OECD Environmental Performance Reviews

COLOMBIA

2014

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OECD Environmental Performance Reviews: Colombia 2014

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Please cite this publication as:
OECD/ECLAC (2014), *OECD Environmental Performance Reviews: Colombia 2014*, OECD Publishing.
http://dx.doi.org/10.1787/9789264208292-en

ISBN 978-92-64-20828-5 (print)
ISBN 978-92-64-20829-2 (PDF)

OECD Environmental Performance Reviews:
ISSN 1990-0104 (print)
ISSN 1990-0090 (online)

United Nations reference number: LC/L.3768

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Preface

Colombia has enjoyed strong economic growth for much of the last decade, underpinned by a commodity price boom, significant economic policy reform and improved security. However, important challenges remain, including the need to steer economic development in a direction that is more environmentally sustainable and socially equitable. This is the main message of this first OECD Environmental Performance Review of Colombia.

The Review provides policy makers with a wide-ranging assessment of environmental conditions and policies that can help inform the preparation of the 2014-18 National Development Plan. Following the decision of the OECD Council in May 2013 to invite Colombia to begin accession discussions with the Organisation, the Report also provides a solid basis for discussing the environmental component of the accession process. This is important, as the OECD environmental acquis includes 50% of all legally binding OECD Council Decisions, and about 30% of OECD Council Recommendations.

Colombia is considered to be the second most biodiverse country in the world, and has a long tradition of developing policies and laws to protect its natural heritage. However, this heritage and the wellbeing of its people are under growing threats from extractive industries, livestock grazing, urbanisation and motorisation. Colombia's vulnerability to environmental changes, and the need to strengthen its environmental policies and institutions, was underlined by floods and landslides related to the La Niña event in 2010-11. The associated economic losses were equivalent to 2% of GDP, and affected over 3 million people, 7% of the population.

This Review intends to help Colombia address some of its main environmental challenges. It presents 45 recommendations including:

- Making green growth a central element of the 2014-18 National Development Plan, and making sectoral ministries accountable for the environmental impacts of their policies.
- Promoting greater use of environmentally related taxes, and phasing out environmentally harmful subsidies and tax exemptions, while mitigating any adverse impacts on poor and vulnerable groups.
- Strengthening the system of environmental management involving different levels of government, particularly by better defining their roles and responsibilities.
- Better managing the environmental impacts of mining, particularly from the use of mercury, and the impacts of mining operations on biodiversity.
- Strengthening the environmental information system, and building support for environmental measures by better communicating environmental information to policy makers and the public.

This Review has been prepared by OECD in cooperation with the Economic Commission for Latin America and the Caribbean (ECLAC). It is the result of a constructive and mutually beneficial policy dialogue between Colombia and the countries participating in the OECD Working Party on Environmental Performance. By strengthening mutual understanding, it helps to foster closer co-operation between Colombia and OECD Members as the country prepares for its eventual membership of the Organisation.

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Organisation for Economic
Co-operation and Development
(OECD)

Foreword

The principal aim of the OECD Environmental Performance Review programme is to help member and selected partner countries to improve their individual and collective performance in environmental management by:

- *helping individual governments to assess progress in achieving their environmental goals;*
- *promoting continuous policy dialogue and peer learning;*
- *stimulating greater accountability from governments towards each other and the public opinion.*

This report is the first OECD review of Colombia's environmental performance. It has been prepared in co-operation with the United Nations Economic Commission for Latin America and the Caribbean (ECLAC). Progress in achieving domestic objectives and international commitments provides the basis for assessing the country's environmental performance. Such objectives and commitments may be broad aims, qualitative goals or quantitative targets. A distinction is made between intentions, actions and results. Assessment of environmental performance is also placed within the context of Colombia's historical environmental record, present state of the environment, physical endowment in natural resources, economic conditions and demographic trends.

The OECD and ECLAC are indebted to the government of Colombia for its co-operation in providing information, for the organisation of the review mission to Bogotá (10-15 December 2012) and for its facilitation of contacts both inside and outside government institutions.

Thanks are also due to all those who helped in the course of this review, to the representatives of member countries participating in the OECD Working Party on Environmental Performance and especially to the examining countries: Chile, the United Kingdom and the United States.

The team that prepared this review comprised experts from reviewing countries: Mr Joost Meijer (Chile), Mr Ian Dickie (United Kingdom) and Mr Bryan Lobar (United States); members of the OECD Secretariat: Ms Angela Bularga, Mr Brendan Gillespie, Ms Eija Kiiskinen, Ms Natalia Mayorga, Ms Soizick de Tilly and Ms Frédérique Zegel; members of the ECLAC Secretariat: Mr José Javier Gómez and Mr Guillermo Acuňa; and Mr Bill Long (consultant), Ms Eva Hübner (consultant), Mr Roberto Martin-Hurtado (consultant) and Mr Rob Visser (consultant). Ms Carla Bertuzzi, Mr Shayne MacLachlan (OECD Secretariat) and Ms Rebecca Brite (consultant) provided statistical and editorial support during the preparation of the report. Preparation of this report also benefitted from comments provided by several members of the OECD Secretariat.

The OECD Working Party on Environmental Performance discussed the draft Environmental Performance Review of Colombia at its meeting on 28 October 2013 in Paris and approved the assessment and recommendations.

Table of contents

General notes 11

Executive summary 13

Part I

Progress towards sustainable development

Chapter 1. **Key environmental trends** 19
1. Introduction 20
2. Transition to a low-carbon, energy- and resource-efficient economy 24
3. Managing the natural asset base 28
4. Improving the environmental quality of life 33

Notes. 36
References 37

Chapter 2. **Policy-making environment** 41
Assessment and recommendations. 42
1. Governance structure for environmental management 44
2. Policy framework for sustainable development 50
3. Policies and regulations for managing environmental media 52
4. Design and effectiveness of selected environmental policy instruments 58
5. Environmental authorisations and compliance assurance 60
6. Monitoring and evaluation of environmental policy 65
7. Promoting environmental democracy 68

Notes. 71
References 71

Chapter 3. **Towards green growth** 75
Assessment and recommendations. 76
1. Introduction 79
2. Policy framework for green growth 80
3. Greening the tax system 82
4. Environment-related subsidies 87
5. Extending the use of other market instruments 91
6. Reconciling environmental and poverty alleviation objectives 93
7. Investing in environment to promote economic growth 94
8. Eco-innovation 99

Notes. 100
References 101

Chapter 4. **International co-operation** 105
Assessment and recommendations. 106
1. Objectives and policy framework 108
2. Bilateral and regional co-operation 110
3. Marine issues 112
4. Global environmental co-operation: sustainable development and the Rio conventions 118
5. Trade, investment and environment 126
6. Official development assistance 131
Notes 134
References 135

Part II

Progress towards selected environmental objectives

Chapter 5. **Waste** 141
Assessment and recommendations. 142
1. Institutional framework 144
2. Municipal solid waste management 146
3. Hazardous waste management 150
4. Other policy developments 156
5. Economic aspects of waste policies 157
Notes 159
References 159

Chapter 6. **Chemicals management** 161
Assessment and recommendations. 162
1. Pressures on health and the environment from chemicals 164
2. Policy and institutional framework for managing chemicals 166
3. Main instruments and mechanisms of chemical safety policies 170
4. Managing the risks of specific chemicals 177
5. International co-operation in chemicals management 182
Notes 184
References 184

Chapter 7. **Biodiversity** 187
Assessment and recommendations. 188
1. Current status and trends in Colombia's biodiversity 190
2. The policy and institutional frameworks 194
3. Policy instruments for biodiversity conservation and sustainable use 198
4. Integrating biodiversity into economic and sectoral policies 207
Notes. 213
References 214

Annex I. Selected data 219
I.A. Selected economic data 220
I.B. Selected social data 223
I.C. Selected environmental data 224

Annex II. Abbreviations 229

Tables

2.1. Colombian air quality standards in comparison with WHO recommended values . . . 54
2.2. Extent of environmental education activities . . . 71
3.1. Health costs of selected environmental factors . . . 94
4.1. Selected environment-related marine conventions . . . 115
4.2. Millennium Development Goal 7: Environmental sustainability . . . 119
6.1. Use of chemicals by statistical group . . . 165
6.2. Regulation of chemicals by use category . . . 166
6.3. Responsibilities of ministries for chemicals management . . . 169
6.4. Selected groups of chemicals . . . 171
7.1. Biodiversity-related objectives of the National Development Plan 2010-14 . . . 197
7.2. Overview of policy instruments for biodiversity conservation and sustainable use . . . 198
7.3. Total mining titles granted in areas of ecological importance in 2010 . . . 211

Figures

1.1. Trends in GDP . . . 23
1.2. GHG and CO_2 emissions . . . 25
1.3. Energy intensity and supply by source . . . 25
1.4. Resource productivity . . . 27
1.5. Water resources and abstractions . . . 29
1.6. Average annual deforestation by region . . . 30
1.7. Fish production . . . 30
1.8. Oil and gas reserves and production . . . 31
1.9. Threatened species . . . 32
1.10. Protected areas . . . 33
1.11. Air quality in selected cities . . . 34
1.12. Access to water and sanitation . . . 35
2.1. Overall organisation of SINA, the National Environmental System . . . 46
2.2. Organisation chart of the Ministry of Environment and Sustainable Development . . . 47
2.3. New and modified environment licences at the national level . . . 61
2.4. Number of on-site visits and share of large installations inspected by ANLA 64
2.5. Overall structure of SIAC, the Colombian System of Environmental Information . . . 66
3.1. Environmentally related tax revenue . . . 84
3.2. Road fuel prices and taxes . . . 85
3.3. Fuel subsidies . . . 88
3.4. Resources allocated to the water and sanitation sector . . . 95
3.5. Environmental protection expenditure . . . 96
3.6. Revenue of CARs by source in 2011 . . . 97
3.7. Trends in CARs revenue . . . 98
4.1. Fish production . . . 116
4.2. Official development assistance . . . 132
5.1. Generation and treatment of municipal waste . . . 149
5.2. Generation of hazardous waste by type of activity . . . 154

5.3. Hazardous waste management by type of treatment 155
7.1. Threatened species 191
7.2. Average deforestation, by region 192
7.3. Protected areas 199
7.4. Sources of funding for protected areas 202
7.5. Head of cattle 208
7.6. Cost-effectiveness of the CIF programme 210
7.7. Mining titles 212

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General notes

Signs

The following signs are used in Figures and Tables:

. . : not available

– : nil or negligible

. : decimal point

Country aggregates

OECD Europe: This zone includes all European member countries of the OECD, i.e. Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

OECD: This zone includes all member countries of the OECD, i.e. the countries of OECD Europe plus Australia, Canada, Chile, Israel,* Japan, Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

Currency

Monetary unit: Colombian peso (COP).

In 2011, USD 1 = COP 1 848

In 2012, USD 1 = COP 1 798

Cut-off date

This report is based on information and data available up to October 2013.

* The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

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Executive summary

Colombia's abundant natural resources are under pressure

Colombia is considered the second-most bio-diverse country and one of the richest countries in terms of water availability in Latin America. Forests cover more than half the territory. The CO_2 emission intensity of the economy is low due to heavy reliance on hydropower. However, the greenhouse gas emission intensity is high due to the high level of emissions from agriculture. Colombia has made important progress in improving access to water services. However, air pollution and the use of mercury and other hazardous chemicals have significant impacts on human health and the economy.

In recent years, Colombia has enjoyed impressive economic growth but it remains one of the world's most unequal countries. Extractive industries, livestock grazing, road traffic and urbanisation exert major pressures on biodiversity and ecosystems. Internal armed conflict has undermined the rule of law, exacerbated a range of environmental pressures (mainly from illegal mining, cultivation of illicit drug crops and deforestation) and restricted access to protected areas and the management of natural resources. Colombia is quite vulnerable to climate change. Extreme weather events have increased in frequency and intensity over the last decade.

A long tradition of environmental laws and policies

The 1991 Constitution and 1993 umbrella Law on Environmental Management established a solid policy and institutional framework for modern decentralised environmental management. Since then, the body of environmental laws and regulations has expanded significantly. However, in the 2000s, Colombia's environmental institutions were largely overwhelmed by environmental pressures. In 2011, the re-establishment of a Ministry of Environment and Sustainable Development (MADS) and the establishment of the National Environmental Licensing Authority were important steps to redress this imbalance.

The way in which environmental organisations at different levels of government work together poses a number of challenges. The 33 Autonomous Regional Corporations have key responsibilities for implementing environmental policies at subnational level. However, they are subject to few accountability constraints and controls. These weaknesses hinder the development of the national environmental information system and the implementation of environmental impact assessment (EIA) and licensing procedures, and impede a consistent approach to environmental enforcement. The 1991

Constitution includes provisions for the right to environmental information and for public participation and access to justice in environmental decision making. However, further efforts are needed to enhance public participation, particularly in the EIA process, and to improve environmental information.

Promoting a socially inclusive and environmentally sustainable growth remains a challenge

The devastating impact of the 2010-11 La Niña event stimulated efforts to better integrate economic and environmental policies. These efforts include a chapter on environmental sustainability and risk prevention in the National Development Plan for 2010-14, adherence to the OECD Green Growth Declaration, the creation of environmental units in sectoral ministries and development of cross-ministerial environmental agendas as well as a comprehensive climate policy. However, the lack of coherence between economic sectoral plans and environmental goals persists. Major programmes and projects should be subject to systematic strategic environmental assessment.

Colombia is close to achieving the Millennium Development Goal on improved access to water supply. However, low public environmental expenditure impedes the environmental authorities from carrying out their functions and generally more investment is needed in environmental infrastructure. It is the poor who lack access to environmental services and suffer most from pollution. A recent reform of the royalty system is expected to increase resources available for infrastructure development and to distribute revenue more equitably across regions. However, the transition to greener growth requires stronger, market-based incentives. Revenue from environmentally related taxes is low and the government's tax take from natural resource extraction could be increased. User charges remain below the cost of providing environmental services. Reviewing the environmental impact of tax expenditure and subsidies would provide a good basis for a reform.

Progress in waste management is uneven

Colombia has developed an extensive regulatory framework for waste management, but it needs to be streamlined. Municipal waste generation per capita is less than half the OECD average, but most waste is landfilled. Although waste disposal capacity has increased and the number of dump sites has been reduced, 30% of landfills do not comply with environmental standards and in several large cities they have reached capacity. Waste policy should be reoriented from a pollution control to a preventive approach. Progress has been achieved in managing specific types of hazardous waste through extended producer responsibility programmes and Colombia complies with the requirements of the Basel Convention. However, management of hazardous waste in the oil and mining sectors has been uneven, and managing the health and environmental risks posed by contaminated sites requires a comprehensive remediation strategy. The design of economic instruments does not enable policy objectives to be achieved and waste management suffers from limited financial resources.

Establishing an effective system to ensure chemicals' safe use will require serious efforts

Colombia has established regulatory systems for several types of chemical products which provide a helpful basis for developing an overarching framework. Its experience in managing industrial chemicals has been strongly influenced by, and is largely limited to, activities to implement multilateral environmental agreements on specific chemicals. Addressing the potential risks of a broader range of chemicals will require better information and strengthened capacity for testing chemicals and assessing risks. Best OECD practices should be used as guidance. Further steps should be taken to provide information about the safe use of chemicals to workers, consumers and other users in line with good international practice. Colombia could also benefit from experience gained by OECD countries regarding chemical accident prevention, preparedness and response. Colombia has made good progress in implementing the Montreal Protocol on ozone-depleting substances and is actively working to implement the Stockholm Convention on Persistent Organic Pollutants. Managing the health and environmental impact of mercury is by far the most challenging chemicals-related issue. A law to reduce and eliminate mercury use was adopted in July 2013.

The role of natural capital in underpinning economic development should be given appropriate recognition

Colombia's rich biodiversity is under increasing threat, with expansion of the agricultural frontier, infrastructure and extractive industries the major drivers of biodiversity loss. Uncertainties about the tenure of indigenous people, illegal seizure of land during the armed conflict and the subsequent displacement of more than 8% of the population have contributed to deforestation and intensified pressures on biodiversity. Although the deforestation rate fell in the past decade, between 30% and 50% of natural ecosystems have been transformed in some way. There is an urgent need to remove incentives for increasing extensive cattle rearing and to stop the authorisation of mining in areas of ecological importance.

In 2012, Colombia adopted a National Policy for Biodiversity and Ecosystem Services to strengthen the framework for conservation and sustainable use of biodiversity. An action plan is now needed to put the new strategy into operation. Although knowledge on biodiversity has improved, the lack of scientific and economic information about biodiversity and ecosystems remains an important constraint on policy making.

The National System of Protected Areas has been a major pillar of Colombia's biodiversity policies. It has received significant support from various international sources. However, a major effort will be required to achieve the Aichi targets of protecting 17% of terrestrial areas and 10% of marine areas by 2020. In this regard, there is scope to expand the use of economic instruments such as payments for ecosystem services in which Colombia has gained some valuable experience. More than one-quarter of the total area under protection is in indigenous reservations or collective territories. This underlines the importance of adequate provision for fair and equitable benefit sharing from the use of genetic resources, in line with the Convention on Biological Diversity and the Nagoya Protocol.

PART I

Progress towards sustainable development

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PART I

Chapter 1

Key environmental trends

This chapter provides a snapshot of key environmental trends in Colombia between 2000 and 2012. It highlights the country's main environmental achievements, as well as the remaining challenges on the path towards a greener economy and sustainable development. The chapter describes Colombia's progress in reducing the carbon, energy and material intensities of its economy; in managing its natural asset base, including water, biodiversity and mineral resources; and in improving the environmental quality of life.

1. Introduction

This chapter provides a snapshot of some key environmental trends in Colombia over 2000-12. It highlights some of the main environmental achievements and remaining challenges on the path towards green growth and sustainable development. The chapter is based on indicators from national and international sources, and broadly follows the OECD framework to monitor progress towards green growth (OECD, 2011). After providing a brief overview of key trends, it describes Colombia's progress in using energy and natural resources efficiently, in managing its natural asset base and in improving the environmental quality of life of its people. The chapter aims to provide a baseline for subsequent chapters which assess how effective Colombian environmental policies have been in affecting these trends and in using environmental policy objectives to generate economic opportunities.

In 2012, Colombia was Latin America's fifth-largest economy. Significant policy reforms since the early 1990s have helped modernise the economy (OECD, 2013a). These reforms, together with improved security, intensification of mining activities and strong commodity prices, have underpinned strong growth (Box 1.1; Figure 1.1). Since the mid-2000s, economic growth has contributed to a decline in absolute poverty and, to a lesser extent, income inequality. However, Colombia remains one of the world's most unequal countries because of its high unemployment rate, large informal employment, low level of educational attainment and inequality in access to education, and the low redistributive impact of the tax-benefit system.

Colombia's environmental performance must be seen in the context of resource richness, diversity and an economy that is growing based on non-renewable natural resources. Colombia has a long tradition of environmental laws and policies. Colombia is considered the second-most biodiverse country and one of the richest countries in terms of water availability in Latin America. Along with the pressures of economic activities, internal armed conflict has undermined the rule of law, exacerbated a range of environmental pressures (mainly from illegal mining, cultivation of illicit drug crops and deforestation) and restricted access to protected areas and the management of natural resources.

Colombia is endowed with abundant minerals, metals and fossil fuels. It is the largest coal producer in Latin America and the fifth-largest coal exporter in the world (Section 3.2). Fossil fuels account for a growing share of domestic extraction of raw materials and are mostly exported. The CO_2 emission intensity is low and declining owing to Colombia's heavy reliance on hydropower. Nevertheless, the greenhouse gas (GHG) emission intensity of the economy is high by international standards due to the high level of emissions from agriculture. Energy consumption has increased in all economic sectors. Transport, mainly by road, is the largest consumer of energy and the largest source of CO_2 emissions. Increasing freight activity, rapid urbanisation and rising incomes and motorisation rates are important drivers of this sector. The carbon intensity of electricity production is

Box 1.1. **The economic and social context**

Economy

- Colombia has a small but buoyant economy. GDP increased by 4.3% annually over 2000-12, faster than in the OECD or the Latin American and Caribbean (LAC) countries (Figure 1.1).
- Per capita income is less than one-third of the OECD average, mainly due to low labour productivity (Annex 1.A) (OECD, 2013a).
- Colombia weathered the financial crisis remarkably well and enjoyed a strong recovery in 2011, underpinned by the booming mining sector (OECD, 2013a). After a deceleration in 2012, the economy is projected to grow by about 4% in 2013 and 2014 (Banco de la República, 2013).
- The share of industry[a] in value added grew from 29% to 38%, well above the OECD average of 27%. Services account for 55% of value added and agriculture for 7% (Annex 1.A). Agriculture still accounts for 18% of employment.
- In the mining industry, oil and gas extraction provides the largest share of value added (9.1%), followed by coal (2.2%), metallic minerals (0.7%) and non-metallic minerals (0.4%).
- Trade in goods and services rose from 33% of GDP to 39%, but remains below the respective OECD and Latin America averages of 58% and 43%. The United States continues to be Colombia's major trade partner. Crude oil and petroleum products account for nearly half of Colombia's merchandise exports in value, and coal for 12%, with manufactured goods making up the bulk of merchandise imports. The leading service export is travel.
- Colombia is one of the largest foreign direct investment beneficiaries in Latin America (OECD, 2012). The mining industry absorbs the largest part of international investment.
- Over the past decade, an improved fiscal framework and debt management have helped consolidate public finances (OECD, 2013a). Colombia returned to a balanced budget in 2005. The fiscal deficit increased in the aftermath of the financial crisis, but declined from 3.1% of GDP in 2010 to 1.8% in 2011 despite emergency spending amounting to about 0.5% of GDP in the wake of 2010 flood damage.
- Tax revenue rose from 9% of GDP in 1990 to 17% in 2010, but Colombia's tax/GDP ratio is half the OECD average. The tax system has a very small redistributive impact (Chapter 3).
- Departmental and municipal spending increased with decentralisation, but subnational government expenditure continues to be largely financed by transfers from the central government (Sánchez, 2012).
- Revenue from environmentally related taxes rose by 30% between 2000 and 2011, driven by increasing fuel consumption. However, it decreased as a share of GDP to 0.7% and as a share of total tax revenue to 3.7%, well below the respective OECD averages of 1.6% and 5.6% (Chapter 3).

Society

- Colombia's population totalled 46.6 million in 2012. About 10% of the population is Afro-Colombian and the share of indigenous people is around 3%. With 40 inhabitants per square kilometre, population density is relatively low but above the OECD average (Annex 1.B).

Box 1.1. **The economic and social context** *(cont.)*

- The vast majority of people live in cities in the Andean and Caribbean regions. Growing urbanisation poses major economic, social and environmental challenges. Between 1997 and 2011, about 3.7 million people (8% of the population) were displaced by political violence, typically migrating to informal settlements in urban and peri-urban areas (OECD, 2013a).
- The population is projected to continue to grow at a relatively high but decreasing rate to 2020 (1.1% annually). It is a comparatively young population: half were under age 26 in 2010.
- The unemployment rate declined steadily to 11.3% in 2012, which remains high compared with nearly 8% for the OECD (Annex 1.B). Informal employment[b] represented 60% of total non-agricultural employment in 2010 (ILO, 2012).
- Colombia is one of the world's most unequal countries (OECD, 2013a). In 2011, income inequality as measured by the Gini coefficient stood at 0.55, compared to 0.31, on average, for the OECD (Annex 1.B). Landholding is highly concentrated, with a Gini coefficient estimated at 0.86, one of the highest in the world.
- Progress has been achieved in reducing absolute poverty: poverty incidence by income[c] fell from 49% of the population in 2002 to 34% in 2011, while multidimensional poverty incidence[d] dropped from 60% in 1997 to 29% in 2011. However, with 22.5% of the population having an income below 50% of median income, the relative poverty rate[e] is more than twice the OECD average (Annex 1.B).
- Life expectancy at birth is 74.5 years, compared with 79.7 years, on average, in the OECD (DANE, 2010a; OECD, 2013b).
- Healthcare spending is relatively high (7.6% of GDP) for the income level (OECD, 2013a). Its growth over the two decades resulted in halving infant mortality[f] to 18.4 deaths per 1 000 live births in 2010, compared with an OECD average of 4.3 deaths per 1 000 live births (DANE, 2012a; OECD, 2013b).
- Health costs associated with air pollution (urban and indoor) and inadequate water and sanitation are estimated at 2% of GDP (World Bank, 2012). This total cost has not changed since 2002 but air pollution became the largest component.
- Total private and public spending on education, at 7.6% of GDP in 2011, is higher than the OECD average (6.2%), but overall educational outcomes remain poor (OECD, 2013a).

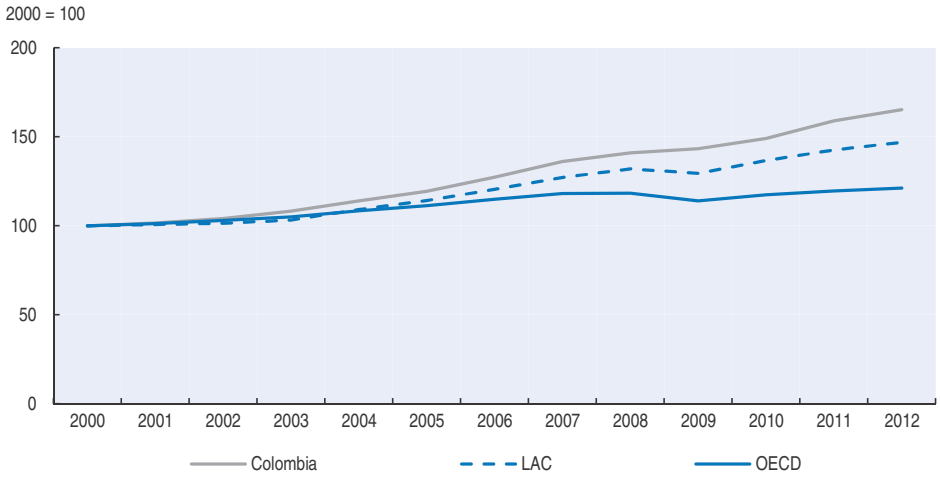
a) Mining and quarrying, manufacturing, production of electricity, gas and water, and construction.
b) Encompasses work that generally lacks basic social or legal protections or employment benefits. and may be found in the formal sector, informal sector or households.
c) An individual is considered poor if he/she lacks the income required to cover a basic family food basket and other basic needs (e.g. healthcare expenses, education, clothing).
d) Covers 5 dimensions: i) household educational background; ii) childhood and youth characteristics; iii) employment; iv) health; and v) access to public services and dwelling conditions. An individual is considered poor if deprived of at least 33% of the 15 variables included in the 5 dimensions.
e) Share of population with an income (after taxes and transfers) under 50% of the median income.
f) Of children under age 1.

expected to rise with the expansion of fossil fuel-based generation capacity to reduce the system's vulnerability to drought (Section 2.1).

Colombia's economy is more resource intensive than the OECD average. Domestic material consumption has increased rapidly but at a slower rate than economic activity, leading to an overall improvement in material productivity. This growth has been driven by rising consumption of biomass and construction minerals. Municipal waste generation per

Figure 1.1. **Trends in GDP**

2000-12



Source: ECLAC (2013), *CEPALSTAT* (database); DANE (2013); *Cuentas Nacionales Anuales*; OECD (2012), *OECD Economic Outlook No. 92* (database).

StatLink http://dx.doi.org/10.1787/888932997626

capita is less than half the OECD average, reflecting the remaining gap in income level. Landfilling is the predominant type of municipal waste treatment (Section 2.2).

