ensure protection of all of Peru's marine ecosystems. Nevertheless, the main challenge in the fishing sector is its informal nature, especially in artisanal fishing and aquaculture. Despite the efforts made, a significant portion of the marine and inland fisheries and aquaculture activities are pursued without supervision, due to the shortage of human resources, the dimensions of the territory, and the inaccessibility of some areas.

The responsibility for scientific research and studies on the fisheries and their relationship with aquatic ecosystems lies with the Peruvian Institute of the Sea (*Instituto del Mar del Perú*, IMARPE) and the Institute for Research in the Peruvian Amazon (*Instituto de Investigaciones de la Amazonía Peruana*, IIAP), as well as with the fisheries and aquaculture faculties of various universities. The Peruvian Institute of the Sea is the institution charged with recommending catch quotas for fish species, monitoring catches, by-catch and fish age criteria, assessing sea species and conducting carrying capacity studies in watercourses used for aquaculture. It is also revising the Environmental Quality Standards for sediments, for regulatory approval.

The body of legislation governing the maritime fishery may be considered obsolete: the General Fisheries Law, No. 25977, dates from 1992 and its regulations (Supreme Decree 012-2001-PE) from 2001. However, systems have been established concerning minimum size, fishing season limits and quotas, among other details, and these have contributed to progress towards the sustainability of the industrial fishery. An outstanding example is the amendment to the anchovy quota, which was changed from an aggregate quantity (which shipowners promptly used up in the course of what was known as the "Olympic race") to a system based on catch quotas per vessel, established in light of the fleet's historic catch (Legislative Decree 1084, Law on Maximum Catch Limits per Vessel of 2008). This has had a positive impact on efficiency in the sector, reducing the size of the fleet and the number of processing facilities while maintaining output capacity. The measure has also had positive repercussions on stocks. The main responsibility for coordination, regulation and supervision of the fisheries sector is the Ministry of Production, although there has recently been some decentralization in supervision of the artisanal fishery toward the regional governments. It is the Ministry of Production that formulates fisheries policy and approves standards for the sector. It also inspects the commercial fishing fleet through its 260 direct



inspectors, as well as coordinating the work of the 700 indirect inspectors belonging to certification firms and paid by the industry itself.

In the fisheries area, the Ministry of the Environment is responsible for establishing policy and specific regulations, for inspection and supervision, and for imposing penalties for breach of environmental rules. In 2012 the OEFA (a specialized technical agency of the Ministry) took over the functions of environmental inspection of the fisheries sector. In the case of aquaculture and fishing in protected coastal and marine areas and inland waters, responsibility lies with SERNANP. In 2012 the Multisectoral Commission for Environmental Management of the Coastal Marine Environment (COMUMA) was established to coordinate the various administrative and technical agencies involved in protection of the sea. This Commission could become a very effective tool for designing a coordinated, coherent and integrated policy on the protection and sustainable management of the marine environment. The Strategic Plan for Management and Handling of the Coastal Marine Ecosystem and its Resources is currently in the public consultation process. It represents an intersectoral policy guide and contains strategic objectives, targets and a short, medium and long-term implementation schedule.

Recent years have seen notable efforts in some areas to reduce the local environmental impact of processing plants by regulating emissions and discharges into the sea, for example in the bays of Chimbote, Samanco and Paracas. Generally speaking, the industrial fishery for indirect human consumption is quite well regulated and supervised. Since approval of Supreme Decree 026-2003-PRODUCE, Regulation of the Satellite Monitoring System (SISESAT), the industrial fishery has been subject to remote tracking. Monitoring of fish landings has also been stepped up.

### *Recommendations*

56. Make progress towards an integrated policy for hydrobiological resources with complete and coherent planning of the usage made of the ocean and continental water basins that takes into account the conditions of ecosystems, combines the objectives of the different policies, establishes clear guidelines based on the ecosystemic approach, provides for concrete actions and is equipped with mechanisms for monitoring compliance and the environmental, social and economic effects of the implementation of those actions. Raise the institutional and political level of the interadministrative coordination agencies, such as the Commission of Environmental Management of the Coastal Marine Medium (COMUMA), in order to contribute to an effective planning process. Adopt, when necessary, specific instruments for places with specific problems, to facilitate a coherent management of marine areas or of the related continental water basins.
57. Capitalize on the available scientific knowledge and strengthen the institutions responsible for providing information, such as the Peruvian Sea Institute (IMARPE) and the Peruvian Amazon Research Institute (IIAP), so they can provide suitable, independent and impartial advice for decision making and policy design. Ensure transparency in fishery figures, including catches and landings, bycatches, discards, inspections, etc. Assess the harmful environmental effects of aquaculture, such as escaping exotic species and excessive use of nutrients and pesticides, and of industrial processes to prepare feedstocks; as well as the pressures on fish populations. Promote the education and training of managers, inspectors and the productive sector.