Colombia is one of the world's mega-diverse countries. Forests cover more than half the territory, compared with 30% in the OECD. Conversion of forest to pasture for livestock grazing continues to be the primary driver of deforestation, although the deforestation rate fell during the past decade. Colombia considers that protected areas cover about 12% of terrestrial areas and 9.2% of marine areas. However, the latter estimate is more than that which is currently assessed using IUCN criteria and includes an area which has been the subject of an international dispute. A significant effort will be required to achieve the Aichi targets of protecting 17% of terrestrial areas and 10% of marine areas by 2020. There are significant overlaps between mining areas (about 8% of the continental land area in 2010) and the areas that are important for biodiversity (Sections 3.1 and 3.3).

Colombia has abundant freshwater resources but there are marked variations in spatial and temporal distribution of this natural resource. More than 60% of the urban population lives in the Magdalena-Cauca river basin, which has only 13% of the national water availability. As a consequence, while water resource use intensity is low at national level, more than a third of the urban population lives in areas under moderate to high water stress.

Colombia is quite vulnerable to climate change. It is projected that its Caribbean region and parts of the Andean region will shift from a semi-humid to semi-arid climate over the course of this century. Impacts on glaciers and high Andean moors (*páramos*) will affect water supply. Extreme weather events have increased in frequency and intensity over the last decade. Economic loss due to floods and landslides related to the La Niña event in 2010-11 was equivalent to about 2% of 2010 GDP. Over 3 million people, about 7% of the population, were affected. This event was instrumental in stimulating a significant reform of environmental policies and institutions (Sections 3.1 and 4.3).

Colombia is close to achieving the Millennium Development Goal on access to safe drinking water but efforts are needed to achieve the sanitation goal and reduce disparities

in access to water services between urban and rural areas. Efforts on air pollution management have helped reduce particulate matter (PM_{10}) concentrations in major cities. However, health costs associated with urban and indoor air pollution and inadequate water and sanitation are estimated at 2% of GDP. Mining has a significant health impact on workers and people in surrounding areas. Colombia is the world's largest mercury polluter per capita, with most of it coming from artisanal gold mining. Nevertheless, for the Colombian population, environment came well after unemployment, terrorism, public security and poverty in response to a question about the most important issues for the country (Section 4).

2. Transition to a low-carbon, energy- and resource-efficient economy

2.1. Carbon and energy intensities

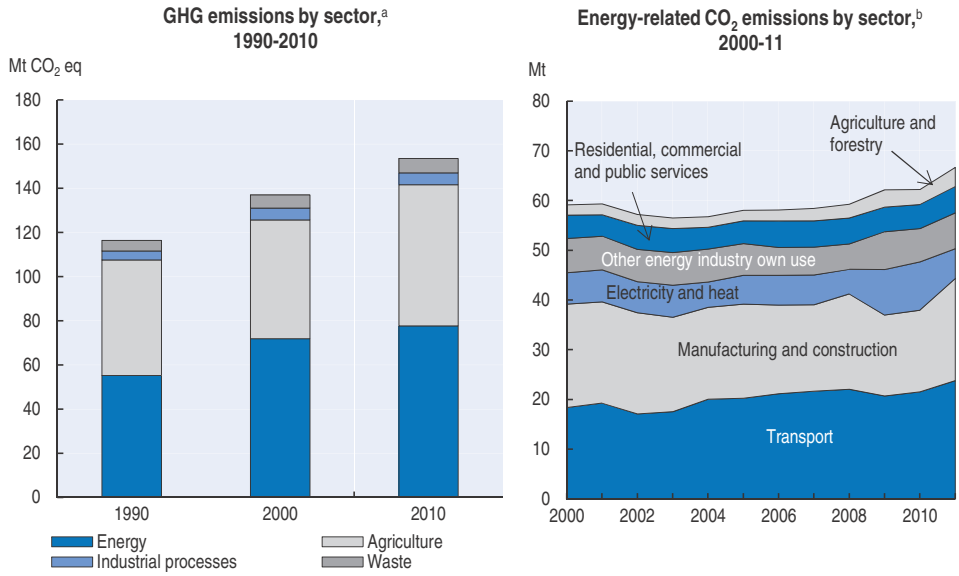
Greenhouse gas emissions

- According to the IEA, in 2010, Colombia contributed 0.4% of global GHG emissions, excluding land-use change and forestry[1] (LUCF) (IEA, 2013a).
- Annual emissions from deforestation[2] were estimated at more than one-quarter of total GHG emissions including LUCF in 2000-05[3] and 7% of total GHG emissions including LUCF in 2005-10 (IDEAM, 2011).
- In 2010, Colombia's GHG emission intensity was 0.47 kg per USD of GDP (at 2005 purchasing power parities), higher than the OECD average (0.43 kg). This is due to the high level of methane (CH_4) emissions from enteric fermentation and nitrous oxide (N_2O) emissions from use of fertilisers. Agriculture accounts for 35% of total GHG emissions excluding LUCF, compared with 7% for the OECD (IEA, 2013a).
- Energy-related CO_2 emission intensities per capita and per unit of GDP were respectively 86% and 52% below the OECD average, reflecting the difference in income and Colombia's heavy reliance on hydropower (Annex I.C).
- CO_2 emissions rose by 13% between 2000 and 2011, driven by growing transport and oil and gas activities and higher energy demand linked to economic recovery. In 2009 and 2010, the reduction of CO_2 emissions from industry was offset by increased fossil fuel combustion for electricity generation due to the El Niño event (Figure 1.2).
- Colombia reduced its CO_2 emission intensity per unit of GDP by 27% between 2000 and 2011, much more than the OECD average (18%). However, this trend is expected to reverse with growing motorisation rates and increased use of coal-fired power plants to reduce the vulnerability of electricity production to hydrological risks (CIF, 2013).

Energy intensity

- Energy production grew faster than GDP. It is nearly four times greater than the total primary energy supply (TPES) as Colombia exports most of its coal production and three-quarters of its oil production (IEA, 2013b).
- In 2011, primary energy intensity per unit of GDP was slightly above half the OECD average (Annex I.A). Since 2000, energy supply and consumption have increased but at a slower pace than economic activity.[4] As a result, energy intensity was reduced by 20%, more than in all OECD countries (Figure 1.3).
- Transport (mostly road) is the largest energy consumer (32%), followed by industry (30%). Over the past decade, agriculture (+43%) and transport (+29%) have been the fastest

Figure 1.2. **GHG and CO_2 emissions**



a) Partial estimate excluding emissions from LUCF and from solvent use. The IEA estimate for total GHG emissions includes an "other" category including emissions from forest fires and from decomposition of aboveground biomass that remains after logging and deforestation which is not shown here because of data uncertainty.
b) Sectoral approach; excludes international marine and aviation bunkers.
Source: OECD-IEA (2013), *IEA CO_2 Emissions from Fuel Combustion Statistics* (database).

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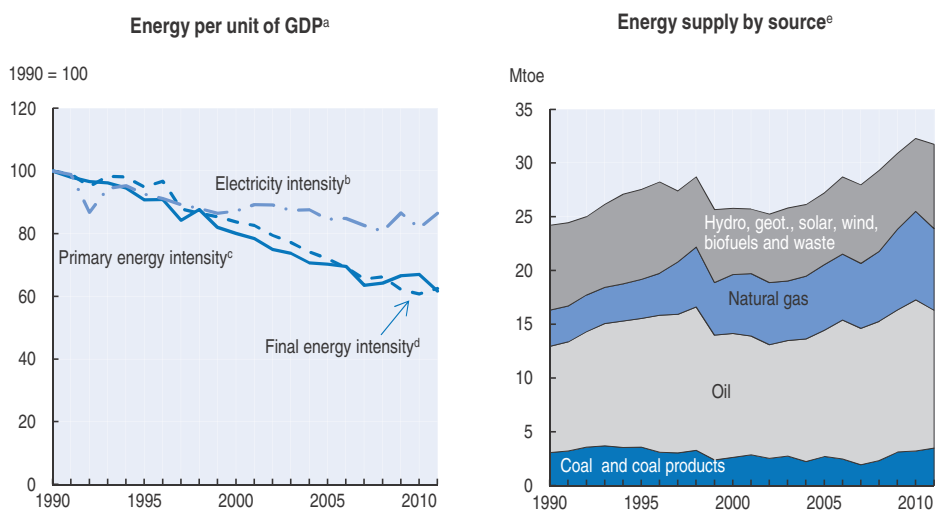
Figure 1.3. **Energy intensity and supply by source**

1990-2011



a) GDP at 2005 prices and purchasing power parities.
b) Electricity consumption per unit of GDP.
c) Total primary energy supply per unit of GDP.
d) Total final consumption of energy per unit of GDP.
e) Breakdown excludes trade of electricity and heat.
Source: OECD-IEA (2013), *IEA World Energy Statistics and Balances* (database).

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growing consumers of energy, followed by the commercial sector (+28%). In industry, consumption declined with the economic slowdown but recovered strongly in 2011.

- Residential electricity consumption grew by 80%, more rapidly than in other sectors and in the economy as a whole (+46%).

Energy mix

- Colombia has a relatively low-carbon energy mix. Renewable energy sources accounted for 25% of TPES in 2011, more than three times the OECD average (Figure 1.3; Annex I.A). Fossil fuels made up the remainder.
- Oil remains dominant in the energy mix at 41% while the proportion of natural gas grew from 14% of TPES in 1990 to 24% in 2011.
- Renewables' share of TPES has been decreasing because of growing urbanisation and associated fuel switching from wood to natural gas for residential heating and cooking. Solid biofuels' contribution to the energy supply has nearly halved since 1990. They now make up 12% of TPES while hydropower provides 13%.
- Hydropower accounts for more than three-quarters of renewables-based electricity. El Niño phenomena, such as the 2009-10 event, result in water deficits that reduce hydropower contribution to electricity production. Fossil fuel power generation capacity is planned to expand to reduce the system's vulnerability to droughts (Chapter 3).
- Since 2006, liquid biofuel production has more than quadrupled, supported by government policy, including blending mandates and favourable tax treatment (Chapter 3).
- The car ownership rate of 65 cars per 1 000 inhabitants is much lower than the OECD average (494), but the vehicle stock increased by nearly 70% over 2000-10 and is expected to double in the next ten years (Annex I.A) (BBVA, 2012).

2.2. Resource efficiency

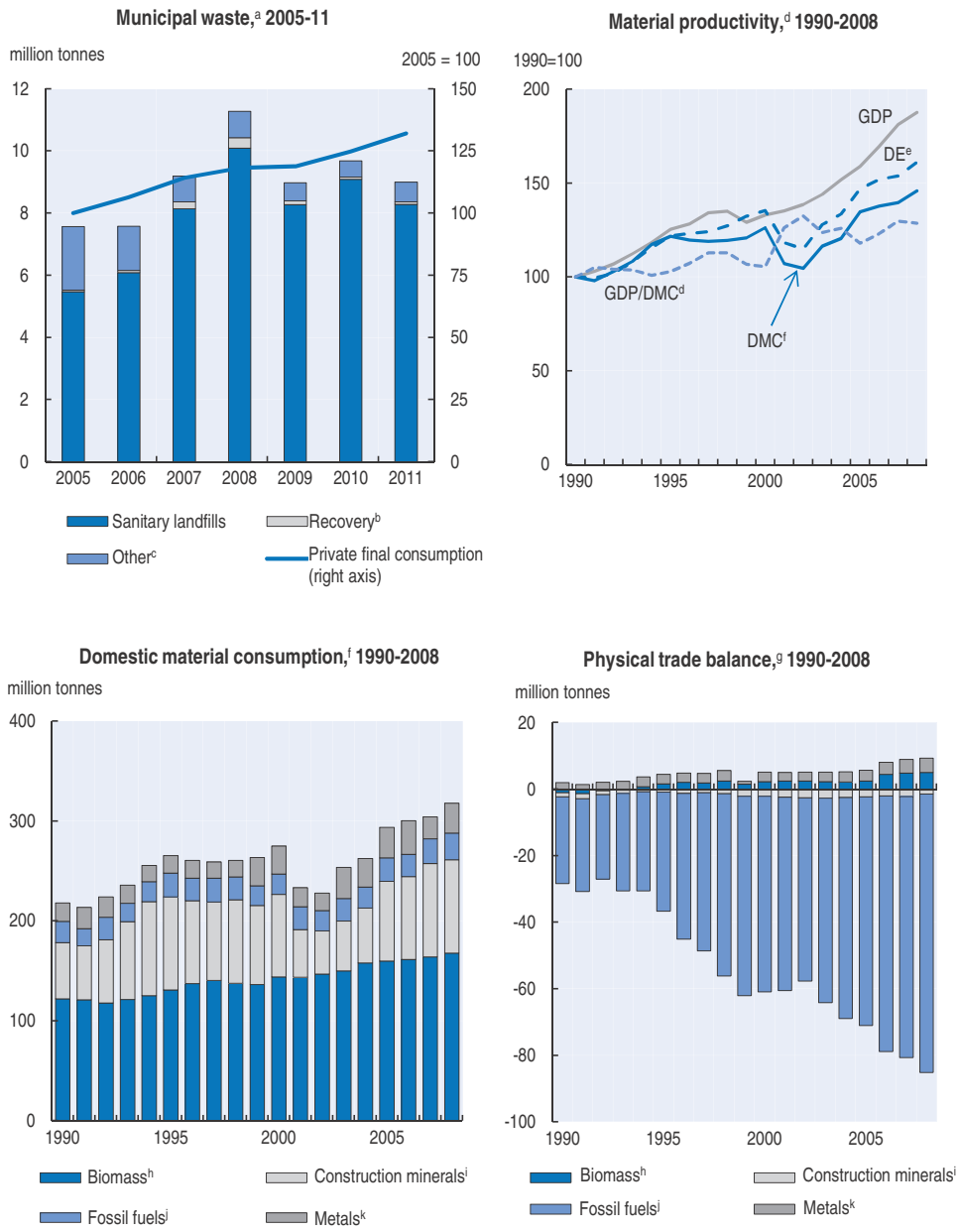
Material productivity

- Colombia's per capita domestic material consumption (DMC)[5] is lower than the OECD average, probably reflecting the remaining income gap and relatively low population density. The country also generates less economic wealth per unit of material used than the OECD average (Annex I.C).
- Between 1990 and 2008, DMC increased rapidly but at a slower rate than economic activity, leading to an overall improvement in material productivity (Figure 1.4; Annex I.C).
- Biomass is dominant in DMC due to the large numbers of livestock. Construction minerals come second, having gained share in the past decade due to investment in infrastructure (Figure 1.4).
- DMC analysis conceals the increased dependence of Colombia's economy on exported primary commodities, particularly coal.[6] Fossil fuels account for nearly one-third of domestic extraction of raw materials, compared with one-fifth in the early 1990s.

Waste generation and treatment

- Since 2005, municipal waste generation has increased roughly in line with private consumption[7] (Figure 1.4).

Figure 1.4. **Resource productivity**



a) Waste collected by or for municipalities; includes household and commercial waste, and similar waste handled at the same facilities.
b) Mainly composting, vermiculture and recycling carried out by treatment plants not complying with adequate technical standards. Excludes recovery from households, commerce and industrial sources (about 1.8 millions tonnes in 2010).
c) Includes waste disposal in non-controlled sites and water bodies, and waste burning in open areas.
d) Economic wealth generated from each unit of material used (GDP at 2005 prices and PPP/DMC).
e) Domestic extraction of raw materials used by the economy.
f) Sum of domestic (raw material) extraction used by the economy and its physical trade balance (imports minus exports of raw materials and manufactured products).
g) Physical trade surplus or deficit of an ecomomy, measuered as imports minus exports.
h) Domestic production from agriculture, forestry and fisheries, plus trade of raw and processed products from these sectors.
i) Domestic extraction and trade of minerals used in construction (e.g. sand, gravel, stones).
i) Coal, crude oil, natural gas, peat and traded derived products (e.g. plastic and rubber).
k) Domestic extraction of metal ores, plus trade of metal ores (e.g. bauxite), metal concentrates (e.g. nickel matte), refined metals (e.g. steel, aluminium, copper), products mainly made of metals (e.g. vehicles, machinery, electronics and electrical equipment), and scrap.

Source: CSIRO (2013), *Material Flows* (database); MADS, 2012; SSPD (2013), *Informe Nacional de Disposición Final 2012*.

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- With about 200 kg of municipal waste generated[8] per capita in 2011, Colombia generates less than half the OECD average of 530 kg per capita, reflecting the remaining gap in income level (Figure 1.4; Annex I.C). Wide variations exist between urban and rural areas.
- In addition, it was estimated that 1.8 million tonnes (about 40 kg per capita) of glass, paper and cardboard, metals and plastics were recovered from households, commerce, institutions and industry in 2010 (Aluna Consultores, 2011).
- In 2012, 80.4% of households were served by waste management services (DANE, 2012b). Coverage of waste services has progressed, from 83% of the urban population in 1993 to 97% in 2012, but remains limited in rural areas (22%).
- Landfilling continues to be the predominant type of municipal waste treatment, accounting for 92% of total treatment – twice the OCDE average, but similar to Latin American members of the OECD (Annex I.C).
- The share of improper disposal (open landfills, discharge to water, burning) was reduced from 27% to 7% between 2005 and 2011. Despite this progress, Colombia fell short its 2010 target of waste disposal at suitable sites in 100% of municipalities (CONPES, 2008; Chapter 5).
- In 2011, about 174 000 tonnes of hazardous waste[9] was generated,[10] nearly half of it from mining activities[11] (IDEAM, 2012). Of that, 158 000 tonnes was managed through recovery (21%), treatment (43%) and final disposal (36%). The rest went to temporary storage.

Nutrient inputs

- The volume of agricultural production rose by 24% over 2000-11, faster than in most OECD countries, with a larger increase in livestock (43%) than in crop production (7%) (FAO, 2013a).
- About 35% of Colombia's land area is used for livestock rearing, an area that has continuously expanded over the past decades. It is considered that only half of this area is suitable for grazing (Chapter 7). Extensive cattle breeding is a major factor in land degradation and deforestation, GHG emissions, water use and pollution.
- The use of commercial nitrogen and phosphate fertiliser increased markedly (FAO, 2013a). Colombia is among the main consumers of commercial fertiliser in Latin America (FAO, 2012). It is estimated that 70% of nitrogen application and 75% of phosphorus application is wasted (Chapter 7).
- Evidence of nutrient surpluses was found in the vast majority of water stations monitored (IDEAM, 2010).

3. Managing the natural asset base

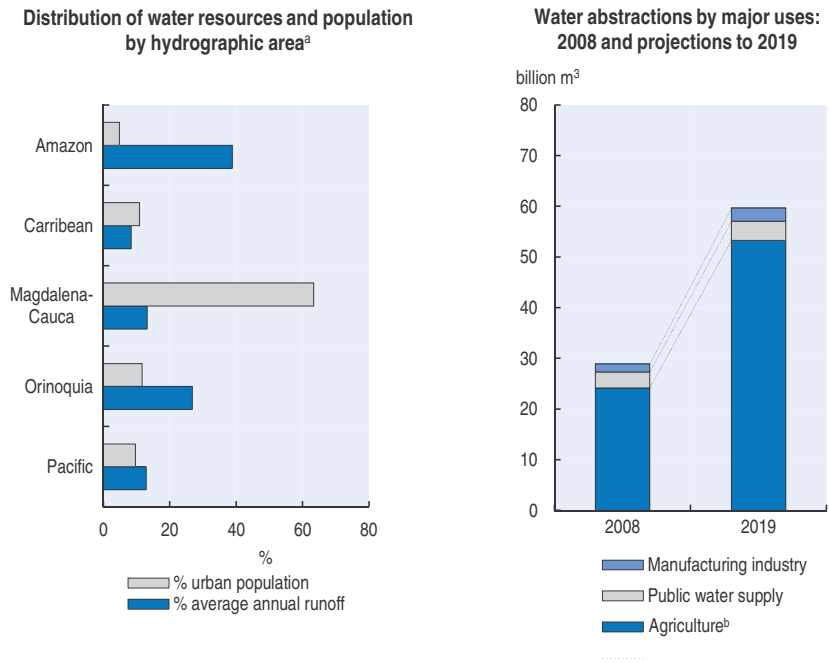
3.1. Renewable stocks

Water resources

- Colombia has abundant freshwater resources at more than 49 000 m^3 per capita,[12] far above the OECD average of 900 m^3 per capita and the LAC average of 7 200 m^3 per capita (IDEAM, 2010).
- There are marked variations in spatial and temporal distribution of this natural resource: the average annual runoff is 1 988 mm nationwide but ranges from 100 mm in La Guajira (Caribbean region) to 6 000 mm in the Pacific. These variations are mainly driven by the two phases of the El Niño-Southern Oscillation (ENSO) climate pattern: El Niño (warm phase, low levels of precipitation) and La Niña (cold phase, high rainfalls).

- Under dry climatic conditions, such as El Niño events, the water flow can be reduced by more than half in the Magdalena-Cauca hydrographic area, where most economic activities take place.
- More than 60% of the urban population lives in Magdalena-Cauca, which has only 13% of national water availability. By contrast, the Amazonas area is home to 5% of the urban population and accounts for about 40% of water resources (Figure 1.5).

Figure 1.5. **Water resources and abstractions**



a) Data refer to surface water.
b) Includes aquaculture.
Source: IDEAM (2010), *Estudio Nacional del Agua 2010.*

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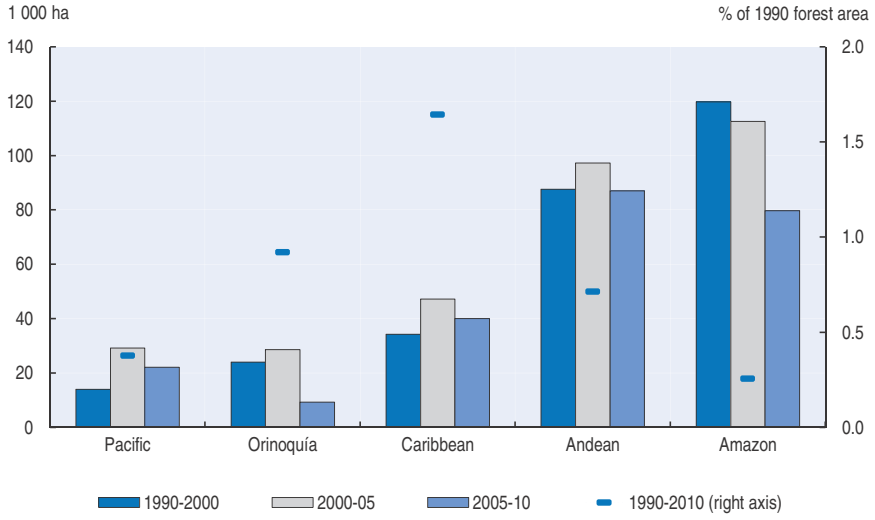
- As a consequence, while water resource use intensity is low at country level, 35% of the urban population lives in areas under moderate to high water stress[13] (Annex I.C).
- IDEAM estimates[14] indicate that agriculture[15] represents 82% of water abstractions,[16] industry 7%[17] and public water systems 11%. Water demand is projected to double by 2019, driven by growing agricultural use, particularly for livestock production (Figure 1.5).

Forest resources

- In 2010, forest covered 60.5 million ha, largely in the Amazon region. This represented 55% of Colombia's mainland area, compared with 30% in the OECD (FAO, 2010).
- The deforestation rate rose from 280 000 ha/year in 1990-2000 to 315 000 ha/year in 2000-05, then fell to 238 000 ha/year in 2005-10 (MADS, 2011).
- Over the past two decades, the Amazon region suffered the largest loss of forest while the Caribbean region was the most affected as a share of forest area. In the most recent period, the greatest loss occurred in the Andes (Chapter 7; Figure 1.6).

Figure 1.6. **Average annual deforestation by region**



Source: Cabrera, E. et al. (2011), *Memoria técnica de la cuantificación de la deforestación histórica nacional - escalas gruesa y fina.*

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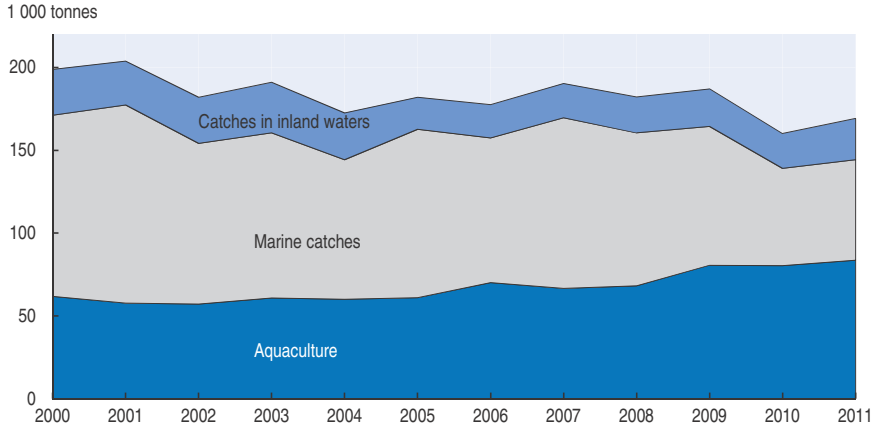
- The main drivers of deforestation are expansion of the agricultural frontier (more than half of forest loss in 2005-10 was due to conversion to pasture for livestock grazing), illicit crops, displacement of people and settlements, infrastructure building, mining, wood extraction and forest fires (Government of Colombia, 2013).

Fish resources

- Colombia accounts for only 0.1% of world fish catches (Annex I.C). Between 2000 and 2011, fish production decreased by 15% (Figure 1.7).

Figure 1.7. **Fish production**[a]
2000-11



a) Fish catches and aquaculture in inland and marine waters, including freshwater fish, diadromous fish, marine fish, crustaceans and molluscs.
Source: FAO (2013), *FAO Fisheries and Aquaculture Information and Statistics Service.*

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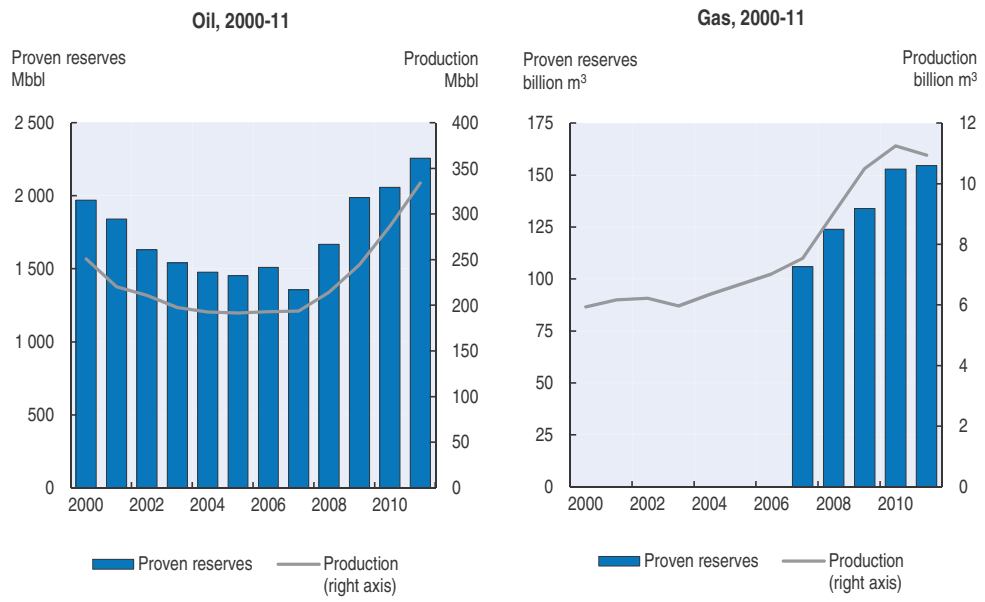
- Catches (mostly tuna from the Pacific Ocean) decreased by 38% while aquaculture production (dominated by tilapia from inland freshwaters)[18] grew by 35% to reach half of Colombian fishery production[19] (FAO, 2013b).
- There is evidence that fisheries and aquaculture have an adverse impact on aquatic biodiversity because of overfishing; illegal, unreported, and unregulated fishing; use of non-selective fishing gear; and discharges of nutrients (INVEMAR, 2012).
- Unsustainable management of fish resources, lack of knowledge, poor technological conditions and institutional and regulatory deficiencies have limited the sector's development and competitiveness (Chapter 4; MADR-IICA, 2011-12).

3.2. Non-renewable stock

Fossil fuels

- At the end of 2011, proven hydrocarbon reserves were estimated at 2.26 billion barrels of oil and 155 billion m^3 of natural gas (Ministerio de Minas y Energía, 2012).
- Since 2000, Colombia's oil production has increased by a third and its production of natural gas by 70% (IEA, 2013b).
- At current rates of production, the estimated life of proven reserves is 7 years for oil and 14 years for natural gas[20] (Figure 1.8).

Figure 1.8. **Oil and gas reserves and production**



Source: ANH (2012), *Indicadores de Gestión y Estadísticas de la Industria* (database), 30 November; ACP (2012), *Informe Estadístico Petrolero* (database), 24 January.

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- Between 2000 and 2011, coal production more than doubled, making Colombia the 11th largest coal producer in the world and the largest in Latin America (IEA, 2012). The coal mining region in northern Colombia is one of the world's largest open pit mining regions.

- Proven recoverable coal reserves are estimated at 4 945 Mt, representing about 60 years of production at current levels (IEA, 2012).
- More than 90% of coal production is exported. Colombia is the fifth-largest coal exporter in the world.
- The area covered by mining titles rose from 1 million ha in 2000 to 8.5 million ha in 2010 (about 8% of the continental land area) (CGR, 2011). Growth in the second part of the 2000s was driven by rising commodity prices and a tax deduction for investments in fixed assets[21] (Chapter 3).

Other minerals

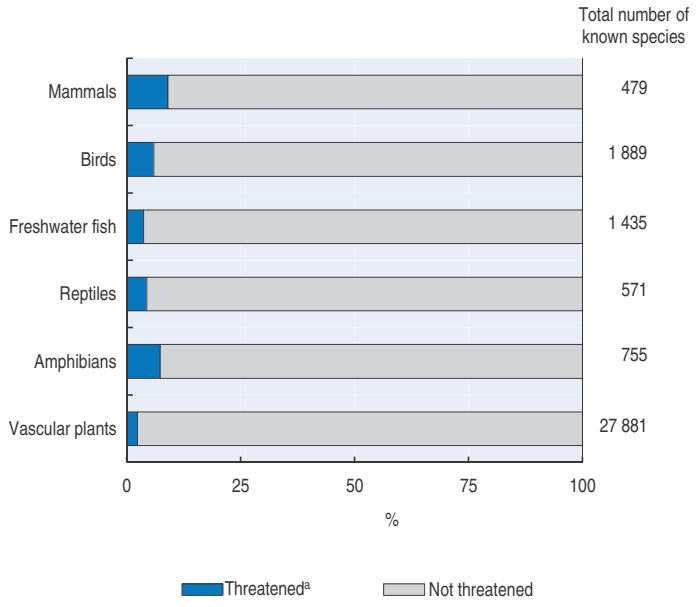
- Colombia holds large reserves of metallic and non-metallic minerals, mainly in the Andean, Caribbean and Pacific regions. Gold, ferronickel and emeralds are the most important in terms of export revenue.

3.3. Biodiversity and ecosystems

- Colombia has the greatest variety of ecosystems within any country and is considered the world's second-most biodiverse country. Land use change is the most important driver of biodiversity loss (Chapter 7).
- The share of threatened species is relatively low compared with OECD countries (Figure 1.9; Annex I.C). This is maybe due to the large number of species in Colombia and to the fact that relatively few have been assessed. The Andes is the region with the highest number of threatened species (Chapter 7).

Figure 1.9. **Threatened species**

Late 2000s



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species. Data refer to the number of species known to be threatened within those species that have been assessed to date.

Source: MADS, 2013.

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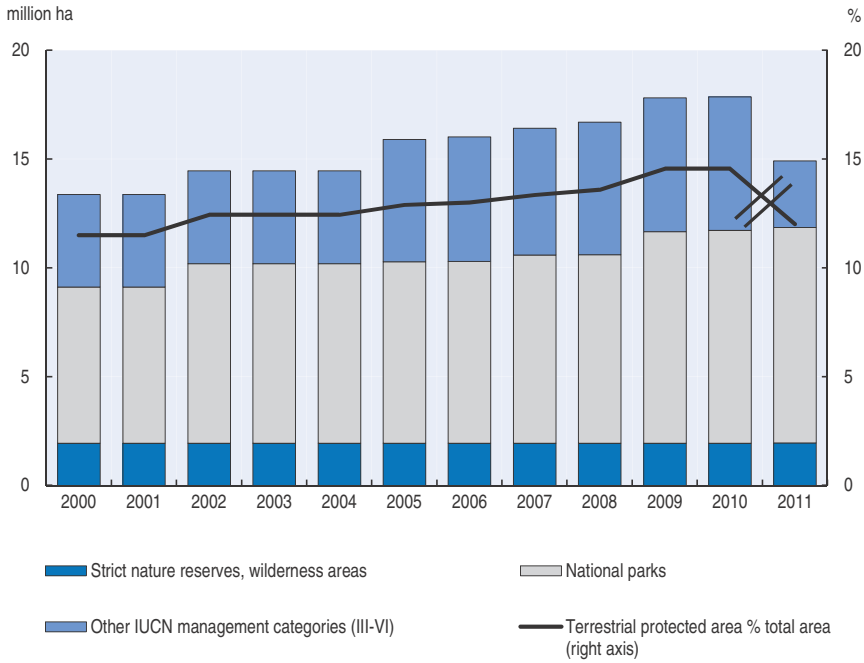
Figure 1.10. **Protected areas**[a]

2000-11



a) Nationally designated protected areas of the National System of Protected Areas (SINAP). Break in time series in 2011: partial data from the Single Register of Protected Areas.

Source: SIAC (2012), *Sistema de Indicadores Ambientales.*

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- In 2011, protected areas covered about 15 million ha, representing 12% of the land area and about 1.3% of the marine area[22] (Figure 1.10; Chapter 7). The government is committed to achieving the Aichi targets of protecting 17% of terrestrial areas and 10% of marine areas by 2020.
- National parks accounted for two-thirds of the protection network. Related designated areas have increased by 38% since 2000.
- Over 2010-13, 2.4 million ha were added to the National System of Protected Areas, out of 3 million ha committed in the 2010-14 national development plan. Between 16% and 32% of the land titled for mining is in areas of environmental importance (Chapter 7).

4. Improving the environmental quality of life

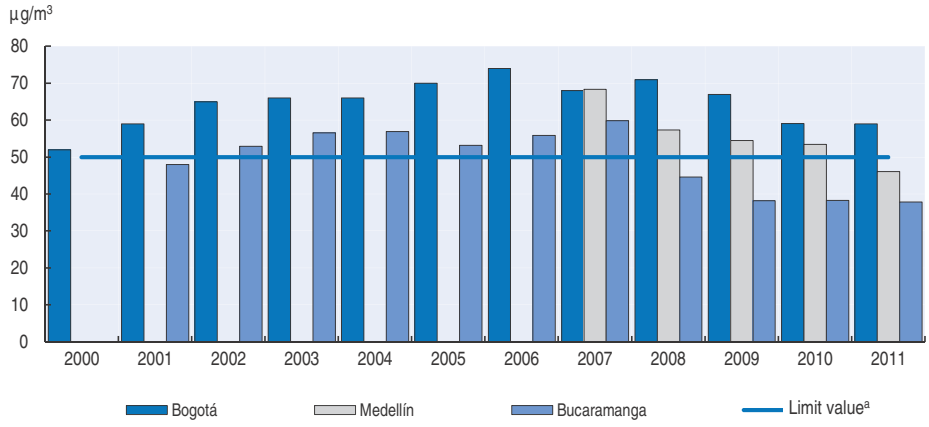
4.1. *Air quality*

- Colombia achieved its Montreal Protocol targets by eliminating its consumption of ozone-depleting substances. It has adopted a strategy to achieve an accelerated phase-out of hydrochlorofluorocarbons by 2025 (Chapter 6).
- Pollution by particulates is the major challenge for public health (IDEAM, 2007). Air pollution levels in Bogotá and Medellin are comparable to those of Latin American cities with severe air pollution problems (WHO, 2011).

- PM_{10} concentrations have been significantly reduced in major cities through fuel quality improvement, traffic regulation and installation of urban mass rapid transit systems. However, related standards continue to be exceeded in Bogotá, despite Colombian limits on pollutant concentrations being less stringent than World Health Organization (WHO) air quality guidelines (Figure 1.11; Chapter 2).

Figure 1.11. **Air quality in selected cities**

PM_{10} annual mean concentrations, 2000-11



a) According to Resolution 610 of 2010 of MADS. Previous standards were 60 µg/m^3 (2009-10) and 70 µg/m^3 (2008).
Source: IDEAM, 2012.

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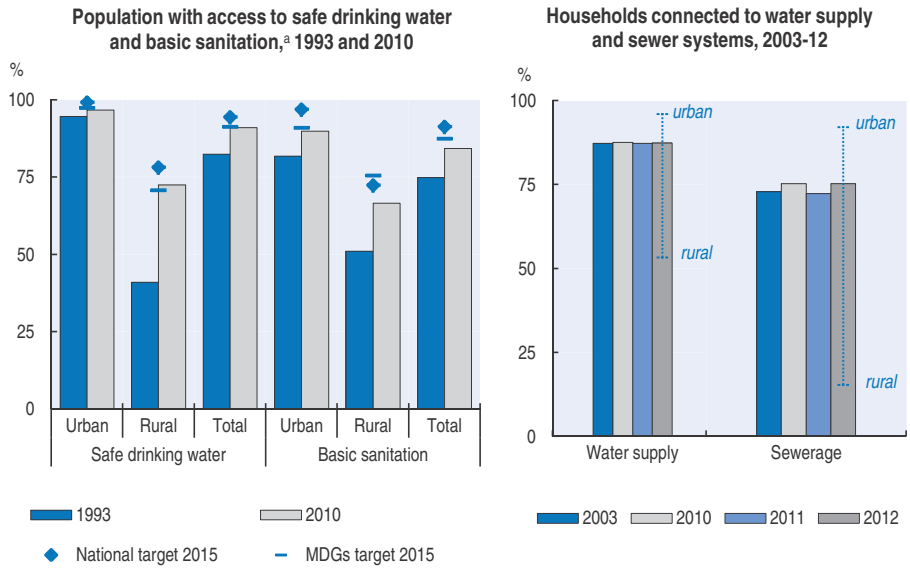
- Significant increases in total suspended particulate (TSP) and PM_{10} concentrations have been reported in open pit mining areas in northern Colombia (IDEAM, 2007). In 2010, three villages near pits were relocated due to exceedance of TSP and PM_{10} concentration limits (Huertas et al., 2012).
- Colombia is the world's largest mercury polluter per capita, with most of it coming from artisanal gold mining (Cordy, 2011; Chapter 6). In the north-east of Antioquia department, where 15 000 to 30 000 artisanal gold miners work, airborne mercury levels were found to exceed WHO limits by up to a thousand times.

Water supply and sanitation

- Increased public investment in infrastructure has extended access to drinking water supply and sewer systems (MAVDT, 2011; Chapter 3). Household connections to the water supply network rose from 87.3% in 2003 to 87.6% in 2010 while connections to public sewerage improved from 72.9% to 75.3% (Figure 1.12) (DANE, 2008, 2010b, 2011, 2012b). In 2011, both rates decreased due to damage to infrastructure caused by La Niña but they recovered to the 2010 levels in 2012.
- With the urban population growing, maintaining coverage levels in cities is a challenge. Disparities remain in access to water services between urban and rural areas.
- Colombia is close to achieving the Millennium Development Goal (MDG) on access to safe drinking water but efforts are needed to achieve the sanitation goal (Figure 1.12). It was estimated that USD 1.7 billion in investment is needed to meet the MDG target on sanitation (WHO, 2012).

Figure 1.12. **Access to water and sanitation**



a) Includes wells and septic tanks.
Source: DANE (2012, 2010 and 2008*), Encuesta Nacional de Calidad de Vida*; Government of Colombia (2012), *Informe de Seguimiento. Objetivos de Desarrollo del Milenio;* IDEAM, 2012.

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- The water and sanitation sector is not efficient. Unaccounted-for water due to physical and commercial losses in distribution networks averaged 49% in 2009, well above the regulatory limit of 30% (Chapter 3). Wastewater treatment plants are operating below capacity, particularly in medium-sized and small municipalities, and only 43% of the municipal wastewater collected is treated (SSPD, 2011).
- There is evidence of pollution in the four major rivers: Bogotá, Magdalena, Cauca and Chicamocha; heavy metals and other contaminants are found in main tributaries on the Caribbean and Pacific coasts. (IAvH, IDEAM, IIAP, INVEMAR, SINCHI, 2011).
- Over 2005-08, the surface water quality index[23] showed good quality levels at 4.5% of monitoring stations,[24] acceptable at 50%, average at 40% and poor at 5.5% (MAVDT, 2010).
- High mercury concentrations[25] are found in monitoring stations located in gold mining areas.
- In 2009, 43% of Colombia's bathing waters failed to meet the requirement for thermo-tolerant coliforms (IAvH, IDEAM, IIAP, INVEMAR; SINCHI, 2011).
- In 2010, the wildlife conservation quality index[26] for coastal waters showed inappropriate or poor conditions at 23% of monitoring stations (INVEMAR, 2012).

Health impacts

- Improved access to drinking water and sanitation has contributed to better health. Between 1990 and 2010, the under-5 child mortality rate due to diarrhoea was reduced by more than 75%. However, diarrhoea remains one of the major causes of child mortality (INS, 2012).

- Over 2007-11, two-thirds of the population connected to the piped network was supplied with safe drinking water while 13% received unsafe water (INS, 2012). The quality of drinking water is notably lower in the Pacific region and higher in Bogotá.
- Health costs associated with inadequate supply of drinking water and sanitation declined from 1% of GDP in 2002 to 0.7% in 2009 (World Bank, 2012).
- Despite efforts on air pollution management, growing urbanisation has led to greater population exposure to urban air pollution, resulting in an increase in related health costs from 0.8% of GDP in 2002 to 1.1% in 2009 (World Bank, 2012). Indoor air pollution, mainly in rural areas, increases the cost by two-tenths of a percentage point (Chapter 3).
- Though its cost has not yet been quantified, mining has a significant health impact on workers and people in surrounding areas (Garay, 2013; Huertas et al., 2012).
- One-fifth of Colombia's territory, 85% of the population and 87% of GDP are at risk from two or more types of natural disaster, including low-frequency, high-impact events such as earthquakes and volcanic eruptions, and high-frequency, lower-impact events such as floods and landslides (World Bank, 2010).
- Damage and economic loss due to 2010 and 2011 inundations and landslides related to the La Niña event were equivalent to about 2% of 2010 GDP.[27] Over 3 million people, about 7% of the population, were affected (ECLAC, 2012).
- Colombia is highly vulnerable to climate change. In the past decade, the country surpassed historical levels of flooding and, at the same time, some regions suffered the driest periods in 30 years. It is projected that the Caribbean region and different areas in the Andean region will shift from a semi-humid to semi-arid climate over the course of this century (Chapter 4).
- Preliminary estimates suggest that the annual cost of climate change impacts (loss of agricultural production, reduced water availability for hydroelectricity, damages to homes, loss of ecosystems) could reach 1.9% of GDP by 2050 (ECLAC, 2013).
- For the Colombian population, environment (0.2%) came well after unemployment (30%), terrorism (27%), public security (13%) and poverty (7%) in response to a question about the most important issues for the country in 2010 (Latinobarómetro). Nevertheless, 90% said environment should be given priority over economic development. Awareness about climate change has been increasing since the mid-2000s. In 2011, more than 90% of respondents said they were personally affected by climate change.

Notes

1. Other than forest and other vegetation fires.
2. Emissions from conversion of forest land to agricultural land less carbon sequestration from forest regeneration.
3. Compared with 17% in 2000 and 14% in 2004 as estimated in the 2010 national GHG inventory.
4. It should be noted that government data reported to the IEA are incomplete and in some cases inconsistent. For example, energy use for coal mining and for pipeline transport is not reported. Reported refinery input and output seem inconsistent.
5. DMC is the sum of domestic raw material extraction (DE) used by an economy and its physical trade balance (imports minus exports of raw materials and manufactured products).
6. In addition, neither DE nor DMC gives complete insight into the environmental pressure associated with material use because neither accounts for unused materials associated with raw

material extraction (particularly high for coal and metals), nor for pollution and waste upstream in a production process.

7. Changes in the quality and coverage of reported data prevent an accurate assessment of trends.
8. Excluding recovery from households, commerce, institutions and industry.
9. Waste or disposal that because of its corrosive, reactive, explosive, toxic, flammable, infectious or radioactive properties, may cause danger or risk for human health and the environment (Law 1252).
10. Amounts reported by companies registered in the Registry of Producers of Hazardous Waste and transmitted to the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM) by the environmental authorities (autonomous regional corporations, urban environmental authorities and sustainable development corporations). In 2011, 79% of records were transmitted to IDEAM.
11. Oil and gas (43%) and coal (2%) extraction.
12. Long-term (1974-2007) average of annual runoff divided by 2011 population.
13. Where demand exceeds 10% of water availability.
14. Incompleteness of the water user registry and a lack of information on groundwater availability and use, and on water used by the oil industry and mining, limit these estimates.
15. Including aquaculture (9%).
16. The OECD definition excludes water used for hydroelectricity generation.
17. Including cooling water used by thermal power stations (2%).
18. Shrimp farming on the Caribbean coast, which represented about 30% of the volume of aquaculture production and more than half of its value in 2007, has been reduced significantly due to price reductions on the international market and appreciation of the peso. Most Pacific coast farms had been closed in 2000 because of disease outbreaks.
19. Fish catches and aquaculture in inland and marine waters, including freshwater fish, diadromous fish, marine fish, crustaceans and molluscs.
20. Seventeen years including probable and possible reserves of natural gas.
21. The tax deduction was abolished in 2011.
22. Between 1.2% and 1.4% depending on the figure used for Colombia's maritime territory (several maritime boundary disputes persist). This figure excludes some areas of the Subsystem of Marine Protected Areas which have less strict management requirements than those of the National Parks Authority.
23. Based on five physicochemical parameters: dissolved oxygen, chemical oxygen demand, total suspended solids, pH and electrical conductivity.
24. Mostly located in the Andean region.
25. Exceeding 0.17 mg/kg.
26. Based on eight variables: dissolved oxygen, pH, nitrate, orthophosphate, total suspended solids, dissolved and dispersed petroleum hydrocarbons and thermotolerant coliforms).
27. Estimates for the period between October 2010 and May 2011.

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PART I

Chapter 2

Policy-making environment

This chapter reviews Colombia's environmental governance system, including mechanisms for horizontal and vertical co-ordination. It reviews the main strategies and initiatives launched between 2000 and 2014 regarding sustainable development, air, water and land management. It examines Colombia's regulatory framework for environmental protection and activities to ensure compliance with environmental requirements. The chapter also reviews instruments used to monitor and evaluate the environmental impacts of economic and sectoral policies, programmes and projects. Progress in promoting environmental democracy, through access to information and improved public participation in decision making, is also discussed.

Assessment and recommendations

Environmental policy and legislation have a long history in Colombia. The 1991 Constitution and 1993 umbrella Law on Environmental Management established a solid policy and institutional framework for modern decentralised environmental management. However, in the first decade of the 21st century, Colombia's environmental institutions were largely overwhelmed by environmental pressures, partly because of a weakening of the institutions but also because the pressures intensified due to rapid expansion of the mining, energy and, to a lesser extent, agricultural sectors. In 2011, the re-establishment of a strengthened Ministry of Environment and Sustainable Development (MADS) and the establishment of the National Environmental Licensing Authority were important steps to redress this imbalance.

Although Colombia's national environmental institutions have been strengthened, challenges remain in the vertical organisation of the environmental management system. The 33 Autonomous Regional Corporations (CARs) have key responsibilities for implementing environmental policies at subnational level. MADS is responsible for overseeing and co-ordinating CARs' activities, and CARs are supposed to function as integral parts of the environmental management system. However, the Constitution provides CARs with a high degree of autonomy in administrative and fiscal terms, and they are subject to few accountability constraints and controls. In addition, their system of governance leaves them vulnerable to capture by local interests; and they are financed in a way that results in most of them lacking human and other resources. These weaknesses hinder the development of the national environmental information system and the implementation of environmental impact assessment (EIA) and licensing procedures, and impede a consistent approach to environmental enforcement.

Since 1993, the body of environmental laws and regulations has expanded significantly. Much of the expansion has been in the form of decrees and resolutions that can be adopted by executive bodies with little if any oversight by the legislature. This approach makes it difficult to ensure coherence and consistency within the environment sector and between environment and other sectors. Among other things, this creates uncertainty for the regulated community. The development of environmental law has been accompanied by the establishment of a comprehensive and progressive framework for environmental enforcement and compliance. This system now needs to be implemented more effectively and consistently, particularly in the major growth sectors.

The 1991 Constitution includes provisions for the right to environmental information and for public participation and access to justice in environmental decision making. However, further efforts are needed to enhance public participation in environmental decision making, particularly in the EIA process. This could also help improve the quality and consistency of environmental decision making.

A variety of measures have been implemented at national and city level to control urban air pollution. Thus far, however, their impact has been outweighed by the increasing

scale of emissions, particularly from transport. Urban air pollution remains a serious problem with significant impacts on human health and the economy. Both the information base and the policy instruments needed to manage air pollution should be strengthened.

Equitable land distribution and agrarian reform are major political challenges. Uncertainties about the tenure of indigenous people, the illegal seizure of land during the armed conflict and the subsequent displacement of more than 8% of the population have led to the level of land ownership concentration being among the world's highest. This has contributed to intensification of some environmental pressures, particularly conversion of forest for cattle rearing. Environmental considerations should be fully taken into account in current initiatives to address the challenge of land redistribution. Further efforts are also needed to ensure that environmental provisions in municipal land use plans are enforced. More generally, the various planning instruments should be better aligned, including watershed management plans as required by the 2010 Integrated Water Resource Management Policy.

Colombia's body of environmental law includes strict provisions on environmental liability, but weaknesses in the legislative framework have limited progress in this area. Moreover, the legislation applying to past pollution is weak. The potential size of this problem should be assessed and priorities for remedial action established on the basis of risk to human health and the environment.

Colombia has established a comprehensive, performance-oriented system of environmental information. The quality and coverage of environmental information have improved. The main challenges are to make the system fully operational and to link it more closely with policy making. Among other things, this requires upgrading and further developing monitoring systems (e.g. on air and water quality), completing environmental registers (e.g. of water users), improving data comparability among CARs and Sustainable Development Corporations, and strengthening the links between environmental, health and economic information. Greater efforts should also be made to disseminate environmental information with a view to building public and political support for environmental measures.

Recommendations

- Reinforce the role of MADS as the main body for directing and overseeing the national environmental management system; provide MADS with the means to more effectively oversee and direct the work of CARs; ensure that the allocation of responsibilities, lines of accountability, financing and capacities of environmental authorities at all levels of government enable environmental policy objectives to be achieved efficiently and effectively; establish co-ordination mechanisms to strengthen regional dialogue and policy integration among CARs and among departments.
- Gradually consolidate laws and regulations so as to establish a coherent and consistent environmental policy framework in keeping with good international practices; eliminate overlapping and inconsistent environmental requirements in other sectors, particularly extractive industries, energy and agriculture.
- Promote public participation in the EIA process; consider how citizens in neighbouring countries could participate in EIAs on projects in Colombia that could affect them.

Recommendations *(cont.)*

- Reinforce efforts to reduce the health impact of urban air pollution; develop a national emission inventory; gradually adjust air quality standards to converge with those issued by the World Health Organisation; further promote cleaner mobility options.
- Fully integrate environmental criteria into policies for land redistribution and agrarian reform; strengthen the means of enforcing environment-related land use in land use plans, particularly in rural areas and coastal zones; ensure the implementation of river basin management plans and their integration into land use plans.
- Require environmental licensing for mining exploration.
- Develop sector-specific national strategies on environmental liability; prepare an inventory of contaminated sites and identify those for which the government will have to assume responsibility; develop a comprehensive remedial action plan covering both the public and private sectors, prioritised on the basis of risk to human health and the environment.
- Strengthen compliance monitoring at national and subnational levels based on potential risk to human health and the environment; issue a consolidated national report each year indicating actions taken, results achieved and future priorities.
- Intensify efforts to improve the quality and relevance of environmental data and information systems for policy making, in particular by: improving environmental monitoring networks and registers; developing technical standards for CARs; improving the coherence of the system of environmental information and ensuring the links with the health information and national statistical systems; and disseminating environmental information to decision makers and the public more frequently, and in an appropriate form.
- Carry out regular evaluations of environmental policies; develop reliable indicators to measure environmental performance; strengthen capacity for economic analysis.

1. Governance structure for environmental management

Colombia is a constitutional republic with a unitary system of government (Box 2.1). The various branches of government are involved in the development and implementation of environmental policy, and there is provision for participation by stakeholders. The environmental governance system also involves several levels of government.

1.1. *Key national environmental institutions*

The 1993 Environmental Management Law (Law 99) set out the main principles of environmental policy and established the institutional framework for decentralised environmental management. This umbrella law established an environment ministry to co-ordinate a National Environmental System (SINA) that was conceived as a set of guidelines, rules, activities, resources, programmes and institutions to facilitate implementation of environmental principles contained in the Constitution and the 1993 law. SINA was seen as a system of actions rather than of entities. It resulted from four decades of development following the creation in 1952 of the Division of Natural Resources in the Ministry of Agriculture, which became the National Institute of Natural Renewable Resources and Environment in 1968.

Box 2.1. **Colombia's governance system**

Colombia's Constitution of 1991 specifies the roles of different branches of government.

The legislative branch comprises a bicameral Congress. The Chamber of Representatives is elected by region and has 166 seats. The Senate is elected nationally and has 102 seats. Members of both houses are elected to serve four-year terms. Legislation must be approved by both houses.

The executive branch is headed by the President, who serves as both head of state and head of government. S/he is elected by popular vote to serve a four-year term. The President leads a Council of Ministers, currently made up of 16 ministers. At subnational level, there are 32 departments, 1 123 municipalities and 5 districts. Departments are responsible for planning and promoting economic and social development within their areas. They play an important intermediary role between the central and municipal authorities. They are headed by a governor elected by popular vote for a four-year term. Municipalities are considered fundamental political-administrative entities with political, fiscal and administrative autonomy. Their functions include planning the development of their territories, providing public services, building civil works and promoting community participation. They are headed by a mayor elected by popular vote for a four-year term. Five municipalities have the status of districts which are cities with a specific feature related to their location and trade, history or tourism (e.g. Capital District of Bogotá, Tourism and Cultural District of Cartagena, Special Industrial Port District of Barranquilla, Biodiverse and Eco-touristic District of Buenaventura). Mayors and governors cannot be re-elected immediately for a second term. This creates incentives for promoting policies with short-term benefits.

The judicial branch consists of the Supreme Court, the Constitutional Court, the State Council, the Supreme Judicial Council and courts of other levels. The attorney general's office is also part of the branch. The Constitutional Court plays a key role in monitoring the constitutionality of laws and international treaties.