58. Encourage the work of the National Fish Health Service (SANIPES) in controlling the levels of pollutants in fishery and aquaculture products, as a sanitary preventive measure and as a source of information for monitoring the pollution levels of bodies of water. Make progress with the understanding and management of sources of pollution that affect aquatic ecosystems.
59. Redouble supervisory and oversight efforts to eradicate illegal fishing and to formalize informal fishery activities, designing specific measures to discourage it and to promote the incorporation of all fishery workers into regulated management schemes. Promote fishery agreements with local communities and small-scale fishing within the total allowable catch (TAC), as applicable, and strengthen local capacities for joint management, in order to facilitate the extraction and sustainable management of hydrobiological resources from both the sea and continental waters.
60. Further development the catch quota system, analysing the effects of extraction on ecosystems, involving the entire sector in the system (indirect human consumption, direct or small-scale human consumption), allowing the possibility of quota transfers between stakeholders and extending it to other at-risk commercial species, both maritime and continental, on the basis of the best knowledge available and mindful of climate change. Create lists of endangered and at-risk species and establish the closed seasons necessary for their survival, particularly in the Amazon. Develop specific extraction plans for ornamental species.

## **Mining sector**

### *Conclusions*

Peru is the biggest producer of gold in Latin America, and sixth in the world. It is the world's third-largest producer of copper, after China and Chile, as well as of silver, tin and zinc, and is an important producer of lead and molybdenum. Copper and gold are the most important products in the economy. In 2012 mining accounted for 12.2% of GDP and roughly 60% of exports. It is a capital-intensive sector, the importance of which is demonstrated by the fact that investment rose from US\$ 1.1 billion in 2005 to US\$ 9.7 billion in 2013. In 2015 there are some 50 mining projects at various stages of development, representing investments of around US\$ 63 billion, primarily in copper mining. The mining industry makes an important fiscal contribution as well: in 2013 it accounted for 9.4% of total government tax revenues.

Despite its reputation as a primary minerals producer, Peru has a number of foundries and refineries, including copper refineries at Ilo, a steel mill at Chimbote, a zinc plant at Cajamarquilla (near Lima) and a facility for lead and other metals at Oroya, along with the MINSUR tin foundry and refinery at Pisco (Ica), some of which have been linked to local pollution problems. At the artisanal scale, gold-mining is the most important: 85% of artisanal miners are engaged in this activity, which in 2006 produced an estimated 24 tonnes of gold, representing roughly 10% of national production with an estimated value of US\$ 390 million.

One of the main problems with small-scale and artisanal mining is the growth of informal and illegal activities that have important consequences, both social and environmental (destruction of vegetation and soils and irresponsible release of mercury into waters and the environment), driven by the high prices obtained for minerals in recent years. As a result, the government is actively promoting a programme to formalize small-scale and artisanal mining and to eradicate illegal mining (DS 045-2010-PCM). Law 30011 gave the OEFA authority to conduct environmental audits of mining activities of this kind, which are pursued without any operating or environmental permit. The Corrective Environmental Management Instrument (*Instrumento de Gestión Ambiental Correctivo*, IGAC), created by DS 004-

2012-MINAM, applies to existing small-scale and artisanal mining operations that are in the process of formalization, to bring them into line with legally determined environmental obligations.

In Peru, natural resources in the ground are the property of the Nation, and it is the State that governs access to them, granting rights for their exploitation through concessions which in the case of mining give their holder the right to explore and exploit these resources. The General Mining Law (DS 014-92-EM) regulates mining activity in the country. DS 020-2008-EM establishes environmental regulation for all mineral exploration activities. DS 040-2014-EM approves the Regulations for protection and environmental management of mining activities, including operations, profits, labour conditions, transportation and storage, replacing the former regulation that was in place for nearly 21 years. Currently, some 15% of the territory is covered by mining rights, and roughly 64% is closed to mining.