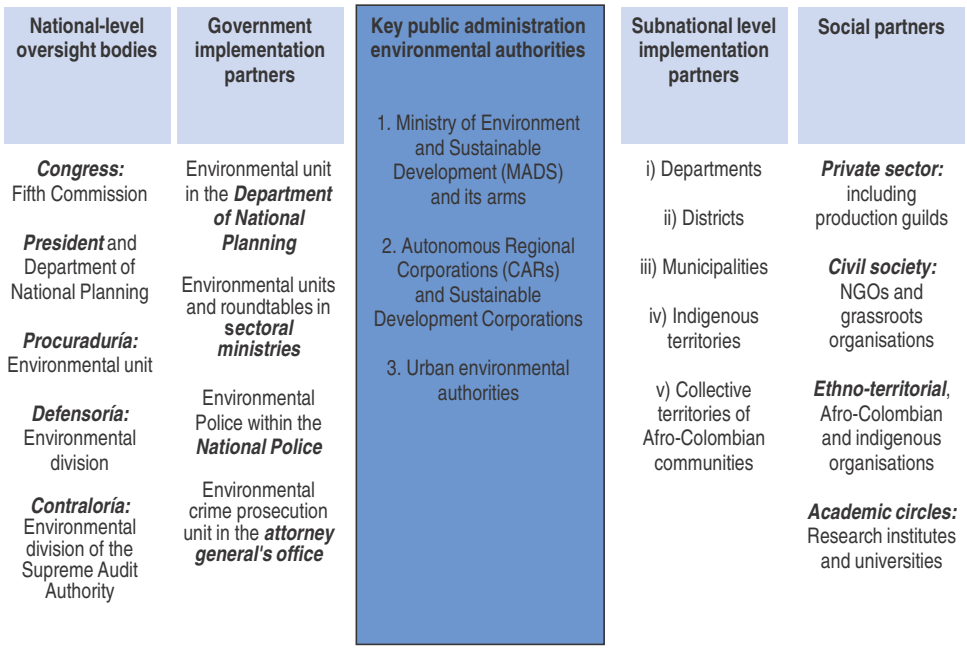
The offices of the inspector general (Procuraduría General de la Nación), comptroller general (Contraloría General de la República) and ombudsman (Defensoría del Pueblo) also provide oversight of the public sector.

In 2002, the Ministry of Environment was merged with the Ministry of Housing, Urban Issues and Territorial Development to better align the implementation of environmental and territorial development policies. However, infrastructure development and housing issues dominated the agenda of the new ministry. This had the effect of stifling environmental action at central level, decreasing the sector's political profile and lowering the ministry's credibility with other stakeholder groups as the leading actor of SINA (ODI, 2010).

In May 2011, following very serious floods related to the La Niña event, the Ministry of Environment and Sustainable Development (MADS) was re-established. It is primarily responsible for environmental policy making in a wide range of areas (Figure 2.2). It has a mandate to organise international environmental co-operation and to review and manage the performance of SINA's entities. The Ministry of Housing, Urban Issues and Territorial Development retained policy-making responsibilities for water supply and sanitation services, municipal waste management, urban development and land use planning.

Within the re-established MADS, four new directorates were set up in addition to the two existing ones (forest and biodiversity; sectorial and urban affairs) to address: i) vertical

Figure 2.1. **Overall organisation of SINA, the National Environmental System**



Source: Law 99/1993, Decree 1124/1999, Decree 3570/2011; MADS, 2012.

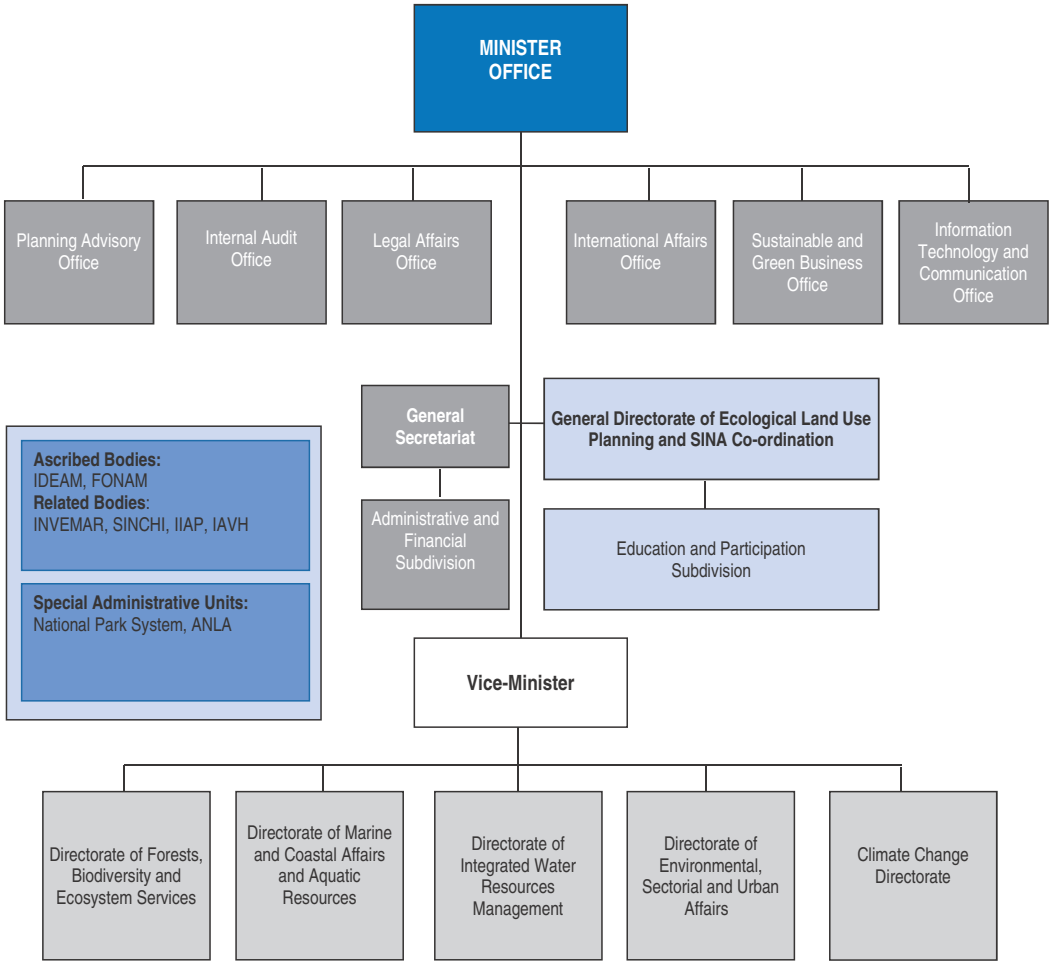
and horizontal co-ordination within SINA and ecological land use planning; ii) integrated water resource management; iii) coastal and marine ecosystem management; and iv) climate change. A unit responsible for green businesses was re-established. The offices of international affairs, legal affairs and planning were strengthened. All these changes involve better alignment between policy goals and organisational structures.

In conjunction with the establishment of MADS in 2011, the National Environmental Licensing Authority (ANLA) was created integrating the former Ministry's division of environmental licences. It is responsible for reviewing environmental impact assessment reports, licensing and permitting, and conducts compliance monitoring and enforcement. Its jurisdiction is limited to projects of national importance.

MADS is supported by five scientific organisations, with legal personality, that carry out a variety of monitoring, analytical and research functions: IDEAM (Hydrology, Meteorology and Environmental Research Institute), INVEMAR (Institute of Marine and Coastal Research), SINCHI (Amazon Institute of Scientific Research), IAvH (Alexander von Humboldt Institute of Biological Resources Research) and IIAP (John Von Neuman Institute of Environmental Research of the Pacific). MADS is also supported by a National Parks Authority, which, like ANLA, has a degree of administrative and financial autonomy but no legal personality.

Two special funds were established under MADS to finance certain environmental activities: the National Environmental Fund (FONAM) and the Environmental Compensation Fund (FCA). FONAM can both finance and co-finance projects implemented

Figure 2.2. **Organisation chart of the Ministry of Environment and Sustainable Development**



Source: MADS (2013), "Organigrama - Estructura Orgánica Ministerio", http://www.minambiente.gov.co/contenido/contenido.aspx?catID=463&conID=1077.

by public or private entities. It finances ANLA and the National Parks Authority. The FCA is a tool for channelling financial support to the most under-resourced subnational environmental authorities (e.g. Amazon, Chocó, San Andrés and Providencia and Orinoquía). About three-quarters of FONAM revenue is generated from the recovery of regulatory costs (payments for licences and inspection) and fines. Earmarking of revenue for use by environment authorities is not recommended by OECD, other than for limited transitional periods, because of the perverse incentives the practice can create. The OECD Guidance for the Public Environmental Expenditure Management could help in reviewing or reforming these funds.

Various other ministries have responsibility for environment-related issues. The Ministry of Health and Social Protection is involved in setting water quality standards and regulating health-related aspects of waste management. Some ministries have established

environmental units to address the environmental dimensions of their work; an example is the Ministry of Mines and Energy. In addition, a number of agencies regulate the use of natural resources, including the National Hydrocarbon Agency, the National Mining Agency and the National Fishery and Aquaculture Authority.

1.2. Horizontal co-ordination

The National Council for Economic and Social Policies (CONPES) promotes cross-sectoral policy coherence by reviewing and approving framework policy papers. It is the most important policy co-ordination institution in the government (OECD, 2013a). The National Planning Department serves as the technical secretariat. It is the only body authorised to submit documents to CONPES. Since 1993, CONPES has issued about 70 documents on environment-related issues. The scope of these documents is wide: e.g. some endorse cross-cutting and sector-specific policies and international loans, others outline future policies, including for the development of specific sectors or regions.

CONPES Resolution 3700 of 2011 addressed horizontal co-ordination regarding climate change. It provided for the establishment of a National Climate Change System by presidential decree by mid-January 2012. The System comprises an Inter-sectoral Commission on Climate Change,[1] (COMICC), a financial management committee and four permanent subcommittees (Sectoral; Territorial; International Affairs; Research, Production and Communication of Climate Change Information) (MADS, 2013). By creating a high-level commission and moving the co-ordinating functions from MADS[2] to the National Planning Department, which reports directly to the president, Colombia is taking positive steps to integrate climate issues into broader economic policymaking. However, by mid-2013, the decree creating the National Climate Change System had yet to be passed (Chapter 4).

Following severe floods, the government strengthened the institutional system for disaster risk management with Law 1523 of April 2012. Strengthening the institutional links between disaster risk management and climate change adaptation would better support climate resilience (OECD, forthcoming).

The National Environmental Council, created in 1993, also has a co-ordination function, but does not work directly with CONPES. Its members are top officials (including ministers), who are required to attend in person. The council is supposed to meet every six months. Despite its high-level membership, it lacks the authority to perform its co-ordination and policy integration functions. Its decisions are not binding and rarely followed. In practice, the Council does not meet.

Between 2007 and 2011, seven bilateral interministerial environmental co-operation agreements were adopted involving MADS (and its predecessor) and other ministries. Although these agreements are useful tools in terms of enabling policy dialogue, in most cases their content is quite general, and they often lack a roadmap for action. At the same time, other ministries may take actions that undermine environmental requirements. For example, the Mining Agency's recent Resolution 341 enables it to categorise some projects as being of national interest and hence exonerated from restrictions in other areas, including environment. However, Decree 1374, designed to safeguard areas of particular ecological importance from mining activities, was later adopted jointly by MADS and the Ministry of Mines and Energy.

1.3. Vertical organisation of environmental management

Responsibility for policy implementation at subnational levels resides mainly with 33 Autonomous Regional Corporations (CARs), seven of which are Sustainable Development Corporations. In some cases, the jurisdictions of CARs and departments correspond. A proposal under discussion to reduce the number of CARs to 16 and strengthen alignment with river basin boundaries was dropped, as alignment with departments is the preferred option.

CARs emerged from agencies that originally had a development function (Box 2.2). They are responsible for all aspects of environmental and natural resource management, including air quality, water resource and waste management, forests and biodiversity conservation. Among other things, CARs transpose and further develop national policies within their jurisdictions, issue local decrees and resolutions, impose taxes and charges, identify investment needs, fund and sometimes execute investment, issue licences and permits and promote and enforce compliance with environmental legislation. Law 99 makes CARs responsible for both environmental regulation and, to some extent, infrastructure development, which has created conflicts of interest (Blackman et al., 2006, Sanchez-Triana, 2007). CARs also oversee the environmental activities of departments and municipalities.

Although MADS has the legal mandate to oversee and co-ordinate the activities of CARs, in practice vertical co-ordination of environmental management is weak. The Constitution provides CARs with considerable autonomy and gives Congress the power to create them and regulate their operations (Article 150). All CARs have a legal personality. They have governing boards on which MADS has only one of thirteen seats. CARs are not subordinated to departments. Oversight by Congress is limited to receiving financial reports from CARs, without any assessment of their performance. As a result of these arrangements, CARs effectively have little accountability to democratically elected institutions (Blackman et al., 2006).

Box 2.2. **The evolution of CARs from investment agencies to environmental authorities**

Colombia's first CAR was created in 1954. Defined with reference to the Cauca watershed, it was based on the model of the Tennessee Valley Authority in the United States, with a wide range of functions relating to environmental management and economic development. Between 1960 and 1988, 18 additional CARs were established, including some defined by departmental boundaries. The scope of CARs' functions was reduced over time (e.g. roads and telecommunications were transferred in 1987 to other specialised entities). In 1993, Law 99 redefined them as principally environmental entities, with a few economic development functions. CARS were attached initially to the Ministry of Economic Development (1960-68), then to the Ministry of Agriculture (1968-77), later to the National Planning Department (1977-93) and, since 1993, to MADS.

Source: Overseas Development Institute (2010), Review of the Sector-wide approach in environment in Colombia: 2007-10; Blackman et al. (2005), *Assessment of Colombia's National Environmental System (SINA)*.

The governance structure of CARs, particularly the composition of their governing boards, has left them vulnerable to capture by local economic and political interests. An

important reform introduced in 2011 (Decree 141), to strengthen technical representation and reduce the scope for conflict of interest on the boards, failed (Constitutional Court sentence C-276/11). More comprehensive reforms are expected, and are needed, to enhance the transparency, integrity and accountability of CARs and to enable them to play a more constructive role in Colombia's environmental governance system.

The broad administrative autonomy of CARs is combined with a concentration of financial resources: the lion's share of SINA's financial resources is from CARs' own resources. CARs are largely financed from municipal property taxes, an arrangement which tends to concentrate resources in the larger and richer regions. In 2011, the share of national transfers in CARs' budgets was as low as 5%, and two CARs accounted for nearly half the combined budget of all CARs (Chapter 3). As a result there are huge disparities in CARs' capacities, with most lacking basic human, financial and technical resources. ASOCARs, a non-government organisation (NGO) based in Bogotá, works to reduce such disparities through capacity development. The NGO is also a member of the FCA technical board that advises on allocation of resources for CAR capacity development.

The national budget provides most of the rest of the finance for environmental management. Colombia's public spending on the environment (excluding water and sanitation) is relatively low and has not kept pace with overall trends in public spending (Chapter 3).

Municipalities play a role in infrastructure development and maintenance, including water and sanitation and waste-related infrastructure. They also have an obligation to invest at least 1% of their ordinary income in the acquisition and maintenance of areas that are important for drinking water supply, or to finance programmes of payment for ecosystem services (see Chapter 7).

Municipalities, districts and metropolitan areas with a population with more than 1 million have the right (under Article 66 of Law 99) to carry out the same environmental management functions as CARs. Accordingly, seven urban environmental authorities have been established, in Bogotá, Buenaventura, Medellín, Cali, Barranquilla, Cartagena and Santa Marta. While this has empowered these municipalities, it has resulted in jurisdictional conflicts between urban environmental authorities and CARs, as well as fragmentation and duplication of responsibilities (Blackman et al., 2006; CGR, 2011). Disputes over control of municipal property taxes are an additional source of tension.

2. Policy framework for sustainable development

The Constitution established sustainable development as a national goal and called for the systematic integration of environmental goals into national development plans (Article 339).

The president is required by law and the Constitution to produce a national development plan (PND) to serve as the basis of policies for each elected term. It identifies long-term national goals and the government's medium-term targets and priorities. It also includes a public investment plan with multiyear budgets.

While PNDs are not sustainable development plans, they nevertheless played an important role in shaping the environmental and sustainable development agendas of the 1990s (Sanchez Perez, 2002). The 2006-10 PND was the first to include a dedicated chapter on the environment. Environmental sustainability is one of four cross-cutting goals in the 2010-14 plan (Box 2.3). Targets and measures to improve the environmental quality of life (including water supply and sanitation, municipal waste management and greener cities) are specified under Goal 1, "Sustainable growth and competitiveness".

Box 2.3. **The 2010-14 PND: Overview of Goal 4 "Environmental sustainability and risk prevention"**

Goal 4, "Environmental sustainability and risk prevention", has four elements: a) integrated and media-specific environmental management; b) disaster risk management through better governance at community level; c) response to the severe flooding of 2010-11; and d) energy mix and energy efficiency. Under the heading "integrated and media-specific environmental management", the plan identifies five strategic pillars of action: i) protection of biodiversity and ecosystem services; ii) integrated management of water resources; iii) sectoral integration and urban environmental management; iv) climate change, reduction of vulnerability, climate adaptation and low carbon development; and v) good environmental governance. Quantitative targets were established for these pillars. They provide a basis for performance management (see also Section 6.1). The targets include an increase in the surface of protected areas from 12.6 million ha to 15.6 million ha, use of green public procurement criteria in 10% of tender calls, reduction of the energy and water intensity of the economy by 3% and reduction of mercury use in the mining sector by 10%.

Under "sectoral integration", avenues for greening every "growth locomotive" (agriculture and rural development, energy and mining, housing and urban development, transport infrastructure, and the so-called innovation sectors) were suggested. For example, in relation to transport infrastructure development, the proposal is to prepare an integrated risk management plan in line with needs for climate change adaptation. In relation to the mining and energy sector, the PND suggests that issues to be addressed include dealing with past pollution, reducing illegal mining and regularly assessing and mitigating the impact of new projects. Nevertheless, gaps remain in the measures aiming to green the "growth locomotives". For example, the PND does not address the risk of biodiversity and ecosystem loss because of infrastructure and tourism development (Romero and Ortiz, 2012).

Given the strategic importance of PNDs, the integration of environment into them is crucial for mainstreaming environment in economic policies. Yet the way the plans are developed constrains the extent to which integration can be achieved. PNDs are developed in a bottom-up way in a very short period, which limits opportunities for promoting synergies among policies. Thus, in the 2010-14 plan, while the cross-cutting nature of environmental issues is acknowledged, opportunities for greening the five main "locomotives of growth" are not systematically explored. Apart from Goal 4, there are no environmental targets established for productive sectors. Thus they have little incentive to allocate resources for environmental activities, and their environmental impacts are not part of their performance assessment.

Strategic environmental assessment (SEA) has played a useful role in integrating environmental considerations into sectoral policies and programmes. For example, a 2008 SEA on environmental health, with emphasis on air pollution in large urban centres, laid the basis for the formulation of the Air Pollution Prevention and Control Policy (CGR, 2011). Similarly, a SEA on water sector reform was instrumental in improving policies related to water supply and sanitation infrastructure and in developing the National Integrated Water Resource Management Policy. In 2004, the National Planning Department developed the first methodological guidance on SEA. In 2008, a SEA guide was elaborated on the basis

of methodology used to support implementation of the European Union's SEA Directive. However, despite the development of this guidance, there is no clear legal requirement to carry out SEA.

3. Policies and regulations for managing environmental media

Environmental policy development and law making have a long history in Colombia. By the mid-1970s, Colombia had passed several important legal acts, including Law 2 of 1959 creating forest reserves, and the Code on Renewable Natural Resources and Environmental Protection in 1974. This landmark piece of legislation included provisions for environmental impact assessment (EIA) and the use of economic instruments. It was also one of the first pieces of environmental legislation to include the polluter-pays principle.

International events have often catalysed important environmental policy developments. For example, the 1991 Constitution was influenced by preparations for the 1992 Earth summit. The Constitution established citizens' right to a clean environment; included provisions for access to information, public participation and access to justice; established the environmental liability regime and sought to clarify property rights for land and natural resources. It provides the State's obligation to protect the diversity and integrity of the environment. Colombia was the first Latin American country to give the environment such prominence in its Constitution. Following the Earth summit, in 1993, Colombia adopted the Environmental Management Law, establishing the key principles and institutional framework for modern decentralised environmental management.

Since 1993, the legal framework for environmental management has expanded significantly: the number of laws, decrees, resolutions and international environmental agreements has more than tripled. Over 100 legal acts have been adopted since 2010 to update the 1990s legislation. More than 300 legal instruments are now in place. These legally binding instruments are complemented by guidance documents developed at national and subnational level.

The co-existence of so many instruments and directives tends to undermine the coherence of the policy requirements and create uncertainty for enterprises. At the same time, there are gaps, such as in the area of waste and chemicals management (see Chapters 5 and 6). Overall, there is a need to consolidate and streamline environmental laws and regulations in a number of areas, and to align them with good international practices (Box 2.4). However, as recent experience with the reform of the 1974 Code on Renewable Natural Resources and Environmental Protection illustrates, this should be driven by substance, not form (Rincon, 2012). Regulatory impact assessment (RIA) is not used in Colombia, a lack that may have contributed to regulatory inflation, overlap and inconsistency. The use of RIA or some other form of ex ante assessment could also help promote consideration of feasibility and enforceability in the development of laws (OECD, 2013b).

A number of strategies have been developed to guide further policy development, and new strategies are under preparation to cope with emerging challenges, such as the Low Carbon Development Strategy, the National Climate Change Adaptation Plan and the REDD+ National Strategy (Chapter 4).

Box 2.4. **Core principles[a] for the technical accession review by the OECD Environment Policy Committee**

- Applying the Polluter Pays Principle (PPP) so that the costs of pollution prevention and control measures are borne by polluters, and are not generally subsidised by governments.
- Promoting the use of economic instruments to improve the allocation and efficient use of natural resources and better reflect the social costs of resource use, waste and pollution.
- Undertaking regular evaluations of the environmental effectiveness and economic efficiency of environmentally-related policy instruments.
- Supporting environmental impact assessment (EIA) procedures that facilitate the thorough analysis of projects with potentially significant environmental impacts, together with public participation measures for informing and engaging those affected by such projects.
- Implementing integrated approaches for pollution prevention and control and for the sustainable management of natural resources.
- Promoting economic and sectoral policies that take into account the need to internalise environmental externalities into economic decisions and practices, and promoting technological and organisational improvements that make the achievement of environmental goals more likely in the future.
- Ensuring that the generation of waste, including hazardous waste, is reduced, the export of waste for final disposal is minimised and is consistent with the environmentally sound and efficient management of such wastes, and that adequate facilities for the environmentally sound management of waste are made available.
- Controlling exports and imports of hazardous waste while allowing trade in waste as end-of-life materials and products destined for economically efficient and environmentally sound recovery operations within the OECD area.
- Ensuring the quality and policy relevance of environmental information and its availability to the public.
- Working closely with other countries to address trans-frontier pollution.
- As appropriate, assuming a similar level of obligations in relevant Multilateral Environmental Agreements as those accepted by most or all OECD member countries.

a) As part of its review, each OECD committee will evaluate the position taken by Colombia *vis-à-vis* all the substantive OECD legal instruments within its area of competence as well as Colombia's policies and practices as compared to OECD best policies and practices. These lists of core principles are non-exhaustive and the committees may consider other issues within their competence as appropriate.

Source: OECD (2013), Roadmap for the accession of Colombia to the OECD Convention.

The following sections examine the policy and legal framework for air, water and land management. Waste management (Chapter 5), chemical management (Chapter 6) and biodiversity (Chapter 7) are dealt with in separate chapters.

3.1. Air quality management

After a lengthy period of development, in 2010 the Air Pollution Prevention and Control Policy for 2010-19 was adopted (MAVDT, 2010a). The approach it takes was originally presented in CONPES Document 3344 of 2005. The policy sets a very ambitious target of

100% compliance with regulations on fixed sources of air pollution by 2019. It calls for development of incentives to reduce air pollution from transport. Specific measures include updating and more systematically implementing regulations concerning air quality and their impact on human health; improving air quality monitoring and modelling and developing emission inventories; conducting a technological reconversion of relevant industrial sectors; and improving regulations on pollution from mobile sources. The policy calls for better co-ordination by key actors. Prior to its adoption, the 2003 National Policy on Urban and Massive Transport (CONPES Document 3260) promoted development of integrated municipal transport in cities of more than 600 000 people and sought to reorganise public transport operations and implement traffic management measures in smaller cities.

As part of its strategy to combat air pollution, Colombia has gradually developed a set of command-and-control measures. Air emissions from both stationary and mobile sources are regulated. Specific controls apply to boilers, kilns and other combustion processes that generate sulphur dioxide (SO_2) emissions. Stringent technical standards apply to incinerators. Ambient and emission standards have been in place since the early 1980s. In 2008, a new regulation strengthened emission standards for stationary sources and extended them to about 40 new activities. Indoor air pollution standards are being jointly developed by MADS and the Ministry of Health and Social Protection. The stringency of ambient standards, however, is lower than what is recommended by the World Health Organization (Table 2.1). At the facility level, air pollution is regulated through permits that are part of an integrated environmental licence, in the case of the largest facilities.

Table 2.1. **Colombian air quality standards in comparison with WHO recommended values**

Parameter	Unit	WHO recommended value	Colombian standard
$PM_{2.5}$	µg/m^3 annual mean	10	25
	µg/m^3 24-hour mean	25	50
PM_{10}	µg/m^3 annual mean	20	50
	µg/m^3 24-hour mean	50	100
Ozone	µg/m^3 8-hour mean	100	80
NO_2	µg/m^3 annual mean	40	100
	µg/m^3 1-hour mean	200	200
SO_2	µg/m^3 24-hour mean	20	250
	µg/m^3 10-minute mean	500	N/A

Source: Resolution 610 of MADS, WHO (2006), *WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide*.

Concerning fuel quality, lead in petrol had been phased out by the end of the 1990s. Sulphur in gasoline and diesel fuels has been gradually reduced. As of 2013, the national standard for sulphur in diesel fuel is 50 ppm, and this level was in force for public transport from 2010. By 2019, the Euro V standard should be used for diesel quality and Euro IV for petrol, with intermediary targets for 2013 of Euro IV and Euro III, respectively. Technology in imported vehicles will have to be able to achieve these standards.

Local authorities and private-sector actors are also involved in air quality improvement. There have been positive subnational initiatives, notably in Bogotá (Box 2.5). Expanding public transport options also has an important social dimension to the degree

that it enhances the mobility of poorer groups. Private-sector initiatives have generated some results. For example, ASOCAÑA, the association of sugar cane producers of the Cauca Valley, increased the amount of green cut of sugarcane harvested without burning from 23% to 39% between 2006 and 2012.