In general terms, the preservation of air and water quality is covered by the respective environmental quality standards (EQS), DS 002-2008-MINAM and DS 006-2013-MINAM, while air emissions and mining effluents are covered by specific maximum permissible limits (MPL). In 2013 environmental quality standards for soils were issued (DS 02-2013-MINAM). In order to reduce discharges into the water from metal mining operations, mining companies were required to submit a comprehensive adjustment plan (*Plan Integral para la Adecuación*, PIA) and to implement the MPL and EQS (RM 154-2012-MEM/DM). The deadlines initially set between 2012 and 2015 for delivery of the PIA and compliance with the respective MPL and EQS have been repeatedly extended.

In terms of socioenvironmental concerns, in 2010 amendments were made to Supreme Decree 042-2003-EM which regulates the previous commitments. These are binding on all mining permit holders; they relate to sustainable development, environmental and social excellence, compliance with social accords, responsible relationships, local employment, economic development and on-going dialogue.

There has been a notable increase in conflicts between mining project developers and the communities or populations affected by these initiatives. The main cause of these conflicts is the concern of local people for their lands, waters and environment, which are nearly always their only means of livelihood. “Prior consultation” (Law 29785, its regulations, Supreme Decree No. 001-2012-MC and the principles of ILO Convention No. 169), participatory workshops and public hearings are instruments for socializing mining projects and mitigating their potential environmental impacts, as well as for preventing social conflicts. Active participation by people in mining zones can facilitate their approval in the respective regions, through negotiations and adjustments to the project. The Peruvian government is addressing the management of social conflicts through Ministerial Resolution 161-2001-PCM. In 2012 the government established the National Office for Dialogue and Sustainability (ONDS) to help resolve the great number of mining-related disputes.

To address the problem of environmental mining liabilities (PAM), Law 28271 recognizes the risks and hazards they pose for the country, particularly in the Andean region. As of 2003, the law regulating the closure of mines (Law 28090 and regulations of 2005 and 2006) holds mining companies liable at the time their operations are closed, and stipulates the measures to be taken to avoid risks to human health and the environment. The country has an inventory of PAMs (identifying 8,616 PAMs in 2015, General Directorate of Mining, Ministry of Energy and Mining), which includes an estimate of the risk to people and the environment. According to that inventory, 50% of PAMs pose a high or very high risk. Peruvian legislation on the treatment and clean-up of PAMs is a model for Latin America. In 2006 the government established the enterprise known as *Activos Mineros* [“Mining assets”] SAC to handle remediation at sites left behind by the former State-owned mining enterprises (CENTROMIN). Those PAMs that cannot be attributed to a responsible party will be treated and mitigated by the Peruvian government (central and regional, Law 28271). Of all the PAMs identified, only 10% have remediation instruments, and responsible parties

have been identified for only 12%: in other words, there are 7,531 PAMs (as of 2015) for which no responsible party has been identified and for which there is no mitigation plan.

Peru has just ratified the Minamata Convention, which establishes strict measures for the production, import, export, use and disposal of mercury. That ratification will be an important step toward reducing environmental pollution and risks to human health.

Recognizing the importance of tax revenues and payments from mining, and with a view to making them more transparent, Peru was the first country in Latin America to implement successfully the accountability standard of the Extractive Industries Transparency Initiative (EITI). Peru has thereby set an example for other mining countries in Latin America. Peru's experience shows that considerable progress can be made through EITI in terms of bringing transparency to payments from mining companies and determining the extent to which those payments flow back into the development of mining areas. A growing number of OECD countries are now implementing this standard (Norway as a member, and the United Kingdom and the United States as candidates).

### *Recommendations*

61. Continue the policies intended to resolve the problem of environmental mining liabilities (PAMs), furthering the creation of information on risks, capitalizing on their economic potential (secondary mining), identifying ownership and responsibilities and designing and implementing monitoring mechanisms. Increase remediation efforts, with particular emphasis on abandoned sites and those that pose the greatest risks. Establish responsibilities and funding needs for the remediation of abandoned PAMs and make use of international technical cooperation. Ensure that PAM remediation plans are adopted and overseen by SENACE and OEFA, respectively.
62. Continue with and step up efforts to eradicate illegal mining and to formalize informal mining activities. Pay particular attention to small-scale and artisanal mining with technological assistance and marketing promotion schemes, to allow them to attain economies of scale and the formalization and adoption of environmentally sustainable technologies and practices.
63. Move towards artisanal mining methods, particularly for gold, that use internationally accessible techniques and standards to prevent environmental degradation and impacts on the health and quality of life of people in the affected areas.
64. As regards the mining sector responsibilities of the decentralized governments, improve the actions of regional governments in the area of permits and environmental oversight, ensuring execution and funding, training their professional staff and strengthening coordination with the Ministry of the Environment and OEFA.
65. Ensure the full implementation of the principle of internalizing costs or requiring polluters to pay. Ensure that the revenue earned through mining activities contributes to the country's sustainable development through long-term investments in other forms of capital (human, physical or natural), with a more equitable approach to social and geographical realities.
66. Continue to promote greater transparency regarding the impact of mining activities on the environment and people's health. Strengthen effective access to information and broad active participation in licensing processes. Promote the incorporation of environmental topics in the different transparency initiatives, such as the Initiative for Transparency in Extractive Industries.



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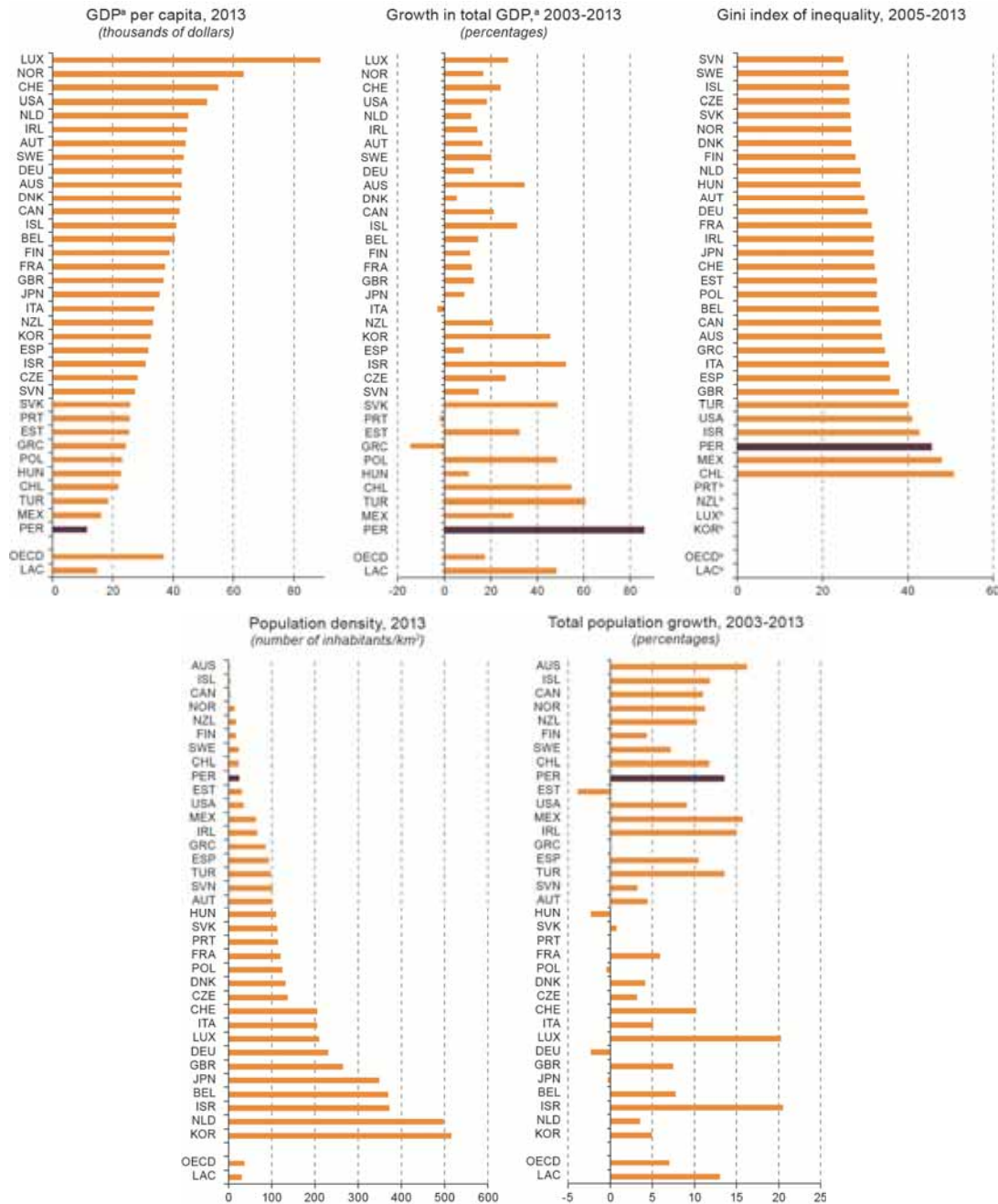
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## SELECTED DATA

### Selected socioeconomic data



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of CEPALSTAT database; national accounts information provided by the Organization for Economic Cooperation and Development (OECD); and World Bank, World Development Indicators, information provided by the International Comparison Programme and national accounts information.