Box 2.5. **Bogotá's policy toolbox aiming to improve local air quality**

The local government in Bogotá has made significant efforts to improve air quality. Measures include:

- **Diesel fuel quality improvement:** The maximum permissible sulphur content of diesel fuel sold in Bogotá was reduced to 50 ppm in 2010 from 1 200 ppm, and the concentration in locally distributed fuel is now around 30 ppm.
- **A world-class bus rapid transit (BRT) system:** Bogotá's TransMilenio has been recognised as the "gold standard" of BRT systems (World Bank, 2013). In a city of 7.6 million people, it accounts for more than 1.5 million, or 74%, of public transit trips in the city. Two-thirds of the city's population lives within a kilometre of a trunk and feeder lane buffer zone for the 112 km system. However, it faces a growing number of challenges, including deteriorated main routes and worsening traffic congestion. Service quality has declined as the system has not been able to keep up with demand, which has encouraged greater use of alternatives, including private vehicles.
- **"Pico y Placa" (Peak and Licence Plate) programme:** Now in effect in all major cities of Colombia, this programme involves restricting car use during peak hours, depending on the last digit of the licence plate number. Programme implementation needs careful monitoring and analysis, as such regimes can create incentives to increase the private car fleet.
- **Development of bike and pedestrian paths:** In 1995, the city began construction of a 344-km *cicloruta* (bike route), the largest network in Latin America. Bogotá also closes road segments for selected hours on holidays and weekends, creating an additional 121 km of pedestrian and bike path called *Ciclovia*. Bicycle use has quintupled because of these initiatives.
- **Car-free days:** Since 2000, Bogotá has had an annual car-free day, an initiative that aims to educate people about alternative transport modes. It is the world's largest car-free weekday event, temporarily removing about 1.5 million vehicles from the streets.
- **Restriction on sales of two-stroke-engine motorbikes and a later ban on their use:** The emission inventory in Bogotá's ten-year decontamination plan notes that motorbikes contribute 25% of total mobile source particulate matter emissions in the city. Four-stroke-engine motorbikes emit 40% less PM than two-stroke ones.
- **Integration of the public transport system.** An ongoing study by the Universidad de los Andes estimates that this measure could reduce $PM_{2.5}$ emissions from public transport by between 74% and 80%, which would translate into health-related economic savings of USD 360 million over ten years.

Source: World Bank (2012), *Environmental Health in Colombia: An Economic Assessment of Health Effects*, Washington, DC.

Despite such initiatives, air pollution continues to be a problem in both urban and rural areas, resulting in significant health costs and impacts on the economy (Chapter 1). The main sources of outdoor air pollution are transport, mining, industry and burning of

sugar cane waste. Important levels of indoor air pollution are associated with use of fuel wood, charcoal and other solid fuels for cooking. In Bogotá, analytical studies have documented that the parts of the city with the dirtiest air are also the poorest (Blackman et al., 2005). More effective implementation of the 2010 Air Pollution Prevention and Control Policy is needed to address challenges related to air pollution. It should be supported by further development of a national air emission inventory and further upgrading and expansion of the air quality monitoring network. Currently, fewer than half of the country's environmental authorities have enough information to know when air quality alert thresholds are exceeded, and emission inventories are available only in a few urban centres. The underdevelopment of these tools is a major obstacle to further development and implementation of adequate air policies.

3.2. Water resource management

Although Colombia is rich in water resources, the population is concentrated in water-stressed areas. It is estimated that agriculture represents 82% of water abstractions (see also Chapter 1 and Section 6.1).

A comprehensive Integrated Water Resource Management (IWRM) Policy was adopted in 2010 (MAVDT, 2010b). It establishes key principles for water management. These include management at river basin level, efficiency of use, and decision making that should be evidence-based, transparent and participatory. The policy established six major goals: i) preserve the ecosystems and hydrological processes upon which water availability depends; ii) characterise, understand and optimise water use demand; iii) improve quality and decrease water pollution; iv) develop a system of integrated risk management for water supply and demand; v) strengthen water sector institutions; and vi) consolidate and improve water governance. For each goal, strategic actions were defined.

Some steps have been taken to implement IWRM; for instance, river basin planning and management tools were specified (Decree 1640 of 2012); a technical guide for the formulation of watershed management plans was developed; strategic plans for the country's five macro-basins (Magdalena-Cauca, Caribe, Pacífico, Amazonas, Orinoco) are being developed; 130 watershed management plans (POMCAs) are being updated or developed. Also in support of IWRM implementation, data on groundwater resources are being improved and sources of illegal use and pollution are being identified. It will clearly be important to link the development of IWRM to policies in related fields, notably on water charges, the management of biodiversity and protected areas, and adaptation to climate change.

Water management is based on planning, command-and-control, and economic and financing instruments (Chapter 3). POMCAs are key water planning instruments. Each user wishing to abstract water from a natural body must obtain a water concession (permit). Failure to comply with conditions attached to water use rights may result in their withdrawal. If the water body faces a critical shortage, the authorities can develop a new water allocation regime and change the levels of abstraction allowed. Colombia's wastewater discharge standards are quite ambitious, according to private-sector and international experts (Sanchez-Triana et al., 2007). Among other elements they require 80% removal efficiency for biochemical organic demand (BOD) and suspended solids for all sources of wastewater discharge dating from after 1984. More relaxed standards can be applied for older sources. Apparently this approach has created disincentives for investment in water supply and sanitation projects. Compliance with the standards for

new sources requires a degree of treatment that could only be financed by more than doubling tariffs and yet would not bring important environmental benefits.

In practice, compliance with water regulations has been low. As Chapter 1 mentions, poor water quality has a significant impact on human health and the economy. Only 43% of the municipal wastewater collected is treated. In Bogotá, around 80% of industrial sources discharge pollutants in volumes exceeding the legal requirements. The number of discharges without a permit has been growing.

To address the issue of access to water supply and sanitation, and improve the sector's governance, comprehensive reforms were made in the 1990s. The aim was to restructure water utilities and enhance private-sector participation. To this end, the government sought to separate service provision from policy-making and regulatory functions, and to promote sustainable financing of the water sector. These reforms enabled Colombia to make substantial progress in expanding access to water supply and sanitation services (Chapters 1 and 3). A World Bank study (2010) concluded that the key to success in the reforms was the adaptation of proposed solutions to the various local conditions (Box 2.6).

Box 2.6. **The water sector institutional model**

The 1991 Constitution enabled greater decentralisation in the provision of water supply and sanitation services, and a shift from direct provision by the government to a model where services are provided by public or private companies. In support of this new model, functions were divided between the national government – in charge of formulating sector policy, enforcing rules and oversight – and municipalities, responsible for ensuring efficient supply of services. General rules for the participation of the private sector in the economy were also formulated at the constitutional level. Specific rules resulted from Law 142 of 1994, which established the Residential Public Services Regime and an independent regulator, the Water Supply and Sanitation Regulation Commission (CRA). The law defined the legal status of public service companies, set up as public companies under commercial law to provide public services. It authorised the creation of community entities in rural areas and certain urban areas. In 1995, the CRA issued tariff methodologies that made it possible to recover the costs of service provision. This regulatory framework was complemented by Law 60 of 1993 and Law 715 of 2001, which created the General Revenue-Sharing System (*Sistema General de Participaciones*), by which transfers from national to municipal level were made possible in the water supply and sanitation sector. Thus privatisation and decentralisation were accompanied by a significant increase in the resources allocated to the sector in the form of transfers.

Source: World Bank (2010), *Institutional Reforms in the Water Supply and Sanitation Sector in Colombia*.

3.3. Land use planning and land management

Colombia has one of the world's highest degrees of concentration of land ownership. As a result, the issue of equitable land distribution and agrarian reform has been a major political challenge for decades. There is an environmental dimension to this issue, as the nature of land ownership is linked to land degradation, e.g. because of the opportunities it provides for extensive cattle ranching (Slunge, 2008). Concentration of land ownership is also related to insecure land tenure rights on the part of the indigenous and Afro-Colombian communities. In addition, internal conflict led to large areas of land being seized illegally, dispossessing around 3.7 million people, 8% of the population, between

1997 and 2011. About 70% of those displaced did not hold registered title to the land they had occupied (USAID, 2010). A Land Restitution Law was passed in 2011, to be implemented over 10 years with a budget equivalent to 8.9% of 2011 GDP (OECD, 2013c). Fair access to land is a key issue in the current peace negotiations.

The 2011 Organic Land Management Law reinforced the principle of environmental sustainability of land management and redefined related mandates and governance structure. For instance, it gave the central authorities the right to choose the location of large infrastructure projects. This led to ambiguity about the roles of the national authorities and CARs. The law allows territorial authorities to adopt "contract plans" whereby they agree to co-finance large, strategically important projects – but no definition of "large projects" is provided. The law also established a regional development fund and a regional compensation fund to support integrated land management. Environmental authorities have not been much involved in these "contract plans", in which environment has been given little consideration.

Land use plans are the main tool for ensuring that territorial development is carried out in an environmentally sustainable manner. The 1997 Territorial Development Law requires municipalities of more than 30 000 population to prepare land use plans. CARs assess and approve environmental issues of the draft plans. The plans categorise land as urban, suburban or rural and specify allowed uses. Land use plans may also impose restrictions on land use for environmental reasons. If land use is severely restricted, the municipality must compensate the landowner. Recent legislation provides for mainstreaming disaster risk management in watershed management plans and for integrating the latter into land use plans. Enforcement of the plans is based on granting construction licences for housing or infrastructure; there is no instrument to ensure that rural land use is compatible with the plans (Blanco, J., 2008). The four-year development plans prepared by elected mayors are seldom consistent with land use plans, despite a requirement to align the two (World Bank, 2013).

4. Design and effectiveness of selected environmental policy instruments

Like most countries, Colombia has gradually adopted various types of environmental policy instruments. A basis for applying economic instruments was established at an early stage (see Chapter 3). Regulatory instruments are widely used, though their design could sometimes be improved (see the discussion of wastewater treatment standards above). This section addresses several other types of environmental policy instruments: environmental liability and insurance, voluntary instruments and eco-labelling.

4.1. Environmental liability and insurance

Article 80 of the Constitution establishes a basis for the State to impose legal sanctions and seek remediation for environmental damage. Environmental liability can be administrative, civil or criminal. There is no criminal liability for legal persons, though companies can be held liable through the personal criminal liability of their managers. The government can be held liable for environmental damage that occurs because of its actions or omissions (Rincon D., 2011).

Law 1333 of 2009 introduced a strict liability regime and requires violators to prove their innocence. All damage must be repaired. Several factors can offset liability, including self-reporting prior to government action or remediation of the damage prior to

enforcement. Examples of aggravating factors are repeat violations and obstructing environmental authorities. The payment of fines or damages does not exempt violators from the obligation to undertake remediation. At the same time, because of the narrow scope of the law, enforcement procedures are also guided by many other legal acts, so there is a degree of ambiguity in enforcement (Rincon, D., 2012). The recent adoption of a guidance document on biodiversity offsets provides additional support for the liability regime (Chapter 7).

The legal framework addresses liability for past contamination to only a limited extent. In 2009, Law 1333 extended the period within which an environmental enforcement action can be taken from 3 to 20 years. This will help in the decontamination of sites where owners can be identified. There is no mechanism regarding decontamination of orphan sites, however, and no financial means exists for the government to take such action. Environmental authorities have made an inventory of publicly owned sites contaminated by pesticides, but no remediation has yet taken place due to a lack of funding (Chapter 5).

The use of environmental insurance remains limited despite a relatively developed legal framework. Law 491 of 1999 requires projects requiring licences (i.e. the largest ones, with the highest environmental risks) to take out insurance covering environmental damage. This requirement was reinforced in Law 685 of 2001. For example, mining concessions require a mandatory mining-environmental insurance policy or a security to guarantee compliance with mining environmental obligations, including those that relate to site decommissioning and any post-closure environmental rehabilitation. During the exploration and construction phases, the insured value should be 5% of expenditure or investment. Calculation of the level of insurance during the production phase takes account of several factors, including the price of the extracted mineral. In August 2012, MADS established a compensation programme for biodiversity loss to complement environmental insurance (see Chapter 7). Insurance against civil environmental liability exists as well.

4.2. Voluntary agreements

Between 1995 and 2006, Colombia entered into 64 voluntary environmental agreements. In Latin America, only Chile made greater use of this approach. The agreements covered a wide range of areas, including hydrocarbons, energy, agriculture and livestock, industry, manufacturing and transport infrastructure. From the government's perspective, an important reason for the expanded use of such agreements was the lack of appropriate environmental policy instruments to manage rapidly increasing environmental pressures in the sectors concerned. From the business perspective, voluntary agreements were a way to reduce uncertainty and influence the design of emerging environmental policy instruments.

An independent assessment of experience with voluntary agreements (Blackman et al., 2009) concluded that their overall performance was poor and the value added questionable. In some of the more successful cases, the experience gained contributed to the development of regulatory capacity and the production of guidance documents. Many companies established environmental management departments and obtained ISO 14001 certification. However, most of the 64 agreements resulted in minimal action of any type. Even those considered the best generally achieved weak results. A MADS report found that in a sample of 47 agreements, only 10 made "significant advances in meeting their commitments" and 10 others were stillborn: regulators and industry abandoned them soon

after they were signed. Where improvements in environmental performance were recorded, they were generally driven by other factors, such as pressures from international markets, local communities or capital markets, and by technological change. Other mechanisms for achieving environmental management objectives were also more influential than voluntary agreements, notably more stringent monitoring and enforcement.

4.3. *Eco-labelling*

A national eco-labelling system was adopted in 2002. Some 20 programmes exist, many driven by customer demand outside Colombia. The programme used by cut flower producers (Florverde) is one of the largest in the sector internationally. It emerged primarily to maintain traditional markets, but has helped enhance environmental sustainability in the sector. According to MADS, more domestic labelling plans are being developed, and there is evidence that such programmes, notably in the service sector (e.g. hotels), are achieving environmental benefits. Harmonisation of national and international labels is increasing.

5. Environmental authorisations and compliance assurance

5.1. *Environmental impact assessment*

A legal basis for environmental impact assessment (EIA) was established in 1974. However, EIA was not required until framework environmental legislation was adopted in 1993 and EIA was linked with environmental licensing. ANLA is responsible for reviewing EIA for projects at national level, with CARs and urban environmental agencies responsible for the rest. Respective jurisdictions are defined by law (Law 99 of 1993, Decree 2820 of 2010). They are determined by the economic sector the project is part of (ANLA is the only reviewing body for oil and gas projects), its size or its potential environmental impact. Exploration activities[3] of extractive industries are not subject to environmental licensing and EIA requirements. ANLA does not have the authority to provide oversight of CARs' performance related to licensing and EIA. At the same time, ANLA does not systematically consult CARs and municipalities on projects that will be implemented in their territory.

Initially, EIA procedures suffered from a number of serious shortcomings: absence of screening criteria; poorly defined procedures, including inadequate provisions for public participation; extensive discretionary powers given to regulators, which often resulted in regulatory capture and corruption. Several studies have identified these problems (Sanchez-Triana and Enriquez, 2007).

In recent legal acts, these problems were addressed to some extent. In 2006, the government adopted several issue-specific and sector-specific terms of reference for EIA studies that clearly specified their content and questions to be addressed in a study. EIA procedures now include provisions for pre-assessment procedures, an assessment of alternatives and an environmental management plan for compliance monitoring. A manual for regulators was also produced with decision-making criteria and procedural steps described in detail.

The development of guidance materials as well as greater use of the Internet has improved the transparency of EIA procedures. Most EIA-related administrative decisions can be accessed online fairly easily, although the information is in technical language that is difficult to comprehend. Final EIA studies are not available to the public, and non-technical summaries do not exist. The level of public participation in EIA procedures is very

low: it has largely stagnated at 10-15% since the mid-1990s. While ensuring public participation is the project proponent's task, the environmental authorities have been very lax in enforcing this requirement. There do not appear to be provisions to engage citizens from other countries that might be affected by projects in Colombia.

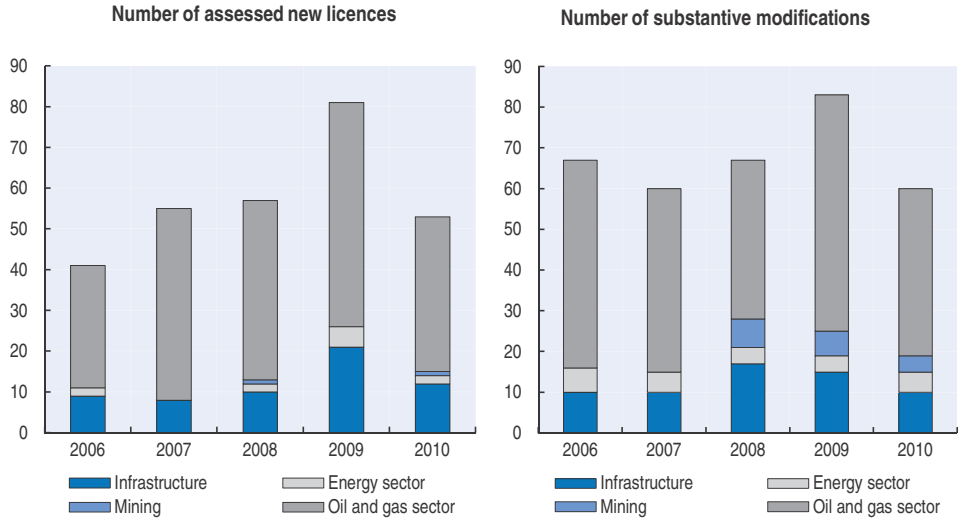
5.2. Environmental licensing and permitting

ANLA and CARs are responsible for environmental licensing, in the same way as for EIA. Licensing suffers from the same type of co-ordination problems as EIA. In contrast to the situation in many other countries, licensing procedures are fairly uniform and there is no significant difference in requirements for large, small or medium-sized enterprises. The content of licences tends to be general and formal rather than focused on specific project-related environmental considerations.

Efforts have been made to reduce the administrative burden on the private sector related to environmental licensing. The main tool is the online Integrated Window for Environmental Procedures, or VITAL, which channels information requests and applications to the relevant environmental authority. A complementary tool, the Information System on Environmental Licensing, provides information to aid in the various licensing procedures. These measures helped reduce the time to process applications from 130 weeks in 2007 to 18 weeks in 2010. The average time spent on licensing in CARs was 95 days. The streamlined procedures also helped authorities cope with the increased number of applications. These developments have been welcomed by the private sector, though many NGOs feel the improvement may have been achieved at the expense of the quality of reviews. Fuller disclosure of the material contained in applications would help alleviate such concerns.

The national-level portfolio of licensed projects has been dominated by the oil and gas sector, and to a lesser extent infrastructure and energy (Figure 2.3). The mining sector has been hardly represented. Agriculture has not been covered at all.

Figure 2.3. **New and modified environment licences at the national level**



Source: Rodríguez, G. A. (2011), *Las licencias ambientales y su proceso de reglamentación en Colombia.*

StatLink http://dx.doi.org/10.1787/888932997854

Environmental impacts are also regulated through individual permits when the impacts are smaller and media-specific. Water use permits, for example, are part of the single environmental licence in the case of large projects. In addition, there are permits under the Convention on international trade in endangered species of wild fauna and flora (CITES), permits for logging in forest reservations and licences for access to genetic resources and for the management of expired medical substances. The number of such authorisations more than doubled over 2006-12, growing from 12 000 cases annually to some 25 000. This exceeds the administrative capacity of SINA entities to regulate and enforce compliance.

This system of environmental authorisations coexists with related systems regulating economic activities, such as construction or extractive industries. This explains, for example, the relative lack of environmental licences in the mining sector. The lack of co-ordination between the environmental and other systems, as in the case of the mining sector, contributes to widespread non-compliance with environment-related licence requirements (CGR, 2012).

5.3. Environmental compliance assurance

The challenge and the institutional response

A number of reports point to high levels of environmental non-compliance in Colombia. Blackman et al. (2006) highlighted non-compliance with air emission regulations as a serious problem across the country. Sanchez-Triana and Enriquez (2005) estimated that 80% of wastewater treatment plants in Bogotá did not meet legal requirements. The Contraloría concluded that about three-quarters of water users were abstracting water without authorisation (CGR, 2012). There are major illegal activities in forestry and, especially, in mining (Box 2.7). In the latter case, much of this activity is linked to the armed conflict. All of this tends to undermine the rule of law in the environment sector.

ANLA, CARs and municipalities are responsible for environmental compliance assurance, inspection and sanctions. They work in close co-operation with the Environmental and Nature Conservation Police, a force established in 2000 under the Ministry of Defence. The police agency has two units: i) environmental education and prevention; and ii) environmental control. Environmental units also exist within urban police forces and as part of the gendarmerie that is responsible for rural areas. The Attorney General's Office includes a Prosecution Unit for Crimes against Natural Resources and the Environment, created in 2011 under the National Prosecution Directorate. The unit is responsible for investigating environmental crimes. Composed of 45 people, it has subnational sections located in Antioquia, Barranquilla, Bucaramanga, Cali and Villavicencio. The creation of this unit responded to commitments under an interagency agreement of 2007 on illegal mining.

Compliance promotion

As in many countries, arrangements are in place to promote compliance with environmental requirements. These include the development of guidance documents and training. Environmental inspectors can impose mandatory environmental training in line with Law 1333 of 2009. Some provisions for financial assistance also exist (Box 2.8).

Box 2.7. **Illegal mining**

According to the 2001 mining code, illegal mining consists of carrying out exploration, extraction or collection activities, involving minerals that belong to the nation or are private property, without a valid mining title or the authorisation of the titleholder of the property. Illegal mining is a criminal offence. Security forces have reported that illegal armed groups, including FARC, the ELN and organised criminal groups, have engaged in illegal mining of gold, coal, coltan, nickel, copper and other minerals. Illegal mines were especially common in Antioquia, Chocó, Córdoba and Tolima departments. Between January 2011 and July 2012, more than 595 illegal mines were closed as part of a comprehensive interagency initiative, but many remain in operation.

Although the legislation is unclear,[a] illegal mining should be distinguished from artisanal and small-scale mining, which involves around 15 000 families for whom mining is the main source of income. Despite initiatives to put these activities on a more legal basis, subsistence mining is still widespread.

The Contraloría estimates that by the end of 2010 less than a quarter of mining titles issued were subject to some form of environmental authorisation. This is equivalent to less than a tenth of the territory covered by mining titles (about 8% of the continental land). Out of some 14 000 enterprises operating in the sector, about three-quarters had no environmental authorisation.

Depending on the data source, in 2010, between 1.3 and 2.7 million hectares of land of ecological importance was subject to mining titles, including some activities conducted under licence (Chapter 7). As of early 2013, a raft of conflicting legislation failed to prevent mining in environmentally sensitive and protected areas (see Section 7.2 and Chapter 7).

a) In the 2003 Mining Glossary, illegal mining also includes informal and artisanal mining as well as mining activities carried out with mining titles outside mining concession area.

Source: Defensoría Delegada para los Derechos Colectivos y del Ambiente (2010), *La minería de hecho en Colombia*; ODI (2010); US Department of State (2012), *Country Reports on Human Rights Practices for 2012*; CGR (2011), *Estado de los Recursos Naturales y del Ambiente 2010-2011*.

Box 2.8. **Financial assistance to green the enterprise sector**

The National Bank for Development and Trade recently put in place a system of "soft" green loans, open to all companies but especially targeting small and medium-sized enterprises (SMEs). The programme supports investment aimed at preventing or mitigating environmental damage and monitoring environmental performance. The bank also has a programme with the city of Bogotá to help microenterprises and SMEs improve their environmental performance. A special environmental credit line co-ordinated by the National Cleaner Production and Environmental Technology Centre is also in place. It supports cleaner production projects, including investment in cleaner technology. Depending on the level of environmental improvement achieved, up to 25% of the initial investment is reimbursed. The government reports that this mechanism has produced excellent results. Additional funds were provided with the support of the Swiss government.

Source: OECD (2012), *OECD Investment Policy Reviews: Colombia 2012*.

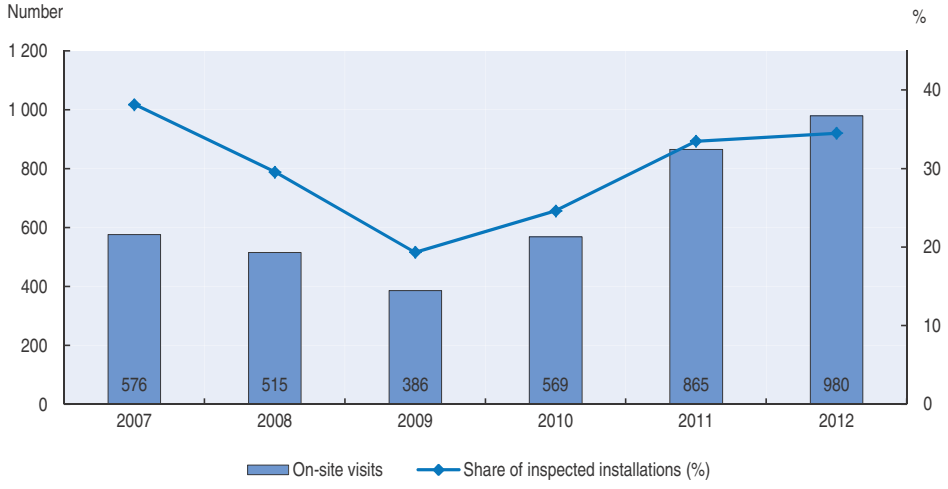
Compliance monitoring

Colombia is working to develop a comprehensive database to facilitate the monitoring of enterprises' compliance with environmental requirements. Tools such as VITAL and the supporting Register of Environmental Offenders are helpful in this regard.

On-site inspection by ANLA, CARs and other relevant authorities is the main instrument for monitoring compliance. Government inspectors can visit any facility and review administrative and technical aspects of compliance. ANLA is developing an annual inspection plan that aims to cover about 30% of the licence holders. The increased number of on-site visits and share of large installations visited in 2011-12 corresponds with the establishment and operation of ANLA (Figure 2.4). No further information on compliance monitoring procedures and results at subnational level was available. Decisions on which facilities to inspect take account of risk and aim to be representative. On-site visits can be announced or unannounced (some 75% are unannounced) and may last up to two weeks. About 10% of inspections are not planned, but respond to complaints or requests from other authorities. Recently Colombia started to co-operate with Interpol on environmental matters, particularly on illegal trade in protected species.

Licence holders have an obligation to conduct self-monitoring and report the results. Sampling and sample analysis must be performed by accredited laboratories. Provision of false data is a criminal offence.

Figure 2.4. **Number of on-site visits and share of large installations inspected by ANLA**



Source: ANLA (2013), *Informe de Gestión 2012.*

StatLink http://dx.doi.org/10.1787/888932997873

Response to non-compliance

In 2009, the legal basis for environmental enforcement was substantially strengthened with the introduction of Law 1333. It established a comprehensive system of administrative environmental non-compliance responses that includes preventative, remedial and compensatory instruments. This has generated opposition in some quarters. The law has considerably strengthened the means of administrative enforcement: daily fines of up to 5 000 minimum monthly wages, equivalent to about USD 1.3 million, can be

imposed, compared with the previous maximum of 300 minimum monthly wages (Global Legal Group, 2010). The law extended the statute of limitations for environmental offences from 3 years to 20. MADS is required to keep a comprehensive, publicly accessible register that includes detailed information on environmental violators and their violations, although it still being prepared almost four years after the law's enactment. The provisions of the law would be strengthened if the government were authorised to take urgent restorative action at the expense of the offender in cases of imminent environmental damage. In line with good international practice, environmental authorities have the right to recover costs they incur in investigations and sanctioning procedures.

Non-compliance response instruments were further strengthened in 2010 with the adoption of Resolution 2086, containing an advanced method to calculate fines. It reduces the level of discretion left to officials in determining administrative fines and proposes calculating fines based on criteria such as economic benefits of non-compliance, duration of non-compliance, degree of environmental impact and/or associated risks, aggravating circumstances, associated costs and ability to pay.

Environmental criminal law has also been strengthened. Law 1453 of 2011 broadened the activities defined as crimes against the environment and adjusted the level of sanctions so that they provide a higher deterrence effect. For instance, punishment for illegal use of renewable natural resources increased from 2-5 years in prison to 4-9 years.

Although the severity of sanctions has been increased, their application has been extremely limited. Between 1993 and 2011, only 433 environmental non-compliance response cases were pursued at the national level. In 2012, ANLA initiated 113 cases (ANLA, 2013a). There is no systemised information on environmental enforcement activity at subnational level.