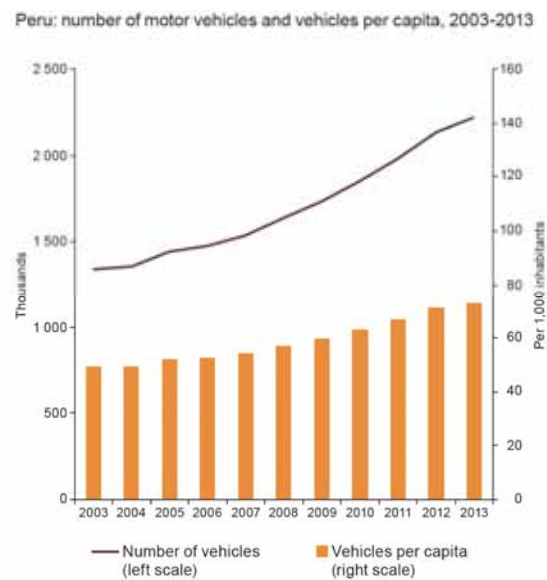
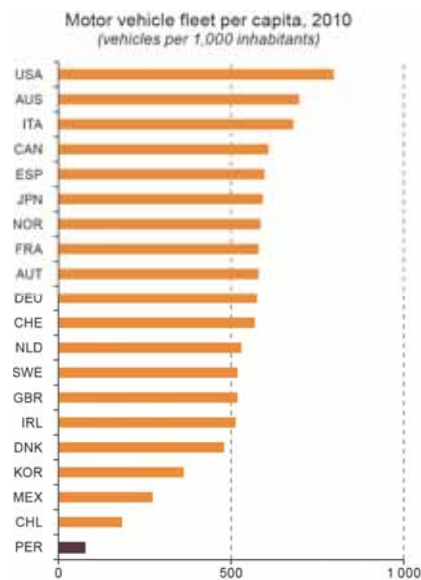
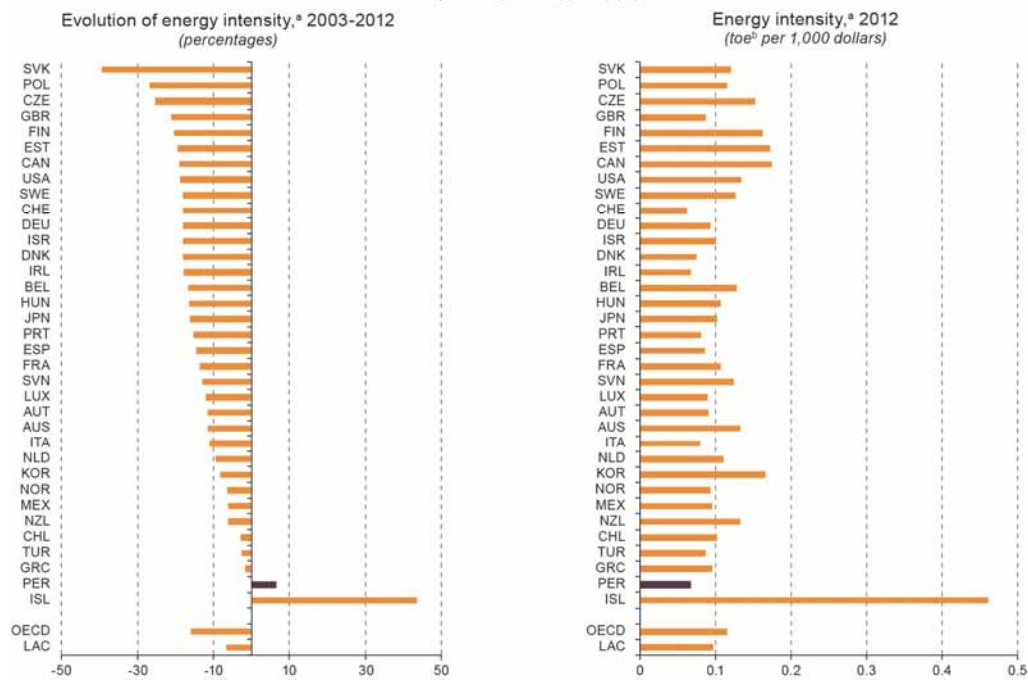
**Note:** Data are from the year indicated or the most recent year with information available; they may include estimated and provisional figures and calculations. Variations in definitions may limit the comparability of data between countries.