6. Monitoring and evaluation of environmental policy

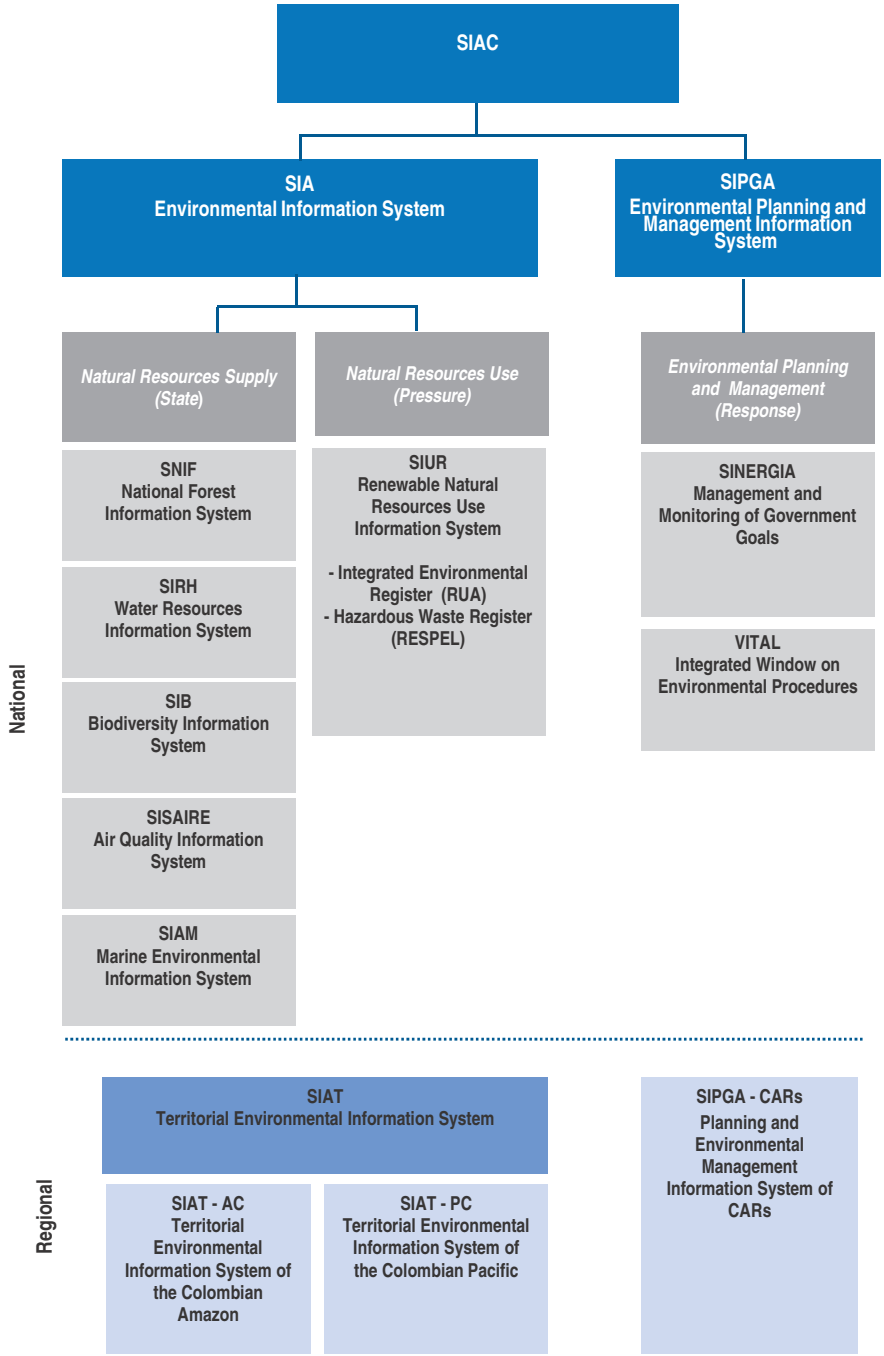
6.1. Environmental information system

The Colombian System of Environmental Information (SIAC) has its origins in the 1974 Code on Renewable Natural Resources and Environmental Protection. The obligation for public entities to provide related information is also part of the code. SIAC was established in its current form in 2006 (Figure 2.5). It is made up of two main elements. The first is the Environmental Information System (SIA), which covers pressures on, and the state of, the environment. The second component is the Environmental Planning and Management Information System (SIPGA), which covers policy responses. SIPGA provides input to the National System of Management and Performance Evaluation, which assesses progress towards the achievement of PND goals.

Conceptually, SIAC is well-designed, and if it were fully implemented, it would provide a good basis for assessing Colombia's environmental performance. However, further efforts are needed to fully integrate the various elements and to ensure the quality and coverage of the component parts.

MADS has overall responsibility for designing SIAC. At the national level, the Institute for Hydrology, Meteorology and Environmental Studies (IDEAM) is in charge of co-ordinating the efforts of the various actors involved in its implementation (which include other research institutes, the National Parks Authority and ANLA). SIAC also has a subnational component for which CARs (including sustainable development corporations)

Figure 2.5. **Overall structure of SIAC, the Colombian System of Environmental Information**



Source: IDEAM (2013), Sistema de Información Ambiental, http://institucional.ideam.gov.co/jsp/sistema-de-informacion-ambiental_1011.

and the urban environmental agencies are responsible. Provision of information by CARs to produce national aggregates is a key weakness in the system.

Colombia has significantly improved the quality and coverage of environmental information. Major progress includes the upgrading and development of the air and water

(inland and marine) quality monitoring systems, improvement of the hydrological and climatic observation network, and the use of remote sensing and geographic information systems for monitoring land cover and land degradation. However, further efforts are needed on environmental health monitoring and on information to better support policy making. The air quality monitoring system is not sufficient for assessing compliance with environmental standards at the national level (IAvH, IDEAM, IIAP, INVEMAR, SINCHI, 2011). Incompleteness of the water user registry hampers implementation of regulatory requirements for water management (IDEAM, 2010). The lack of information on key sectors (e.g. water and energy use, pollutant discharges from the oil and mining sectors) limits the relevance of national aggregates.

Colombia's environmental information system could provide better support for decision making if the economic component were strengthened. The National Administrative Department of Statistics (DANE) monitors environmental expenditure as part of its work on public sector accounts. It keeps physical accounts of non-renewable resources (as of 1994, oil, gas and coal stocks; and as of 2000, iron, copper and nickel stocks). Work is under way to develop environmental economic accounts for water, energy and timber products.

Colombia is co-operating in the World Bank project on Wealth Accounting and Valuation of Ecosystem Services (WAVES). The project is a global partnership that aims to integrate the value of natural resources into the system of national accounts. Colombia is also part of a joint OECD-UNIDO initiative to implement green growth indicators in Latin American countries.

6.2. Evaluation of plans and policies, and institutional performance

Several mechanisms exist for ex post review of environmental policies. In line with government-wide practices, MADS produces several types of reports on its institutional performance, including: i) monthly reports to the president and the National Planning Department; ii) annual activity reports; and iii) annual reports to Congress, focusing on progress achieved in reaching PND goals. CARs also report to Congress, purely on financial issues. Ministers provide a report to the Contraloría on results achieved during their term in office. While the various reports can be useful for ensuring the environmental sector's accountability, they are essentially self-reporting and tend to provide a descriptive list of accomplishments rather than a critical assessment of policy impact and remaining challenges.

Decree 1200 of 2004 and Resolutions 0643 of 2004 and 0964 of 2007 established environmental planning and monitoring tools for assessing CARs' performance. They aimed to monitor the level of budget disbursement and progress on a combination of output and outcome targets. Two ratings were constructed: on financial and on substantive performance. Data were collected annually based on self-reporting. Data collected in 2007-11 showed that performance was very variable, both within and between CARs, on both financial and substantive elements. Poor reporting by CARs is a major obstacle to the assessment of progress in policy implementation. In 2012, the Contraloría pointed out the lack of harmonised budgeting procedures as an impediment to the proper assessment of CARs' own financial resources and expenditure. While the analysis confirmed the existence of serious capacity gaps, it is not a substitute for more effective dialogue and co-operation between the central authorities and CARs.

The Contraloría develops annual reports on environmental management as required by the Constitution (Article 268). Each contains a standard part assessing overall progress, as well as two to three thematic chapters that look at specific environmental policies. For example, environmental impacts of mining, mangrove ecosystems management and the IWRM Policy were analysed in the report issued in 2012. Occasionally, thematic reports are issued outside this cycle. For example, the interface between mining and environment was discussed in a 2013 report. Reports issued by the Contraloría are a useful tool for evaluating and improving policies, and would benefit from wider circulation and use.

The World Bank has conducted a comprehensive country environmental analysis, based on a series of institutional analyses and assessment of costs related to pollution (Sanchez-Triana, E. et al., 2007). This work was influential in shaping air and water policies, and improving the environmental governance system. For example, attempts to strengthen CARs' governance and accountability are part of the follow-up to the analysis. A second study, on the costs of environmental degradation, was conducted in 2012, making a strong case for further improvement of air quality control policies (Chapter 3). These studies provide good references and experience for developing capacity for more systematic environmental policy evaluation.

7. Promoting environmental democracy

7.1. Access to environmental information

The Constitution recognises citizens' general right to information (Article 20) and the right to request (Article 23) and have access to (Article 74) public documents. In 1998, IDEAM issued the first state of the environment report. Comprehensive reports were prepared in 2004 and 2010, and there have been thematic reports on the state of forests, water resources, hazardous waste and air quality. The other research institutes also publish regular thematic reports. The 2010 report discussed both the state of the environment and natural resources and the government's response to environmental pressures. Achieving a balance between comprehensive and thematic reports can be a good way of informing the public on environmental trends and development. Nevertheless, a frequency of at least four years would be more in line with practices in OECD countries. This could be complemented by the annual release of headline environmental indicators. Minimum indicators have been developed and some are used to follow up PND goals on environmental sustainability, as well as Millennium Development Goals (Chapter 4). However, uncertainties in their baseline definition and weaknesses in data quality and availability have hindered the assessment of progress.

IDEAM has set up an Internet portal that brings together SIAC's media-specific information and makes it available to the general public. This portal incorporated all the individual information subsystems shown in Figure 2.5. The tool could be more user-friendly and complete; for instance, various subportals have their own structure, available information is highly aggregated and some media, e.g. water and forests, are better covered than others.

The creation of the Integrated Environmental Register (RUA) in June 2010 was the first step towards an electronic pollutant release and transfer register. RUA will be gradually implemented at the sectoral level, starting with manufacturing, agriculture, livestock and the energy and extractive industries. Comprehensive information on resource (material) and energy inputs and outputs for the entities covered will be collected. All legal persons

will have to register in RUA, and a succinct data request form was designed to this end. A Hazardous Waste Register was established several years earlier.

A call centre was established at the national level to respond to requests from citizens. In 2010, some 8 000 request from citizens were addressed, half by phone. Callers waited 20 seconds on average for a response (MAVDT, 2010c).

As part of e-government, most environmental legislation is published on the Internet, and the websites of all environmental authorities have been improved. More generally, the government has been actively promoting the use of e-government. At the core of these efforts is the proactive provision of information to citizens through the Internet. In 2010, an assessment of progress in various dimensions of e-government was made, concerning information, interaction, transactions, e-services and participation. The participation dimension was considered weakest. Many CARs had a very low score in this regard: four were rated as having made zero progress, and 24 were given progress scores lower than 50%. Progress on other dimensions, especially access to information, was judged satisfactory.

7.2. Public participation

Article 79 of the Constitution links the right to enjoy a healthy environment with the right of "the community's participation in the decisions that may affect it". Law 99 of 1993 established specific procedures and mechanisms for public participation in environmental decision making. It stipulated the public's right to intervene in environmental administrative procedures, such as the issuance, amendment or cancellation of environmental permits or licences. Law 99 also recognised the right of prior consultation for indigenous and Afro-Colombian communities when an activity involving exploitation of natural resources may cause an impact at economic, environmental, social or cultural level. To strengthen stakeholder participation in watershed management, watershed councils were created through Decree 1640 of 2012. As Box 2.9 suggests, the existing public participation mechanisms do not always work.

Box 2.9. **Suspension of mining law because of inadequate consultation**

Until recently, two legal acts regulated mining: Decree 2655 of 1988, the former mining code, which still governs mining titles issued before 9 February 2001; and Law 685 of 2001, the current mining code. Law 685 was amended by Law 1382 of 2010, which introduced changes to strengthen environmental requirements associated with mining operations. For example, Article 3 included rules to ban mining in areas of environmental importance. Article 4 requested that the Ministry of Mines and Energy develop a national mining plan taking account of environmental policies, norms and guidelines. In 2011, Law 1382 was found to be unconstitutional by the Constitutional Court on the grounds that the right to prior consultation afforded to indigenous and Afro-Colombian communities had been violated. However, the court also recognised that nullifying Law 1382 could infringe the constitutional right to a clean environment. Accordingly, the court suspended the entry into force of its own decision for two years to give the executive and legislative branches time to adopt new legislation in compliance with the prior consultation requirement. As new legislation has not yet been adopted, the 2001 mining code is in force without its 2010 amendments.

Source: Murillo Chavarro (2012), *Country Report Colombia: Mining Code Unconstitutional*.

There is also evidence from other sources that public participation in environmental decision making could be improved. The development of the National Policy for Integrated Management of Biodiversity and Ecosystem Services is said to have been rushed, limiting opportunities for stakeholder engagement (ODI, 2010). In addition, there is evidence that the industrial lobby has been able to reduce both the evolution and ambition of environmental policies, in relation to establishing targets and translating them into practice.

7.3. Access to justice

As in many countries, it is not easy to establish standing for individuals or groups to allow them recourse to courts in efforts to protect the environment. Nevertheless, there have been cases where courts have effectively been used for environmental protection (UNEP, 2013). For example, in a court case that involved logging on the territory of indigenous peoples, the court found that "the devastation of forests alters their relation with the environment and endangers their lives, since with the reduction or disappearance of the forest, the main source of animal protein is also reduced or extinguished". Similarly, a food company was ordered to suspend its air emissions because of strong odours that, the court concluded, constituted "an arbitrary intrusion in the privacy rights of the plaintiffs".

Another mechanism that provides access to justice is an *acción de tutela*, a writ protecting some fundamental right. A judge can be asked to protect a person's fundamental rights when they are being violated by a state agent or an individual to whom the person is subordinated, and when there is no other legal means of stopping the violation of these rights. There are no studies analysing how this mechanism has been used in the environment sector, though apparently examples of its application exist (UNEP, 2004).

7.4. Environmental education

The 2001 National Environmental Education Policy laid the basis for government action. Law 1549 of 2012 aimed to strengthen the institutional basis for environmental education, assign responsibilities and promote further integration of environmental education policies into regional development.

An Intersectoral Communication and Environmental Education Agenda for 2010-14 is being implemented by eleven ministries and associated institutions. At subnational level, Interinstitutional Environmental Education Committees have proved effective in promoting environmental education. For example, in 2010, activities by the committees covered several departments, including Antioquia, Amazonas, Bogotá, Chocó, Cundinamarca, Huila and Magdalena. Environmental education programmes have penetrated all levels of the education system. All schools have active environmental education projects (PRAE), with almost 1 million students directly involved, and nearly 27 000 teachers receiving training (Table 2.2). Each PRAE focuses on a specific environmental problem in the local community concerned. Other examples of environmental education programmes include the National Water Culture Programme and the "Soy ECOlombiano" (I am ECOlombian) Programme.

Table 2.2. **Extent of environmental education activities**

Department	No. of education establishments	Share of establishments that have environmental education programmes %	No. of teachers who received training	No. of students who have taken part in a PRAE
ANTIOQUIA	718	100	2 727	95 428
BOLÍVAR	655	100	2 489	87 115
BOYACÁ	590	100	2 242	78 470
CALDAS	373	100	1 416	49 543
CAUCA	378	100	1 435	50 208
CÓRDOBA	515	100	1 957	68 495
GUAVIARE	125	100	475	16 625
NARIÑO	268	100	1 017	35 578
NORTE DE SANTANDER	253	100	960	33 583
QUINDÍO	205	100	779	27 265
RISARALDA	168	100	637	22 278
VALLE DEL CAUCA	608	100	2 309	80 798
CESAR	203	100	770	26 933
LA GUAJIRA	158	100	599	20 948
META	273	100	1 036	36 243
TOLIMA	198	100	751	26 268
CAQUETÁ	88	100	333	11 638
SANTANDER	293	100	1 112	38 903
PUTUMAYO	118	100	447	15 628
SUCRE	250	100	950	33 250
ATLÁNTICO	248	100	941	32 918
AMAZONAS	68	100	257	8 978
MAGDALENA	45	100	171	5 985
ARAUCA	70	100	266	9 310
CASANARE	155	100	589	20 615
VICHADA	70	100	266	9 310
TOTAL	7 085	100	26 923	942 305

Source: MADS (2012), Colombia's response to the OECD Environmental Performance Review questionnaire.

Notes

1. Its members are the Ministers of Interior; Foreign Affairs; Finance; Agriculture; Health; Mines and Energy; Commerce, Industry and Tourism; Education; Environment and Sustainable Development; Housing; and Transport plus the directors of the National Planning Department, IDEAM, DANE and the National Disaster Risk Management Unit.
2. In 2002, the Office for Climate Change Mitigation was created in the Ministry of the Environment to promote Clean Development Mechanism projects. In 2005, it became the Climate Change Mitigation Group.
3. Except those that require roads to be built.

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PART I

Chapter 3

Towards green growth

This chapter examines how environment is being mainstreamed into Colombia's economic and sectoral policies. It examines the use of tax policy to pursue environmental objectives, and progress in removing fiscal incentives that can encourage environmentally harmful activities. The chapter also looks at other economic instruments to implement the polluter-pays and user-pays principles and to recover the cost of providing environmental services such as water and waste management. It includes a discussion of public and private investment in environment-related services and infrastructure. Colombia's innovation performance, including on environment, is also assessed.

Assessment and recommendations

In recent years Colombia has enjoyed impressive economic growth driven by a commodities boom and supported by improved security conditions. It now faces the challenge of further promoting growth that is socially inclusive and environmentally sustainable. Income inequality and concentration of landholding are among the most extreme in the world, and it is the poor who lack access to environmental services and suffer most from pollution. In recent years, poor air and water quality have resulted in health costs equivalent to 2% of GDP. The costs would be higher if account were taken of the health impact of using mercury and other hazardous chemicals in the mining sector. Significantly more investment is needed to prevent and control pollution and to provide the environmental infrastructure that citizens require to enjoy good environmental quality of life.

The devastating impact of the 2010-11 La Niña event (equivalent to about 2% of 2010 GDP) stimulated efforts to better integrate economic and environmental policies. The inclusion of a chapter on environmental sustainability and risk prevention in the National Development Plan (PND) for 2010-14 was an important step towards development of a green growth strategy. Other measures included adherence to the OECD Green Growth Declaration; the decision to establish a high-level commission to co-ordinate climate change policy, prepare a low carbon development strategy and develop a national adaptation plan and a strategy to reduce emissions from deforestation and forest degradation; and the creation of environmental units in sectoral ministries (e.g. Ministry of Mines and Energy) and development of cross-ministerial environmental agendas. There was also increased awareness of environmental issues, and commitment to address them, in the private sector. However, the various policy initiatives do not add up to a coherent policy framework for green growth. The lack of coherence between economic sectoral plans and environmental goals persists, and economic sectors are not accountable for their environmental performance.

The transition to greener growth requires stronger, market-based incentives. Colombia has made progress in reducing transport fuel subsidies, and domestic prices have increasingly reflected international prices. However, many exemptions and tax treatments continue to narrow the base of transport fuel taxes, limit the related revenue and inhibit incentives to reduce energy use. In 2011, environmentally related taxes stood at 0.7% of GDP and 3.7% of total tax revenue, well below the corresponding OECD averages. A study (by the Ministry of Environment, Ministry of Finance and Administrative Department of Science, Technology and Innovation) that was concluded in 2013 should provide a useful basis for considering how environmentally related taxes could be extended. Any increases in these tax rates should be accompanied by targeted transfers to sections of the population that might be adversely affected. As in other countries, there is a significant difference in the taxes applied to gasoline and diesel, which is not justified environmentally. Taxes on motor vehicles are not linked to their environmental performance.

The government's tax take from natural resource extraction could be increased to help raise much-needed financial resources. Although significant tax advantages have recently been removed, exemptions remain, in particular on exploration, despite the considerable negative environmental externalities associated with mining. A recent reform of the royalty system is expected to increase resources available for infrastructure development and to distribute revenue more equitably across regions. To be effective, the increased funding will need to be matched by efforts to enhance the institutional capacity of regional authorities.

The government publishes annual estimates of tax expenditure which are widely used in Colombia. This helps improve transparency. Broadening the scope of the analysis to cover the environmental impact of tax expenditure and subsidies would provide a good basis for reforming environmentally harmful subsidies. A range of tax incentives has been introduced to achieve environmental objectives. Colombia has implemented tax incentives for electric, hybrid and dedicated natural gas vehicles in the last two years and recently the Colombian government approved the import of 300 electric and hybrid light vehicles (cars and taxis) with 0% import tax. It is anticipated that 2 250 light electric vehicles will be imported in the next 3 years with the same exemptions. However, there is evidence that some of these schemes are neither environmentally effective nor economically efficient. They would benefit from careful review.

Colombia is close to achieving the Millennium Development Goal on improved access to water supply. However, further efforts are needed to improve access to basic sanitation and reduce disparities in access to water services between urban and rural areas. Several reforms have improved efficiency in the sector, including provisions for private participation. Public expenditure on water and sanitation more than doubled in the past decade. A major impediment to extending water-related infrastructure is the low level of user charges, which remain below the cost of providing water services. The current system of cross-subsidised prices for utilities (electricity and gas, water and waste) aims at keeping prices low for poor households. However, it has a low redistributive impact and does not provide an incentive to use energy and water efficiently or to reduce waste generation, particularly for those who can afford to pay. As a result, it threatens the financial sustainability of service provision. Charges for water supplied to agriculture give farmers virtually no incentive to use water efficiently.

Public environmental expenditure is low compared to OECD countries at a similar stage of development, and the share of the budget allocated to the national environmental protection system has not kept pace with overall public spending. There is evidence that the lack of financial resources impedes the environmental authorities from carrying out their functions. Private environmental protection expenditure is only partially monitored and contributions from key sectors are not assessed.

Public investment increased significantly in the past decade, in particular for reconstruction after the La Niña event. However, it remains low compared to other emerging economies, and the role of the private sector could be enhanced. Generally, insufficient attention has been given to environmental considerations in public investment programmes. Progress has been made in developing mass transit systems in several cities and these have yielded environmental benefits. However, they need to be significantly scaled up to reduce health and economic costs. Sustainability criteria are not sufficiently considered in support programmes for agriculture. Policies encouraging

expansion of fossil fuel-based electricity generation capacity following El Niño events should be reassessed and consideration given to the development of non-hydro renewables to avoid a locking in of investment capital into long-lived, emission-intensive technologies. Investment programmes should be subject to systematic strategic environmental assessment (SEA) and efforts to assess the economic benefits of environment-related investments strengthened.

Colombia has recognised the need to substantially strengthen innovation. Expenditure on R&D is set to rise, in part funded by an increased allocation from royalty revenue. However, even if short-term targets are achieved, the level of effort will be considerably less than in most OECD countries. Colombia should take this opportunity to mainstream green growth into its innovation strategy, using a mix of supply- and demand-side instruments. Although Colombia does not have an explicit eco-innovation policy, it has taken initiatives it can build on, including on green public procurement and eco-labelling.

Recommendations

- Establish green growth as a central element of the 2014-18 National Development Plan and in the future work of the National Council on Economic and Social Policy (CONPES); define concrete, measurable environmental objectives for key economic sectors and make ministries accountable for achieving them; ensure that all major programmes and projects are subject to SEA that takes into account the long-term effects of climate change.
- Assess how the use of environmentally related taxes could be extended, including by: i) restructuring fuel and vehicle taxes to take account of their contribution to GHG emissions and local air pollutants; ii) removing tax exemptions on transport fuel and on mining and oil exploration; iii) introducing excise duties on energy products used for stationary purposes; and iv) taxing agro-chemicals.
- Broaden the annual review of tax expenditure to include assessment of the environmental and social impact of tax expenditure and subsidies with a view to reforming those that are environmentally harmful; assess environmentally motivated tax incentives with a view to reforming those which are not environmentally effective and economically efficient.
- Enhance the financial, social and environmental sustainability of water and sanitation service provision by: i) assessing water subsidies in all sectors to ensure that they do not incentivise wasteful water consumption; ii) better targeting public resources to expand access to water and sanitation services; iii) increasing water pollution charges to increase revenue available for investment in wastewater treatment infrastructure; and iv) developing the capacity of smaller municipalities to manage service provision contracts with the private sector.
- Further integrate environmental and social policies by: i) reviewing the efficiency and effectiveness of mechanisms for addressing territorial disparities; ii) reviewing the approach to tariff setting and subsidy provision for energy and water services; and iii) targeting financial support to households adversely affected by increases in energy and water prices following tariff reform.
- Integrate an eco-innovation component into the national innovation strategy and include a balanced mix of supply- and demand-side measures; promote public-private partnerships for the development and diffusion of environment-related technology.

1. Introduction

Colombia has experienced strong economic growth in the last decade. In 2000-12, the economy grew at an average of 4.3% per year, more than twice the rate of OECD countries. Growth has been supported by enhanced macroeconomic policy setting, the benefits of a commodity boom and better security conditions (OECD, 2013a). In 2012, Colombia was Latin America's fifth-largest economy.

The country now faces important challenges to ensure sustainable and inclusive growth. Its growth prospects remain strong by OECD and Latin American standards: GDP is projected to grow by 4.5% in 2013 and by 4.6% per year over the longer term (MHCP, 2013). The recent OECD Economic Assessment of Colombia (OECD, 2013a) noted that policies needed to be adjusted to fully capture the opportunities provided by the commodity boom and to boost productivity growth. Further efforts are also required to reduce income inequality and highly concentrated land ownership, which are among the most extreme in the world. In 2012, unemployment was more than 12%, high compared to the OECD average of 8%. Although the security situation has improved, 3.7 million people – 8% of the population – were displaced between 1997 and 2011. This has increased the pace of urbanisation.

Colombia's pattern of economic development has intensified environmental pressures. In particular, the rapid expansion of the oil and mining sector – which accounted for 12% of GDP and 71% of exports in 2011 – and rapid urbanisation have generated a range of environmental pressures (OECD, 2013a). The health costs associated with air pollution (urban and indoor) and inadequate water and sanitation are estimated at 2% of GDP (World Bank, 2012). Over the last decade, air pollution has become the largest component of these costs, whose overall level has remained roughly constant. These estimates do not include the significant health costs resulting from the use of mercury and other hazardous chemicals in mining. The greenhouse gas (GHG) intensity of the economy is higher than the OECD average due to relatively high emissions from the agricultural sector: 35%, compared with 7% in the OECD. Energy intensity and waste generation are low, in large measure because the per capita income is one-third the OECD average. Colombia's energy mix is relatively green due to the large share of hydropower in electricity production.

The economy is dependent on abundant renewable resources and is vulnerable to natural disasters and climate change. Freshwater resources far exceed those generally available to citizens in OECD countries but are unevenly distributed. In 2010, more than half the land area was covered by forest, compared with the OECD average of 30%. The forests and other ecosystems are host to one of the richest biodiversity situations in the world. However, deforestation has had a major impact on Colombia's Amazonian, Caribbean and, more recently, Andean regions. The main cause has been the extension of livestock rearing. The devastating impact of the 2010-11 La Niña phenomenon illustrates the country's vulnerability to natural disasters and the need to develop a climate change adaptation strategy (Box 3.1).