<sup>a</sup> Gross domestic product at constant 2011 prices and purchasing power parity.

<sup>b</sup> Not available.



## Total primary energy supply



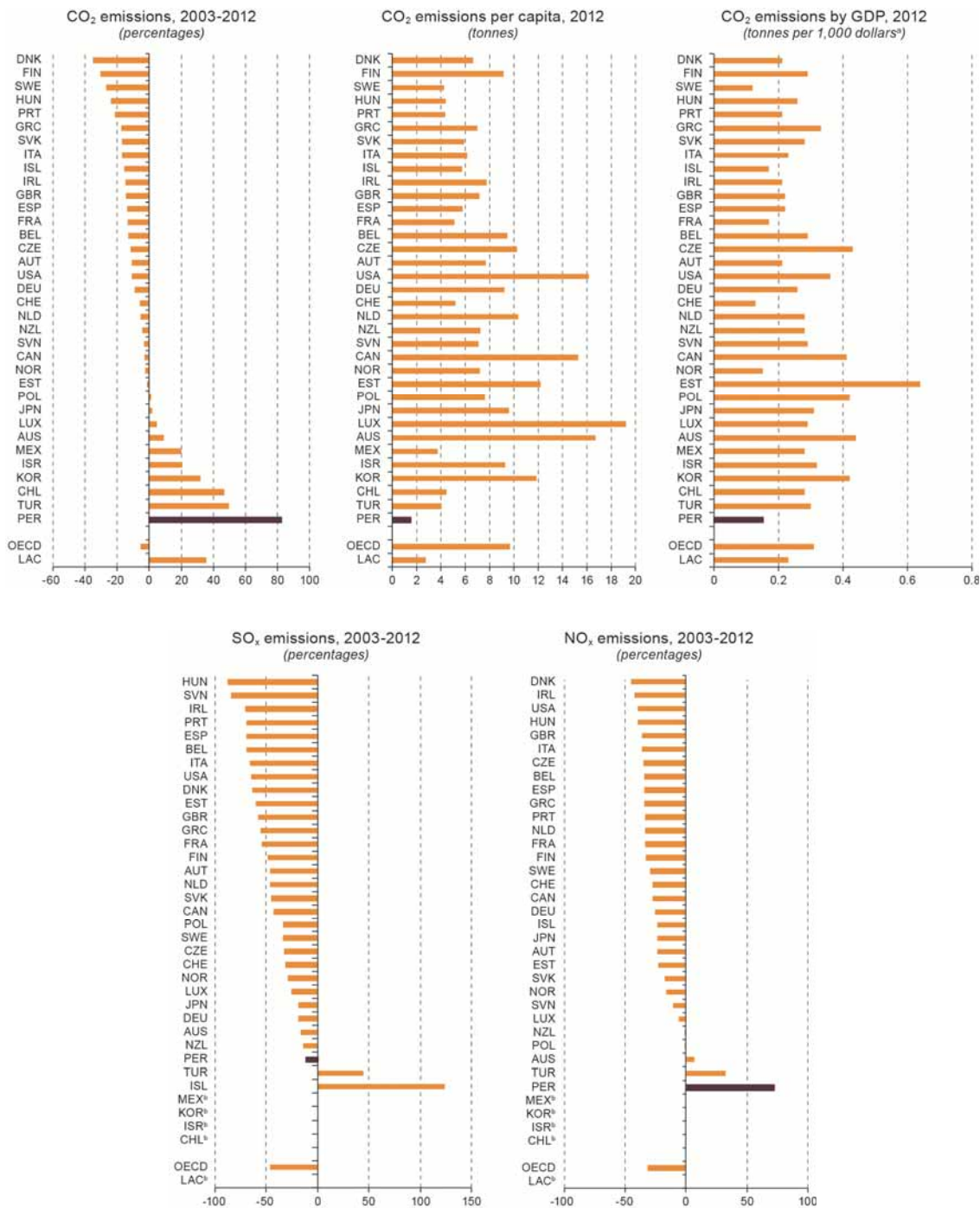
**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of CEPALSTAT; Organization for Economic Cooperation and Development (OECD); International Energy Agency (IEA), World Energy Statistics and Balances; and National Superintendency of Public Registries of Peru.

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<sup>a</sup> Total primary energy supply per unit of gross domestic product at constant 2011 prices and purchasing power parity.

<sup>b</sup> Tonnes of oil equivalent.

Selected environmental data

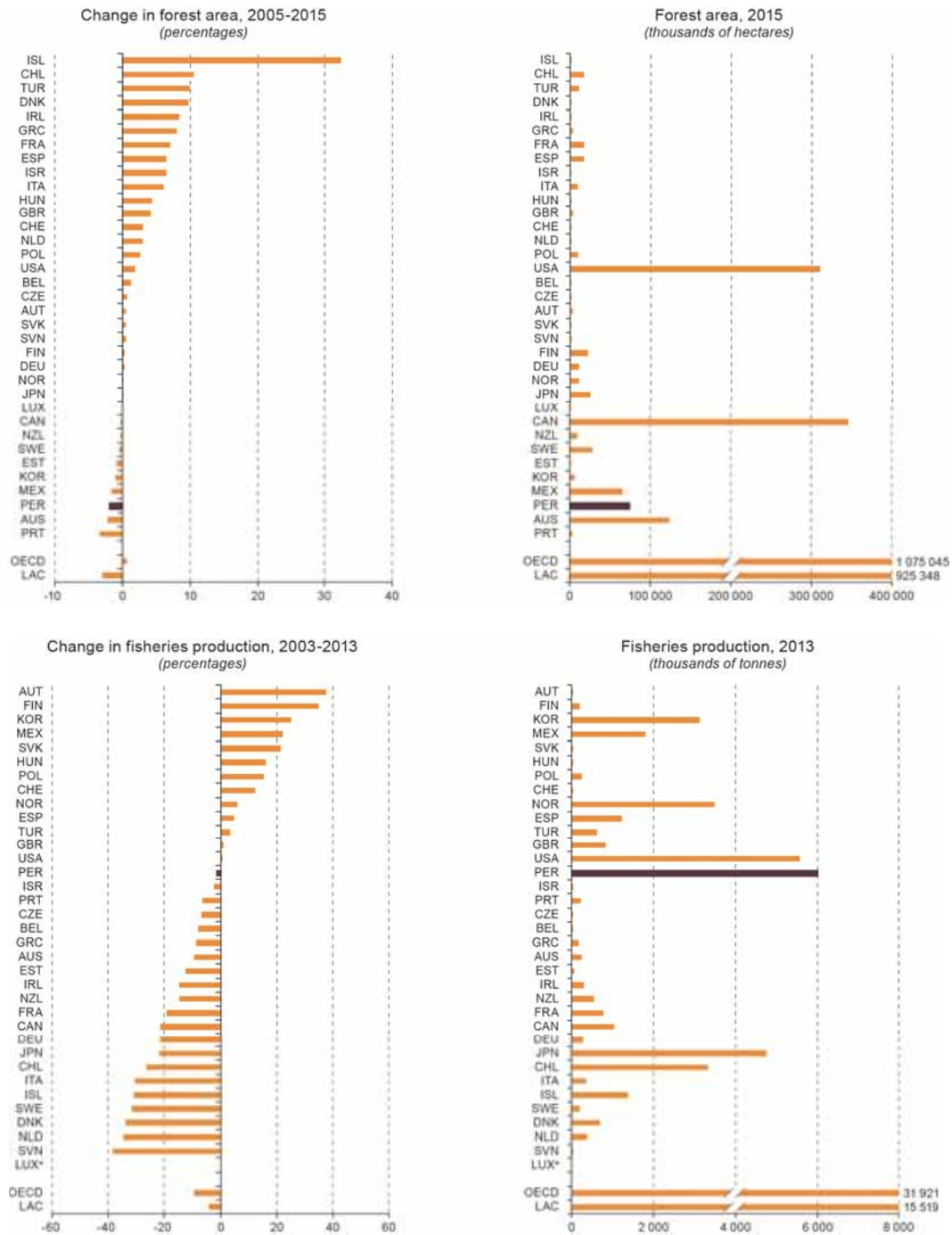


**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of Organization for Economic Cooperation and Development (OECD), International Energy Agency (IEA) and Ministry of Energy and Mining of Peru.

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<sup>a</sup> At constant 2005 prices and purchasing power parity.