Box 3.1. **Vulnerability to climate change and green growth**

Colombia is highly vulnerable to climate change**.** The high mountain ecosystems called *páramos* are experiencing increases in maximum temperatures of 1°C per decade. Glaciers are retreating by 10-15 m per year and the sea level is rising by 3.5 mm per year for the Caribbean Sea and 2.3 mm per year for the Pacific Ocean. Over 75% of Colombians completely or partially depend on the *páramos* for their water supply. Hydropower represents over 70% of the country's electricity generation capacity (IEA, 2012). During the 2010-11 La Niña phenomenon, major floods affected 3 million people (3 000 were reported dead or missing), inflicted damage equivalent to about 2% of GDP and reduced the country's capacity to grow in subsequent years (ECLAC, 2012). While those events cannot be definitely linked to climate change, the duration and intensity of rainfall were consistent with its potential effects. Colombia's vulnerability to extreme weather events is strongly influenced by socio-economic factors and its model of development. Individual factors include deforestation, slash-and-burn agriculture, artificial drainage of wetlands, changes of natural river courses and building of human settlements in areas at risk for floods or landslides.

Colombia is responding to the challenge, but the government needs to consider the impact of climate variability and climate change in current decision making. Since 2010, the government has started to prioritise climate resilience, to shift from disaster response towards a more integrated approach to risk prevention and management, and to integrate climate change and disaster risk management into sectoral policies and planning instruments at all government levels. The current focus is on institutional development (e.g. the creation of the National Climate Change System) and knowledge generation (e.g. the development of studies that estimate the economic impact of climate change for specific sectors). The Ministry of Finance and Public Credit has published a financial strategy to reduce the fiscal vulnerability of the government to natural disasters. In terms of land use planning, there is a need to simplify, re-sequence and better co-ordinate the planning system, with a more central role for water planning. In terms of infrastructure, there is a need to factor the long-term impact of climate change – not just of extreme weather events – into infrastructure development. In terms of financial risk management, there is a need to improve the incentive framework for private uptake of insurance coverage. The Ministry of Finance has proposed expanding the role of insurance to reduce fiscal vulnerability to climate change. Only 7% of the losses caused by the La Niña phenomenon of 2010-11 were insured.

2. Policy framework for green growth

In 2012, Colombia signed the OECD Declaration on Green Growth. The declaration commits countries to pursue a green growth strategy, encourage green investment and sustainable management of natural resources, reform subsidies and long-term price signals, liberalise trade in environmental goods and services, and promote green growth in partner countries through international co-operation.

The 2010-14 National Development Plan (PND) represents an important step towards developing a green growth strategy. It identifies three major sources of sustainable economic growth: innovation, competitiveness and five "locomotives of growth" (agriculture and rural development, energy and mining, housing and urban development, transport infrastructure, and the so-called innovation sectors) (DNP, 2011). The PND devotes a full chapter to environmental sustainability and risk prevention. Water and

sanitation (including waste management) are covered in the chapter on housing and urban development. The plan highlights the need to ensure that economic growth is compatible with environmental protection, in particular as regards the energy and mining sector. The provision of environmental services and development of sustainable urban transport are seen as opportunities for economic growth and poverty reduction. The PND does not, however, place the same emphasis on identifying and exploiting opportunities for growth based on better management of land, water and biodiversity resources.

The PND examines approaches for better integrating economic and environmental policies. It recognises that the current incentive structure does not promote sustainable management of natural resources (biodiversity, water). It also recognises that there is a need to evaluate the economic efficiency of environmental regulations and that the entities within the National Environmental System (SINA) have failed to put forward economic, financial and social rationales to support environmental policy proposals. A key finding is that there is a lack of coherence between economic sector plans and environmental goals, partly because environmental performance is not part of the criteria for evaluating the performance of economic sectors. The responses put forward in the PND to deal with these challenges include the use of strategic environmental assessment (SEA) of "locomotive" sector plans, as well as the adjustment of economic instruments for water management, in addition to more traditional regulatory approaches.

While several policy initiatives have been developed, they do not add up to a coherent policy framework for green growth. The National Council on Economic and Social Policy (CONPES) has paid increasing attention to environmental issues. The number of CONPES documents that discuss environmental policy issues increased from 14 in 1992-2001 to 50 in 2002-11 (Mayorga, 2012). While some of the documents are limited in scope (territorial or sectoral) or relatively technical (such as approval of international loans), others are designed to have a broader policy scope (Chapter 2). Colombia has had a cleaner production policy since 1997, and in 2002 the environment ministry issued the national strategic plan for green markets. In 2010, the ministry published its policy on sustainable production and consumption, with the aim of changing production patterns towards sustainability while promoting business competitiveness and social well-being (see also Chapter 5). There is a concern, however, that this policy was developed by the environment sector as part of the Marrakech process on sustainable consumption and production without engaging the economic ministries (agriculture, industry, mines and energy) or the national planning department.

Colombia has recognised the need for intersectoral co-operation to achieve green growth, but has not yet established sufficiently ambitious arrangements in this regard. The 2006-10 PND promoted the establishment of interministerial and intersectoral agendas. Between 2007 and 2010, the Ministry of Environment, Housing and Territorial Development (now the Ministry of Environment and Sustainable Development or MADS) signed bilateral agendas with six other ministries, as well as with several business associations (Chapter 2). However, their effectiveness has been hindered by the relative weakness of the ministry and sometimes by its lack of analytical and policy development capacity when it comes to negotiating strong intersectoral commitments. MADS has found it difficult to identify the strategic issues and targets to be agreed, relying to a large extent on proposals made by other ministries, which have tended to focus on relatively marginal issues. SEA, a key instrument for integrating environmental considerations in sectoral policies and programmes, was introduced in 2004 but is not compulsory, and thus is little used outside MADS.

The country has adopted a comprehensive approach to climate change, although implementation of key strategies has yet to start. Colombia has low GHG emissions, both per capita (far below the OECD average) and absolutely (0.4% of global emissions). At the same time, the government recognises the need to reduce the GHG intensity of the economy, which is above the OECD average. This is linked to the high share of GHG emissions generated outside the energy sector: 35% come from agriculture, while the OECD average is 7%. Three key interministerial initiatives related to climate change are being developed: the national adaptation plan, the REDD+ strategy and the Low Carbon Development Strategy (ECDBC) (Chapter 4). The ECDBC is expected to contribute to the national development objectives of economic growth, productivity, innovation, competitiveness, poverty reduction and sustainable rural development. The specific objective of the strategy is to identify and implement development paths for each sector that will decouple GHG emissions from growth. As part of the development of the ECDBC, Colombia started developing marginal abatement cost curves for transport, waste, energy, mining and agriculture.

3. Greening the tax system

There are opportunities to strengthen environmentally related taxes as part of a broader fiscal reform. The Colombian tax system has been in need of fundamental reform to raise additional revenue, promote economic growth and reduce inequality. The system is characterised by narrow tax bases, extensive use of tax expenditure, high tax avoidance and a very low redistributive impact (OECD, 2013a). Opportunities exist to simplify the system, reduce distortion and raise additional revenue, including from environmental, property and mining taxes. The fiscal reform approved in December 2012 introduced measures to address these shortcomings. It also mandated the Administrative Department of Science, Technology and Innovation (Colciencias) and the finance and environment ministries to prepare a study on the effectiveness of existing environmental taxes and charges and to assess the possibility of introducing new ones. This study was presented to the Congress in June 2013 but was not made public.[1]

3.1. Environmentally related taxes

Although it rose by 30% between 2000 and 2011, revenue from environmentally related taxes is low, and has decreased as a share of GDP and total tax revenue. In 2011, it amounted to 0.7% of GDP and 3.7% of total tax revenue, well below the respective OECD averages of 1.6% and 5.6% (Figure 3.1). As in OECD countries, revenue from environmentally related taxes is dominated by taxes on transport fuels. There is no tax on most energy products used for stationary purposes, such as electricity and cooking fuels. Despite a decreasing trend in petrol and diesel tax rates in the second half of the 2000s, related revenue grew, driven by increased demand for transport fuels, particularly diesel (Figures 3.1 and 3.2).

Regulation of transport fuel prices has resulted in implicit fuel subsidies. The government has sought to reduce transport fuel subsidies by linking domestic and international prices using a producer pricing formula (Box 3.2). As a result, trends in transport fuel prices have mostly reflected international prices and exchange rates (Figure 3.2). The administratively set producer price has nevertheless remained below the export parity price, providing an implicit subsidy. In 2011, it represented 0.3% of GDP, equivalent to nearly half the revenue from taxes on transport fuels (see Section 4). Price

and tax levels remain lower than in most OECD countries (although less so when expressed in purchasing power parities), but are higher than in the United States and Mexico. The scope for raising transport fuel tax rates is constrained by smuggling from Venezuela and Ecuador, where fuel prices are lower (Figure 3.2). To curb smuggling, fuel prices are reduced in border departments, and Venezuela has provided Colombia with petroleum products at reduced prices.

Transport fuel prices and taxes do not take into account the environmental impact of fuel use. Until January 2013, Colombia had three taxes on transport fuels: a value added tax (VAT),[2] an excise tax and a surtax (Figure 3.2). The 2012 tax reform combined the excise tax and VAT into a single national tax on fuels and provided for an annual adjustment for inflation (Box 3.2). While the reform reduced the tax difference between diesel and petrol, the surtax is still lower for diesel. The price gap between diesel and petrol had led to demand for diesel more than doubling over the past decade. As a result, the share of diesel in fuel consumption rose from 26% in 2000 to 52% in 2010 and Colombia became a net importer of diesel. This is likely to have increased the environmental impact of transport, as diesel has a higher carbon content and its combustion generates more nitrogen oxide (NO_x) and particulate emissions. From an environmental perspective it would be preferable to differentiate the tax on fuels according to their energy content or their impact on GHG emissions and local air pollution. There is no tax on liquefied petroleum gas, which accounts for 8% of transport fuel consumption. Transport biofuels (biodiesel and ethanol) are also exempt from fuel taxes, but this is motivated by concern about farmers' income rather than the environment. The exemption has been maintained despite increasing concern about the environmental impact of first generation biofuels (Box 3.4).

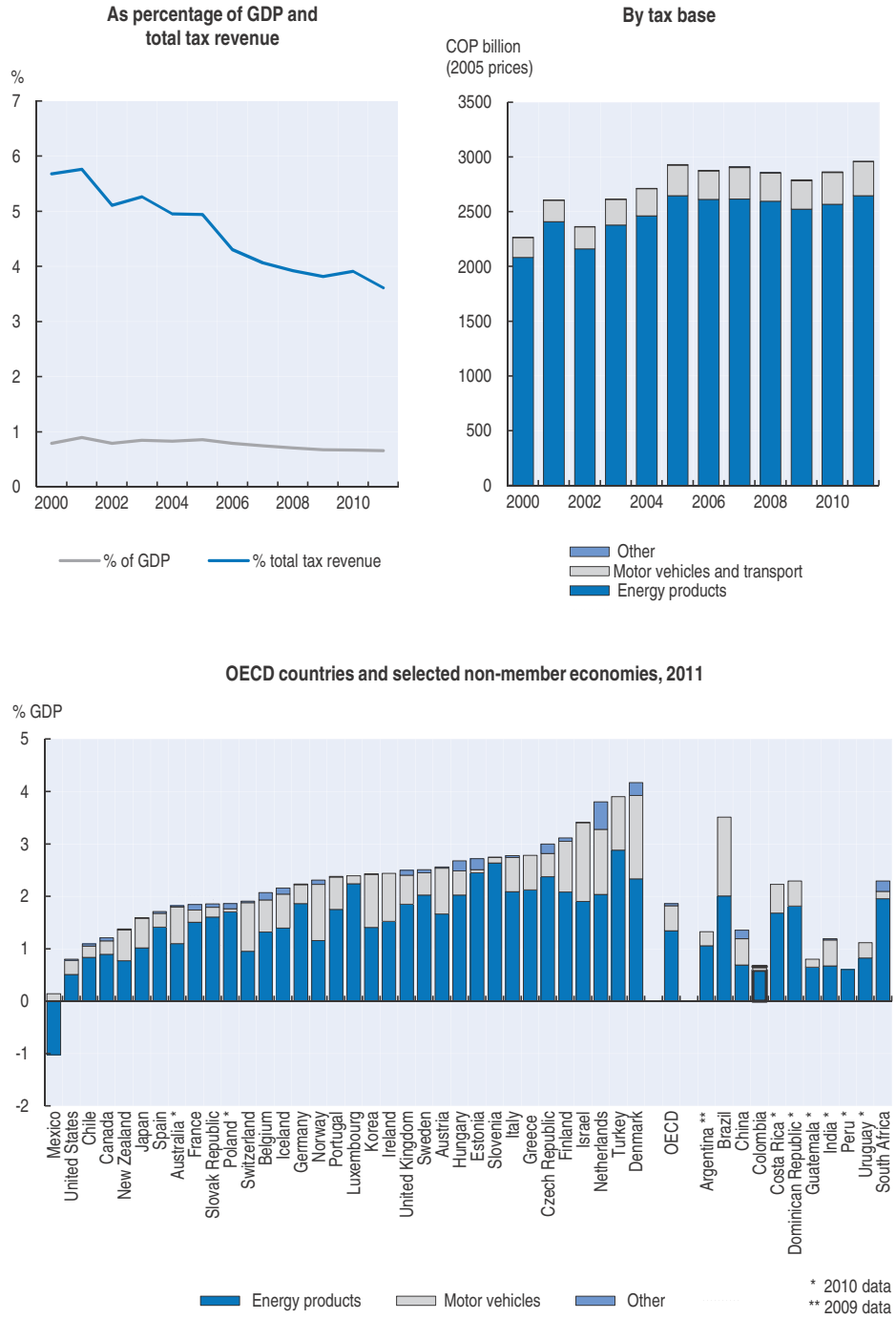
There is social and political opposition to introducing measures that result in increased transport fuel prices. As in many other countries, the lower price for diesel is justified by the potential impact higher prices would have on consumers. The policy has been influenced by the road transport sector, which captures the largest share of the benefits (García Romero and Calderón Etter, 2013b). In March 2013, thousands of truckers went on strike to protest rising fuel prices. The strike ended after three days when the government agreed to reverse a price increase and not to increase the diesel price for three months (Kojima, 2013).

Revenue from motor vehicle taxes nearly doubled in real terms but continues to contribute a small share of environmentally related taxes. Since the 2012 fiscal reform, a VAT rate of 16% applies to all vehicles,[3] along with a one-off tax ranging from 8% to 16% of the sales value of the vehicle. The one-off motor vehicle tax can be deducted from income tax. A tax on vehicle ownership ranging from 1.5% to 3.5% of the assessed value of the vehicle is levied annually. Neither of these taxes is linked to the environmental performance of the vehicle.

3.2. Fiscal treatment of the mining sector

Despite their negative environmental impact, the oil and mining industries benefit from favourable tax and royalty treatment. The 2010-14 PND identifies oil and mining as one of the five "locomotives" of economic growth and estimates that they have realised only 22% (oil) and 10% (mining) of their potential. Royalties on natural resource extraction increased from less than 0.5% of GDP in the mid-1990s to over 1.3% in 2011. However, revenue could be increased further (OECD, 2013a). The government's tax take from the oil sector seems relatively low by international standards (Agalliu, 2011). Resource taxation

Figure 3.1. **Environmentally related tax revenue**

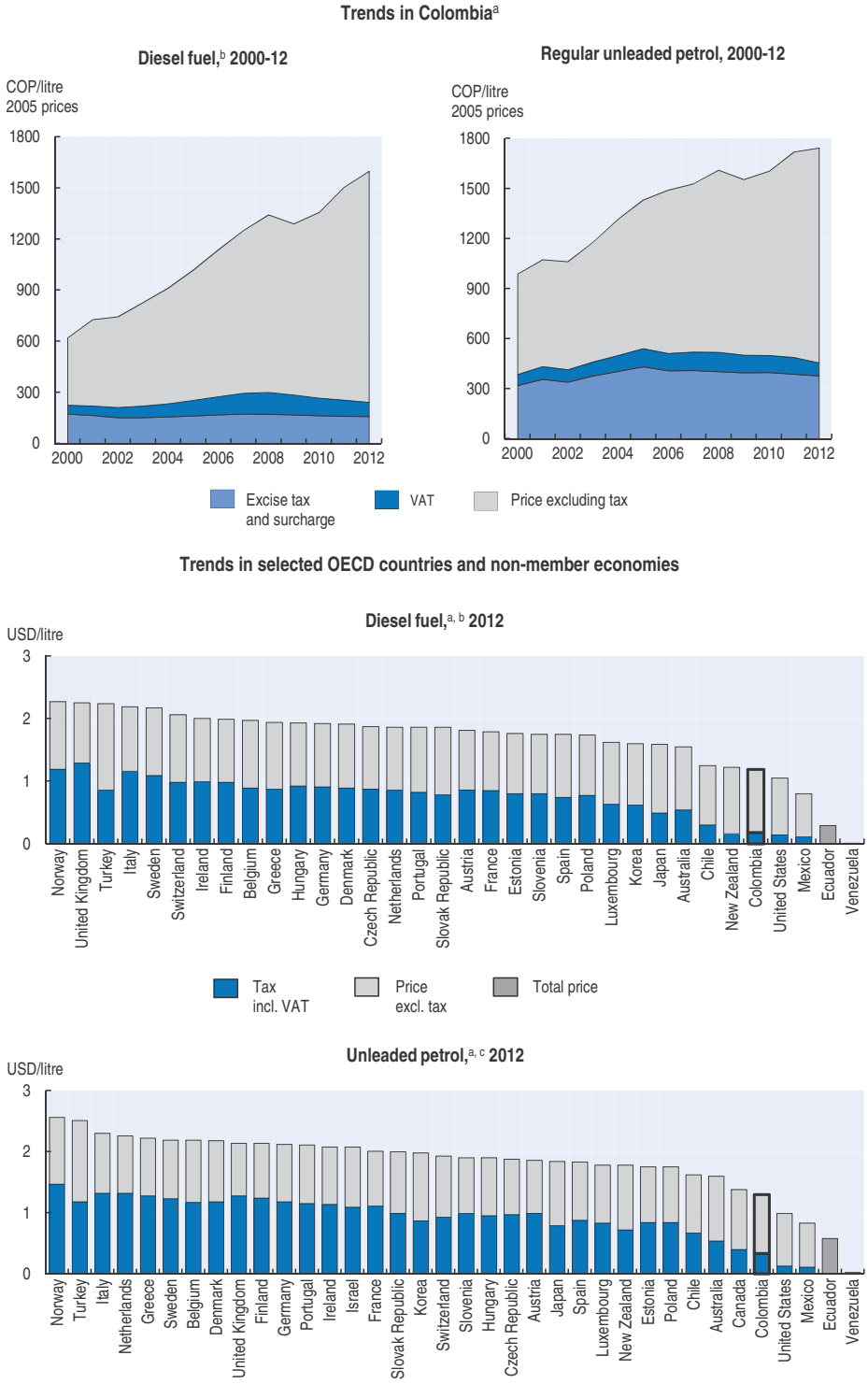


Source: OECD calculations; OECD/EEA (2013) *OECD/EEA Database on Instruments Used for Environmental Policy and Natural Resources Management.*

StatLink http://dx.doi.org/10.1787/888932997892

could be shifted more towards profits, either by setting the profit tax higher for the mining sector or by moving towards a resource rent tax. The latter option is not feasible, however, at least in the short term, as it requires more advanced administrative capacity. The oil and

Figure 3.2. **Road fuel prices and taxes**



a) Average prices for Bogotá.
b) Automotive diesel fuel for non-commercial use.
c) Unleaded premium (RON 95), Colombia, Ecuador, Japan and Venezuela: unleaded regular; Israel: 2011 data.
Source: OECD-IEA (2013) *IEA Energy Prices and Taxes Statistics* (database); UPME/SIPG (2013), *Precios de Combustibles* (database); World Bank (2013), *World Development Indicators* (database).

StatLink http://dx.doi.org/10.1787/888932997911

Box 3.2. **Setting transport fuel prices**

Colombia regulates petrol and diesel prices using a formula with four variables: producer income, taxes, commercialisation margins and transport costs.

Producer income (PI): This element aims to cover the opportunity cost of selling in the domestic market, as opposed to the international market, and to stabilise prices. It is revised every month. If the export parity price (EPP) has increased and the PI is below the EPP, the PI can be increased by up to 3%. If the EPP has decreased and the PI is above the EPP, the PI can be decreased by up to 3%. Otherwise the PI does not change. For some geographical areas the PI is reduced and the shortfall covered by the national budget.

Taxes: Since January 2013, petrol and diesel have been subject to a national fuel tax equivalent to USD 0.15/litre of petrol and diesel, and USD 0.23/litre of premium petrol. The tax is revised annually for inflation and includes a surtax of USD 0.04/litre for diesel and USD 0.17/litre for petrol). Some sea-based activities (fishing, navy, coastguard) enjoy a reduced tax on diesel. Fuels sold in the San Andrés archipelago also enjoy preferential tax rates.

Commercialisation margin: The Ministry of Mines and Energy establishes a profit margin each year for wholesalers and retailers that defines the maximum wholesale and retail price in small towns; it is not binding for retailers in cities. In early 2013 it was set at the equivalent of USD 0.12/litre.

Transport costs. They vary by region. In Bogotá, they represent around 5% of the selling price for petrol and diesel.

mining industries receive significant fiscal advantages. For example, until 2010 they had the highest deduction on investment because of their high capital intensity. Until 2011, mining companies in border areas benefitted from price discounts for diesel and petrol. Although those two advantages have ended, tax deductions remain, for example on exploration despite its negative environmental impact. The multitude of tax advantages provides incentives for foreign investment, but it undermines the transparency of the tax system. The fiscal treatment of oil and mining should be reviewed to assess whether the environmental externalities of the sector are sufficiently captured.

Box 3.3. **Natural resource royalties and their role as a source of funding for environmental investment**

Royalties from exploitation of non-renewable resources have traditionally been an important source of public spending on environment-related investment in Colombia. They are levied as a percentage of production, valued at international prices, and converted to Colombian pesos. Royalty rates vary with the type of mineral, and increase with the amounts extracted. Between 2006 and 2011, income from royalties increased by 70%, but there was concern that most oil-producing and mining regions, which received a large share of the royalties, have weak institutions, resulting in largely ineffective investment of the royalties (Olivera and Perry, 2009). In 2011, royalties from the hydrocarbon sector amounted to COP 8 trillion (ANH, 2012).

Box 3.3. **Natural resource royalties and their role as a source of funding for environmental investment** *(cont.)*

Until 2012, most royalties were directly transferred to the departments and municipalities where resource exploitation took place or the ports from which the resources were transported; this was the case for 68% to 92% of hydrocarbon royalties and 84% of those for coal. Such transfers totalled COP 2 340 billion for hydrocarbons and COP 374 billion for coal in 2006. These direct royalties had to be spent on investment to cover basic needs in the areas of health, education, and water supply and sanitation (at least 60% until reaching pre-determined coverage targets), other priority investment projects (up to 30%) and pensions for public workers (up to 10%). Up to 10% could be spent on operating costs and technical assessment of investment. Thus, direct royalties financed investment in water supply and sanitation (including solid waste management) and other environmental investment classified as priority. The rest of the royalties went to the National Royalty Fund, intended for mining promotion, environmental protection and regional investment projects. But half these indirect royalties go in fact to the national pension fund of the territorial entities, and about 30% of the rest goes to environmental projects (DNP, 2007).

In 2012, a new royalty system was introduced, allocating royalties to six main funds. This means the regions' direct allocations will fall from 80% of royalties in 1994-2010 to 25% in 2012 and 10% in 2014. From 2014 the Regional Compensation Fund will get 24% of royalties to invest in infrastructure in the poorest regions and municipalities, and the Regional Development Fund will get an additional 16% of royalties (not earmarked).

The royalty reform means the Autonomous Regional Corporations (CARs) no longer receive support from the National Royalty Fund to finance environmental investment. Before the reform, the fund represented 3% of CAR financing. While only eight CARs received funds directly (because they operated in departments that produced natural resources), all the poorest CARs have effectively seen their funding decrease (OECD, 2013a).

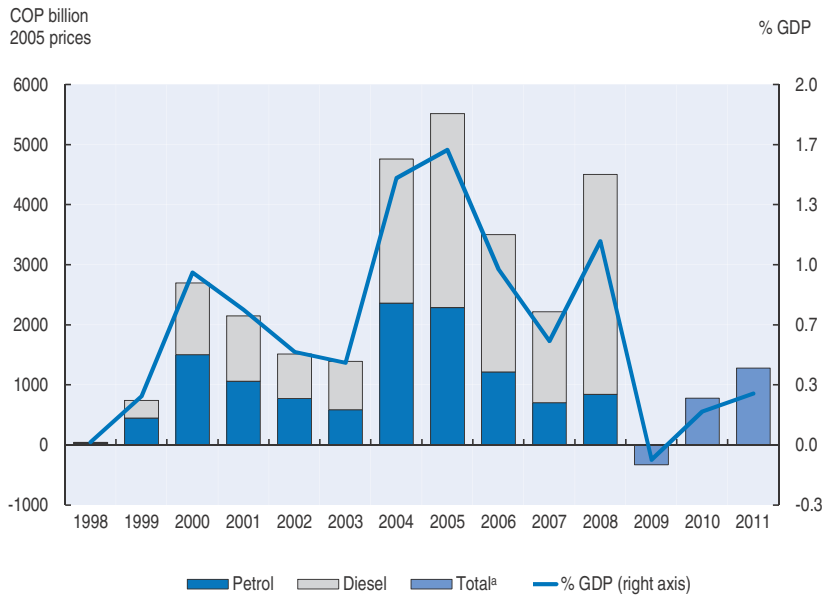
4. Environment-related subsidies

4.1. Energy subsidies

As indicated above, Colombia has historically subsidised fuel consumption (see Section 3.1). In 2008, due to the increase in international prices, the government disbursed about COP 6 trillion (1% of GDP) in fuel subsidies (Figure 3.3). This prompted the creation of a fuel price stabilisation fund (FEPC) intended to stabilise prices at no cost to the national budget. In practice, petrol and diesel continued to be subsidised but at a lower level. The FEPC had been endowed with COP 330 billion in 2008, but by the end of 2011 it had accumulated a debt of nearly COP 2 trillion (Kojima, 2013), equivalent to 0.3% of GDP, which represented a budgetary transfer. Further fuel price-setting reforms were implemented in 2011 for petrol and 2012 for diesel to allow for gradual increases in prices. These changes were reported to have reduced FEPC's deficit by 28% in 2012 (MHCP, 2012a). However, sustaining the reform effort is proving difficult because of political opposition (see Section 3.1).

Specific fuel subsidies are provided to some sectors and territories. Sectors that benefit from a lower price on diesel include fishing, aquaculture and the navy (boat fuel only). Diesel consumed in the Amazon region and in electricity generation by small power plants in areas where there is no grid connection is exempted from fuel taxes. To reduce

Figure 3.3. **Fuel subsidies**



a) The breakdown for diesel and fuel subsies is not available for 2009-11. It is estimated that diesel subsidies accounted for 65% of total fuel subsidies in 2011.
Source: García Romero H. and L. Calderón Etter (2013), The Political Economy of Fuel Subsidies in Colombia.

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smuggling from Ecuador and Venezuela, the price of petrol and diesel sold in border departments[4] is reduced by nearly 40%. This is achieved through reductions in the producer income (by 25% in the case of petrol and 32% in the case of diesel), exemptions from the national fuel tax, reduced surtax and a different biofuel-mix mandate. In these areas, the price reductions lead to higher per capita fuel consumption (García Romero and Calderón Etter, 2013a). The total fiscal cost of these measures is not known, as there is no information on the extent of smuggling of the fuels sold in these areas into other Colombian departments. The government publishes annual estimates of tax expenditure in its Medium-Term Fiscal Framework. This review should be deepened and broadened to include the environmental impact of tax expenditure and subsidies.