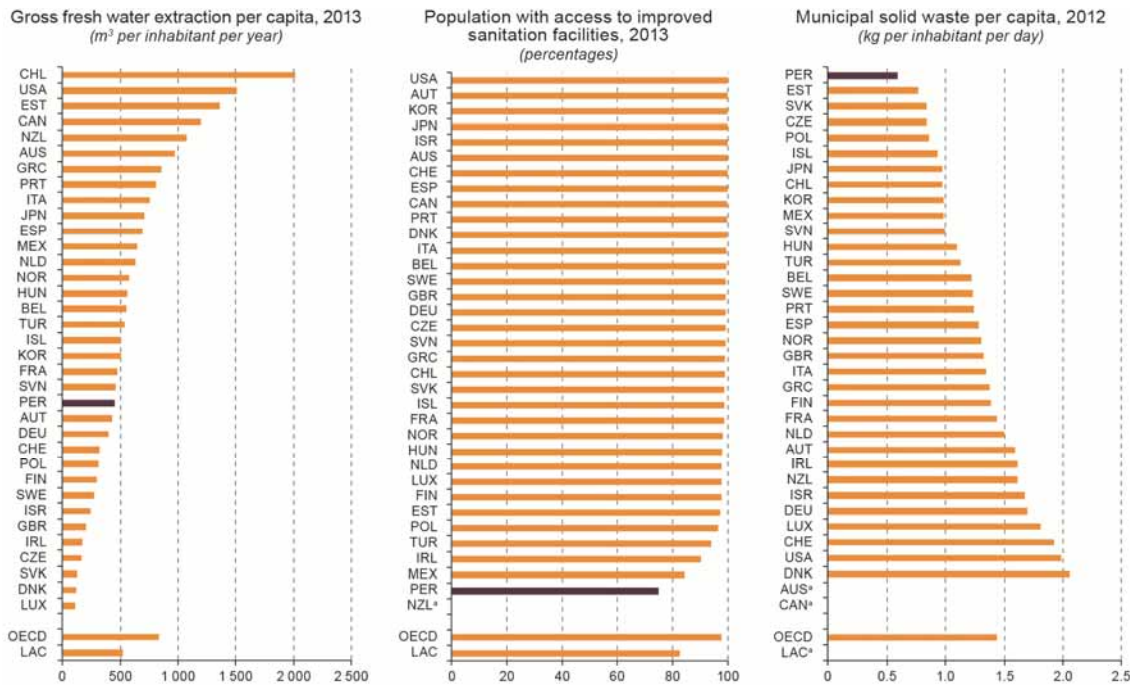
<sup>b</sup> Not available.



**Source:** Food and Agriculture Organization of the United Nations (FAO), Statistics and Information Branch of the Fishery and Aquaculture Department, 2016; *Global Forest Resources Assessment 2015*, Rome.

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<sup>a</sup> Not available.



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of World Bank, World Development indicators; Organization for Economic Cooperation and Development (OECD) and Ministry of the Environment of Peru.

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<sup>a</sup> Not available.

# Environmental Performance Reviews

## PERU

The Environmental Performance Review programme of the Organization for Economic Cooperation and Development (OECD) provides independent assessments of countries' progress in achieving their domestic and international environmental policy commitments, together with policy-relevant recommendations. The reviews are conducted to promote peer learning, enhance governments' accountability to each other and to the public, and to improve countries' environmental performance, individually and collectively. The OECD has been conducting these reviews since 1992, supported by a broad range of economic and environmental data. Each cycle of the Environmental Performance Reviews covers all OECD member countries and selected partner countries. The most recent reviews include: Colombia (2014), Spain (2015), Brazil (2015) and Chile (2016). The Economic Commission for Latin America and the Caribbean (ECLAC) has promoted environmental reviews in Latin America and the Caribbean, in cooperation with the OECD, and has undertaken similar assessments in the states of Amazonas and Acre in Brazil.

This report is the first review of Peru's environmental performance. It evaluates progress towards sustainable development and green growth, with a focus on environmental management (air, waste and chemicals, water and biodiversity) and the sustainable use of the natural resources base. The environmental performance of the farming, fishing and mining sectors is analysed in detail.

More information about the Environmental Performance Review programme can be found online at [www.oecd.org/env/countryreviews](http://www.oecd.org/env/countryreviews) and [www.cepal.org/es/evaluaciones-de-desempeno-ambiental-1](http://www.cepal.org/es/evaluaciones-de-desempeno-ambiental-1).

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