4.2. Agricultural support

Inappropriate land use is a drag on the economic and environmental performance of the agricultural sector. About 35% of Colombia's land area is used for livestock rearing, and the area has continuously expanded over the years (Chapter 7). Only half of this area is actually suitable for grazing, so productivity in the livestock sector is low. Tax incentives and government subsidies support large landholdings, even if the land is underused. This creates land market inefficiencies, exacerbates land inequality and has adverse environmental impacts. Extensive cattle breeding is a major factor in land degradation and deforestation, GHG emissions, water use and pollution.

There is a significant opportunity to reform agricultural subsidies so as to reduce their environmental impact. The Ministry of Agriculture and Rural Development runs rural development and agricultural support programmes. The agricultural sector receives significant support in the form of special credit lines, capital subsidies[5] (up to 40% of credit

payments by small farmers are covered by the Incentive for Rural Capitalisation), agricultural insurance subsidies and irrigation subsidies (up to 80% of construction costs are co-financed by the Rural Development with Equity programme). These programmes are focused on increasing productivity and income for farmers. However, they do not take into account environmental impacts or seek to promote environmental objectives (García Romero and Calderón Etter, 2013a). Most support mechanisms are mobilised through Finagro, a second-tier development bank. Although its policies mention environmental concerns, it has no special credit lines for environment-friendly projects such as irrigation efficiency, conservation or organic agriculture. Its resource allocation decisions do not seem to include environmental criteria, as evidenced by the high share of support provided to cattle ranching. Another example is the support for biofuels (Box 3.4).

Box 3.4. **Colombia's support for biofuels**

For the last decade, Colombia has supported the production and consumption of biofuels (ethanol and biodiesel). This support is intended to achieve agricultural rather than environmental objectives. The creation of over 27 000 direct jobs was attributed to the production of ethanol and biodiesel in 2011. At the agricultural production level, investments in oil palm plantations benefit from income tax exemptions, sales of sugar are exempted from VAT and sales of oil palm nut enjoy reduced VAT (7%). At the industrial production level, there is an income tax deduction of up to 40% of investment in fixed assets. At the consumption level, there is a mandate to mix biofuels (8-10% for ethanol and 7-10% for biodiesel, depending on the region). At the same time, mixed biodiesel is exempt from the national fuel tax, and mixed ethanol is exempt from the national fuel tax and the surtax. This policy mix has high costs in terms of prices paid by consumers (even with the tax exemptions, biofuel production costs are higher than those of traditional fuels), fiscal costs for the government and environmental impacts such as increased deforestation, water consumption and pollution. Some of these negative impacts have been recognised. As a result, there has been no increase in the mixing targets in recent years; they have stayed at a maximum of 10% while the original goal was 20% by 2012.

Source: García Romero and Calderón Etter (2013a); Fedesarrollo (2012).

There are also implicit subsidies to the agricultural sector that increase environmental pressures. Support for the sector includes subsidised water prices in some parts of the country, mostly in the form of price regulations negotiated by irrigation federations. Since 2004-05, the level of irrigation water charges has been so low that they represent less than 0.5% of production costs, even for water-intensive crops such as rice. Such low prices provide little if any incentive to use irrigation water efficiently. The 2012 fiscal reform exempted fertilisers and pesticides from VAT to reduce the bill for agrochemicals and other inputs, which, for some crops, represents up to 60% of total production costs. However, there is some evidence that the use of agrochemicals is excessive: Colombia has one of the highest rates of fertiliser use in Latin America, with 70% of nitrogen applications wasted (Chapter 1). Thus the exemption of agrochemicals from VAT reform generates both fiscal and environmental costs. These resources could be better allocated, for example by expanding programmes for agrochemical management.

There is a need to evaluate agricultural and rural development programmes from an environmental perspective as a basis for reforms. By promoting agricultural production

without incorporating environmental criteria, programmes aimed at increasing production (such as guarantees, subsidised credit, subsidised investment, subsidised insurance, technical assistance and debt relief) are likely to increase pressures on the natural resource base. At the same time, some programmes are likely to have positive environmental impacts – in particular the land titling programmes, which would promote sustainable management, but also rural development programmes that provide subsidies for sanitation and for rehabilitating small irrigation districts.

4.3. Environmentally motivated tax incentives

A range of environmentally motivated tax incentives has been introduced in the tax code. These have been applied in various forms, including through sales tax, value added tax, local taxes and import tariffs (Box 3.5). In some cases, the incentives were also intended to increase the competitiveness of business. The tax expenditure associated with environmentally motivated incentives has been increasing. For example, the income tax deductions for investment in environmental protection (pollution monitoring and control) introduced in 2002 amounted to a tax expenditure of COP 7 billion in 2003 and 2004 (Rudas, 2008a). It increased to COP 104 billion (for COP 686 billion in investment) between August 2010 and August 2012 (MADS, 2012a).

Box 3.5. **Environment-related tax incentives**

Sales tax. Partial tax exemption on timber sales from plantations – only 20% of timber sales are subject to sales tax.

Value added tax. VAT reduction for firms for investment in equipment to comply with environmental regulations for air pollution, GHG emissions, water pollution and recycling. VAT exemption for equipment to run and serve natural gas-powered vehicles. VAT exemption for natural gas for transport. VAT reduction for electric buses and taxis for public transport.

Income tax

- Voluntary investment in environmental projects benefits from a reduction in the income tax base (up to 20% of the taxable income).
- Profits from the sale of land to municipalities for environmental protection purposes can be deducted from the income tax base.
- Profits from certified ecotourism projects can be deducted from the income tax base for up to 20 years.
- Energy sales from wind or biomass are exempted for 15 years (subject to certification and reinvestment of profits).

Local taxes. Some municipalities, such as Bogotá, provide tax incentives for public transport companies that invest in clean technology – often as part of a package that includes other measures. Oil exploration and exploitation are exempt from all regional and municipal taxes as well as river transport taxes.

Import tariffs. Imports of buses and trucks with hybrid, electric or natural gas technology benefit from a reduced import tariff of 5% (instead of 15%). The Colombian Government approved the import of 300 electric and hybrid light vehicles (cars and taxis) with 0% import tax. It is anticipated that 2 250 electric light vehicles will be imported in the next 3 years with the same exemptions.

There are concerns about the effectiveness and efficiency of environmentally motivated tax incentives. Between 1997 and 2004, Colombia provided COP 40 billion per year in VAT exemptions for investment in cleaner production technology. However, only 2.4% of requests for such exemptions included technical information about the expected environmental benefits. An evaluation of the programme determined that about half the projects benefiting from tax exemptions had low cost-effectiveness, and only 5% were highly effective (Rudas, 2008a). From an environmental perspective, it is generally more cost-effective to tax "bads" rather than subsidise "goods" (OECD, 2011). The opportunity cost of the exemptions also needs to be taken into account: their design and administration takes up the scarce administrative resources of environmental authorities, and the resources involved might be better used, for example by improving funding for the National environmental system (SINA). The 2012 fiscal reform mandated a study of the effectiveness of existing environmental taxes and charges, and evaluation of the possibility of introducing new ones.

5. Extending the use of other market instruments

Colombia has a long tradition of using market mechanisms for natural resource and environmental management. Water pollution charges were introduced in the 1970s by the Natural Resources Code. The forestry levy was introduced in 1982. Law 99/1993 established that any discharges of agricultural, mining or industrial waste, or wastewater, should be subject to pollution charges according to the negative effects caused. However, only water pollution charges are applied to some extent. Colombians can file class action suits against parties that have caused environmental damage and claim compensation, though this instrument is rarely, if ever, used (García Romero y Calderón Etter, 2013a). The most recent innovation in the use of market mechanisms is the introduction of biodiversity offsets (Chapter 6). Colombia has no GHG emission trading system; the government feels that the sectors with most potential for GHG reductions are agriculture and transport, which are less amenable than others to trading.

5.1. *Reforming utility prices*

There is an opportunity to phase out subsidies for water and energy as part of a broader reform of social support programmes. The subsidy system combines demand-side subsidies (covering lower rates charged to those in need) with supply-side subsidies covering part of the investment cost (Blanc et Botton, 2010). Demand subsidies are covered by cross-subsidies among users (Box 3.6). The system applies to water, electricity and gas consumption. About 90% of Colombians are entitled to subsidised prices for these services. However, subsidised prices lead to overconsumption that is hard to justify given the low redistributive impact of the cross-subsidy system. The way households are targeted results in many high-income households benefiting from subsidised prices. For households connected to the services, the reduction in utility prices is reflected in higher housing costs (Medina and Morales, 2007). And households with no access to public services (e.g. people living in remote areas) are de facto excluded from the subsidy. In addition, the system is not sustainable, as the share of consumers paying the surcharge is low and declining – from 5.7% in 1997 to 3.5% in 2008 (Parra, 2011). The central government and municipalities have to finance the difference. In 2011, the central government's support to the electricity sector reached 0.2% of GDP (MME, undated). In addition, VAT exemption for electricity, gas and water represented an implicit subsidy of about 0.2% of GDP (MHCP, 2012b).

Box 3.6. **Cross-subsidisation of utility services**

Utility services (in particular water, electricity, gas and telephone) are priced according to the socio-economic category of the housing unit. There are six socio-economic categories (*estratos*). The classification criteria include physical characteristics (e.g. type of roof, type of garage, facade conditions), urban environment (e.g. road conditions, presence of pavements) and town planning (e.g. location). *Estrato* 1 represents the poorest. Households in *estratos* 1, 2 and 3 receive subsidies on their utility bills (up to 50%, 40% and 15%, respectively). Those in *estrato* 4 pay the standard rate, and those in *estratos* 5 and 6, as well as industrial and commercial users, pay a premium of up to 20% which partly finances the subsidies to the lower strata.

Studies by the World Bank and the government suggest that this classification system no longer aligns well with the distribution of income. Some 90% of Colombians are in strata 1, 2 and 3. Moreover, because any house in a given area can be classified according to the mean for that neighbourhood, inaccuracies are inherent as many households living in poor average strata belong to the upper income quintiles – e.g. nearly 50% of those in the second poorest strata now are in the two richest quintiles, up from 31% in 2003.

Source: OECD (2013a), *OECD Economic Surveys: Colombia 2013 – Economic Assessment*.

Pricing of water and sanitation services has been moving towards fuller cost recovery. In 2004, a new tariff methodology was introduced to regulate cross-subsidies and subsidies for water and sanitation services. It established a transition period of five years for the standard tariffs to cover the reference costs of provision (Box 3.6). There has been some progress towards this objective, although it has not been reached in smaller municipalities. The subsidy is applied to the fixed charge and to basic consumption (up to 20 m^3 per month). From an environmental point of view, the subsidy could be applied to the fixed charge and not to the basic consumption in order to discourage waste. Since the end of the regulatory transition period (2009), tariffs have been adjusted for inflation. In addition, Colombia has made considerable advances in metering water consumption, reaching more than 95% of households. At the same time, it has a high rate of water unaccounted for, 49%, well above the maximum target of 30% established by the regulator, the Drinking Water and Basic Sanitation Commission. Water and sanitation subsidies are financed through the national budget, royalties and a system of transfers between levels of government (Figure 3.4). In 2011, a new tariff methodology was developed to better reflect the cost of providing water and sanitation services in the definition of the standard tariff.

Water use charges do not provide incentives for efficient water use. The water use charge rates are made up of two components: a national flat rate set by MADS and a regional multiplier factor set according to the social, economic and environmental characteristics of the region and the investment needed for the protection and restoration of river basins. Despite increasing pressures on water bodies, over the last decade the rates of water resource charges have actually decreased. The minimum national rate is only COP 0.0003 per cubic meter. The full introduction of the regional multiplier factor has been postponed until 2017. The charge collection efficiency is only 67% (García Romero and Calderón Etter, 2013a; CGR, 2011). Water volumes are not always monitored, for example for mining (IDEAM, 2010), and the cost of collecting the charge is often higher than the revenue to be collected. The charge on hydropower production is levied on the value of the electricity produced rather than the volume of water used.

Water pollution charges also have little incentive effect. They were first established in 1974 and have been revised substantially since then. For industry, they are levied on discharges of organic matter (BOD) and suspended solids (TSS) above a minimum standard, while for households they are based on water consumption. CARs establish the charge rates and collect the charges. For 2013, the minimum rates were COP 128/kg of biochemical oxygen demand (BOD) and COP 51/kg of total suspended solids (TSS). Water pollution charges had significant positive impacts in the late 1990s and early 2000s; for example, between 1997 and 2003 water pollution discharges in Meseta de Bucaramanga fell by 70% (Rudas, 2008b). However, there are concerns that current water pollution charges are too low to have a significant effect in the municipal sector. In Bogotá, the water user charge represents about 0.15% of the average water bill, and water pollution charges about 1.85% (Rudas, 2008b). There is also a need to invest in control of effluents and charge collection efforts; charge collection efficiency is only 75% (CGR, 2011).

5.2. *Waste charges*

Waste management charges do not cover the full cost of service provision. In 2005, a regulatory reform established that reference tariffs for waste management charges should be based on service provision costs. The cost calculation was being updated in 2013. Use of waste management services is estimated according to total weight at landfill. However, waste management charges do not fully recover all waste management costs. This is partly due to a structure of cross-subsidies (from higher to lower *estratos*) similar to that used for water services.[6] Public subsidies from municipal and other levels cover the difference between user charges and cost of service provision. As the subsidy is related to the volume of waste collected and treated, it provides a disincentive for minimising waste generation. Colombia has introduced an advanced recycling fee through the extended producer responsibility approach (Chapter 5).

6. Reconciling environmental and poverty alleviation objectives

Inequality, poverty and environment are strongly linked. The poor are more likely to lack access to environment-related services. For example, Afro-Colombian and indigenous communities in isolated areas often lack access to drinking water and, in particular, to basic sanitation. The poor are also more likely to face difficulties in access to land and other natural resources. Holdings of around 40% of properties (representing 1.2 million ha) are informal, and 0.4% of the population owns 62% of the country's best land (USAID, 2010). Exposure to pollutants is also linked to poverty; for example, the poor working in illegal, traditional and unauthorised mining are more exposed to hazardous substances such as dust (causing silicosis) and mercury.[7] In addition, the people affected by the effects of the chemicals involved in the production of and fight against illegal crops are mostly poor.

Colombia is making efforts to integrate social and environmental policies. Since 2007, several laws and policies have given increased consideration to the plight of vulnerable groups. For example, the 2010 integrated water resource management policy specifies that water management should address the needs of children, the elderly and ethnic minorities. In 2012, a policy was established to address the lack of water and sanitation services in slums. Colombia has in place an Environmental Compensation Fund aimed at addressing territorial disparities, but it needs to be reviewed and adjusted to better achieve its objectives. Since 2005, after analysis of the health impact of pollution and associated costs (Table 3.1), Colombia has introduced policies and instruments to better address urban

Table 3.1. **Health costs of selected environmental factors**

(% GDP)	2002 (%)	2009 (%)
Urban air pollution	0.8	1.1
Inadequate water, sanitation and hygiene	1.0	0.7
Indoor air pollution	0.2	0.2
Total	2.0	2.0

Source: World Bank (2012b), *Strengthening Environmental and Natural Resources Institutions, Study 2: Environmental Health in Colombia – An Economic Assessment of Health Effects*.

air pollution and indoor air pollution from solid fuel use; these include ambient air quality standards and the progressive tightening of sulphur content in transport fuels (Chapter 2).

7. Investing in environment to promote economic growth

Colombia needs to foster investment in infrastructure to support economic growth, improve the quality of life of its people and reduce inequality. Between 2000 and 2011, public investment as a share of GDP increased from 2.2% to 3.4%, driven in recent years by the need for reconstruction in the wake of the La Niña event. Social inclusion and transport are the most important investment areas, each accounting for about 20% of public investment. Although it is rising, the level of investment in infrastructure is low compared to other emerging economies, in particular in the transport sector, and remote areas still lack basic infrastructure (OECD, 2013a). Under the new royalty system, the government plans to spend nearly 40% of royalty revenue to finance infrastructure projects. Recently the government improved the planning and prioritisation of public infrastructure investment as well as the regulatory and institutional framework of public-private partnerships. However, more should be done to ensure that investment translates more effectively into better infrastructure, including more systematic use of ex ante cost-benefit analysis and evaluation of the environmental and social impact of projects and programmes.

Transport infrastructure (roads, railways and ports) is particularly poor by international standards. Both the quality and quantity of roads are low, and rail and river transport represent only 15% and 3%, respectively, of the freight volume (Ministerio de Transporte, 2011). The cost of internal freight transport is among the world's highest. Although some mining companies have invested in rail and ports to facilitate access to markets, public-private partnerships represent only around 0.5% of GDP, compared with the OECD average of 2%. Urban transport infrastructure also faces significant challenges, particularly in Bogotá (Box 3.7). The lack of long-term and multimodal planning has led to inadequate primary arteries between the main production centres and ports, undermining competitiveness. As well as reducing transport costs, greater use of rail and water transport could help minimise the environmental impacts of the transport sector. The strategy to develop river and rail transport, part of the 2010-14 PND, should be effectively implemented. This will entail improving co-ordination between the institutions in charge of infrastructure projects and those overseeing river management (OECD, 2013a).

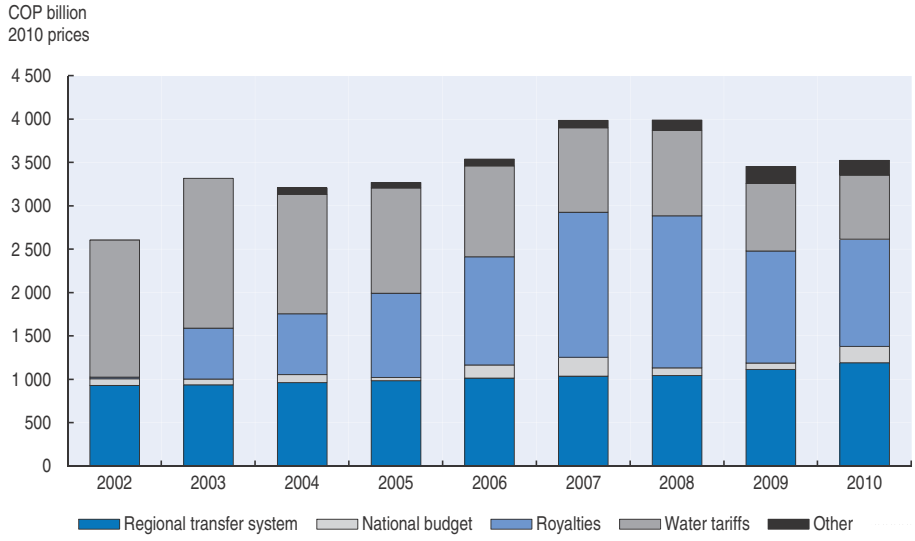
More progress has been made in providing access to water and sanitation and to waste services. The reforms implemented in the 1990s improved the efficiency of the water sector with the development of various schemes involving private sector participation (Chapter 2). They also generated significant increases in funding, including from water charges. Public expenditure in the sector, from the national budget, regional transfers and royalties, more than doubled in the past decade (Figure 3.4). Increased investment in

Box 3.7. **Unrealised benefits of investing in urban transport infrastructure: The case of Bogotá**

Problems of transport infrastructure in Bogotá, where a quarter of the country's GDP is produced, are detrimental to the overall economy as traffic congestion limits the productivity gains from scale and agglomeration. The capacity and quality of public mass transport need to be significantly enhanced to give users efficient alternatives. Rising purchasing power and inadequate public transport alternatives led to a doubling in the number of private vehicles from 2005 to 2010, while the total length of roads remained practically constant, reducing vehicle speed. Too many ageing buses from over 60 private companies circulate on primary and secondary streets, causing additional congestion and pollution. In the main arteries, the exclusive-lane bus network is overstretched due to long construction delays related to poor planning and corruption in the contracting process. In addition to market-based incentives to manage transport demand (such as congestion charges), addressing this challenge requires investing in infrastructure (such as effective implementation of the Integrated Public Transport System, a proposed suburban rail service) and greater interconnectedness of transport modes (including bicycle lanes). These measures could reduce fuel consumption and CO_2 emissions by up to 20% in the near term and 40% by 2040 compared to business as usual (Acevedo et al., 2009).

Source: Adapted from OECD (2013a), *OECD Economic Surveys: Colombia 2013: Economic Assessment*.

Figure 3.4. **Resources allocated to the water and sanitation sector**



Source: SSPD (2011 and 2010), *Estudio Sectorial Acueducto y Alcantarillado* (2010 and 2006-09).

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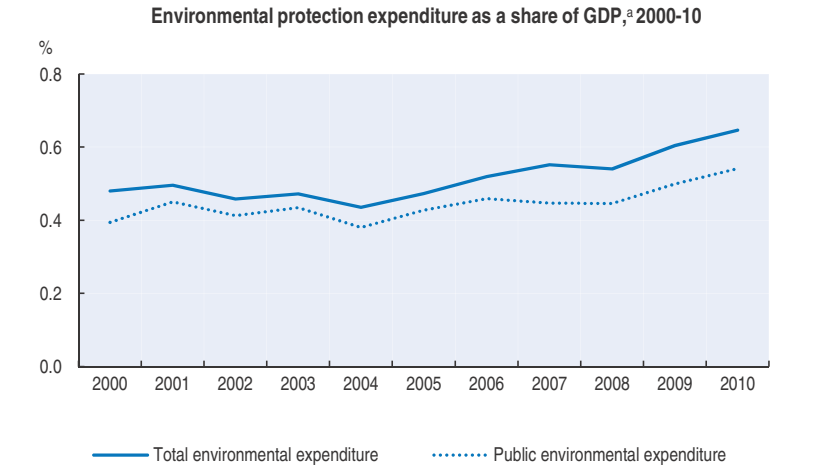
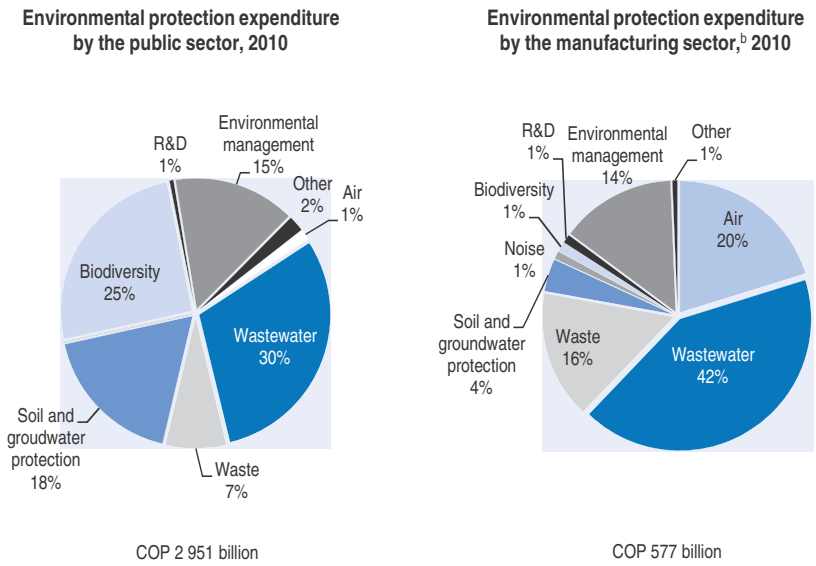
infrastructure means Colombia is close to achieving the Millennium Development Goal on access to safe drinking water. However, additional efforts are needed to expand the coverage of sanitation and reduce disparities in access to water services between urban and rural areas. Household connections to the water supply network rose from 87.3% in 2003 to 87.6% in 2010 while connections to public sewerage improved from 72.9% to 75.3%. In 2011, damage to infrastructure from La Niña events caused these rates to fall to 87.3% and 72.3%. An estimated COP 3 trillion is needed to meet the Millennium Development Goal on sanitation (Chapter 1).

Figure 3.5. **Environmental protection expenditure**





a) Investments and current expenditure of the public sector (including central government, municipalities, departments and CARs) and manufacturing industries. Includes expenditure on i) pollution abatement and control covering air protection, waste and wastewater management, protection and remediation of soil and groundwater, and other environmental protection activities (R&D, administration, education); and ii) biodiversity and landscape protection. May include expenditure on risk management.
b) Includes payments to specialised producers of waste and wastewater management services (COP 66 billion and 67 billion). In addition, Ecopetrol, the main oil company, reported COP 988 billion in environmental expenditure in 2010.
Source: DANE (2012), Gasto en protección ambiental 2000 - 2010.

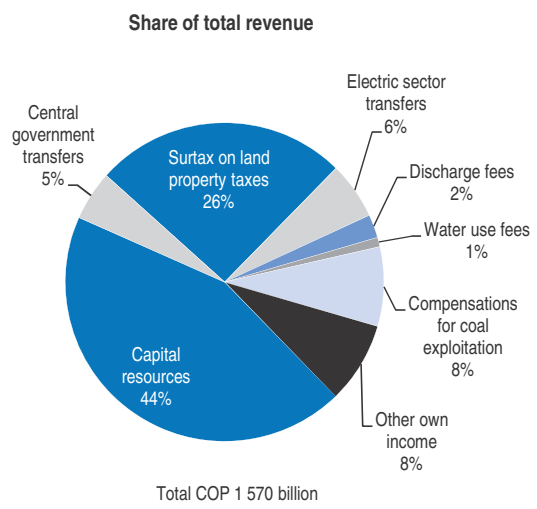
StatLink http://dx.doi.org/10.1787/888932997968

Environmental protection expenditure is growing, but remains low. Total environmental protection expenditure[8] as a share of GDP was stable in the first half of the 2000s at slightly below 0.5% of GDP. It increased to 0.65% of GDP in 2010, including 0.55% of public expenditure (Figure 3.5). SINA spending accounted for 0.28% of GDP,[9] and municipal and departmental environmental spending (mostly financed through budget transfers) represented 0.27% of GDP (DANE, 2012). This is still far from the levels in OECD countries, particularly when they were at a similar stage of development. Environmental expenditure in OECD countries commonly ranges from 1% to 2% of GDP or more. In Mexico, public environmental expenditure doubled

from 0.5% to 1% of GDP between 2000 and 2010 (OECD, 2013b). According to the Contraloría, public spending was not enough for environmental authorities to properly carry out their functions (CGR, 2011). For example, protected areas receive only 80% of their basic needs and less than 50% of what is needed for optimal management (Chapter 7).

There are several sources of public spending on environment, but the largest part is channelled through CARS. Public spending on environment has three main sources of finance. First, national budgetary resources allocated through the annual budget process. The national parks system, the five research institutions, many CARs and MADS are financed in this way. In 2012, SINA was allocated COP 408 billion from the regular national budget and COP 207 billion from the National Adaptation Fund created after the La Niña events (MADS, 2012b). In addition, municipalities and departments were allocated COP 1.3 trillion of budget transfers for water and sanitation (MHCP, 2012c). Second are resources generated by CARs, which in 2011 amounted to about COP 1.5 trillion. These resources are generated mainly by rents from capital resources, the environmental surcharge on the municipal land tax, royalty-based compensation and the power sector levy (Figure 3.6). Third are contributions from international co-operation: between 2007 and 2011, environment-focused aid averaged about COP 280 billion per year (Chapter 4). This support remains very important for biodiversity-related spending (Chapter 7). Colombia has also derived substantial external financial support for environmental activities through multilateral channels (GEF, climate finance, multilateral banks).

Figure 3.6. **Revenue of CARs by source in 2011**



Source: MADS, 2013.

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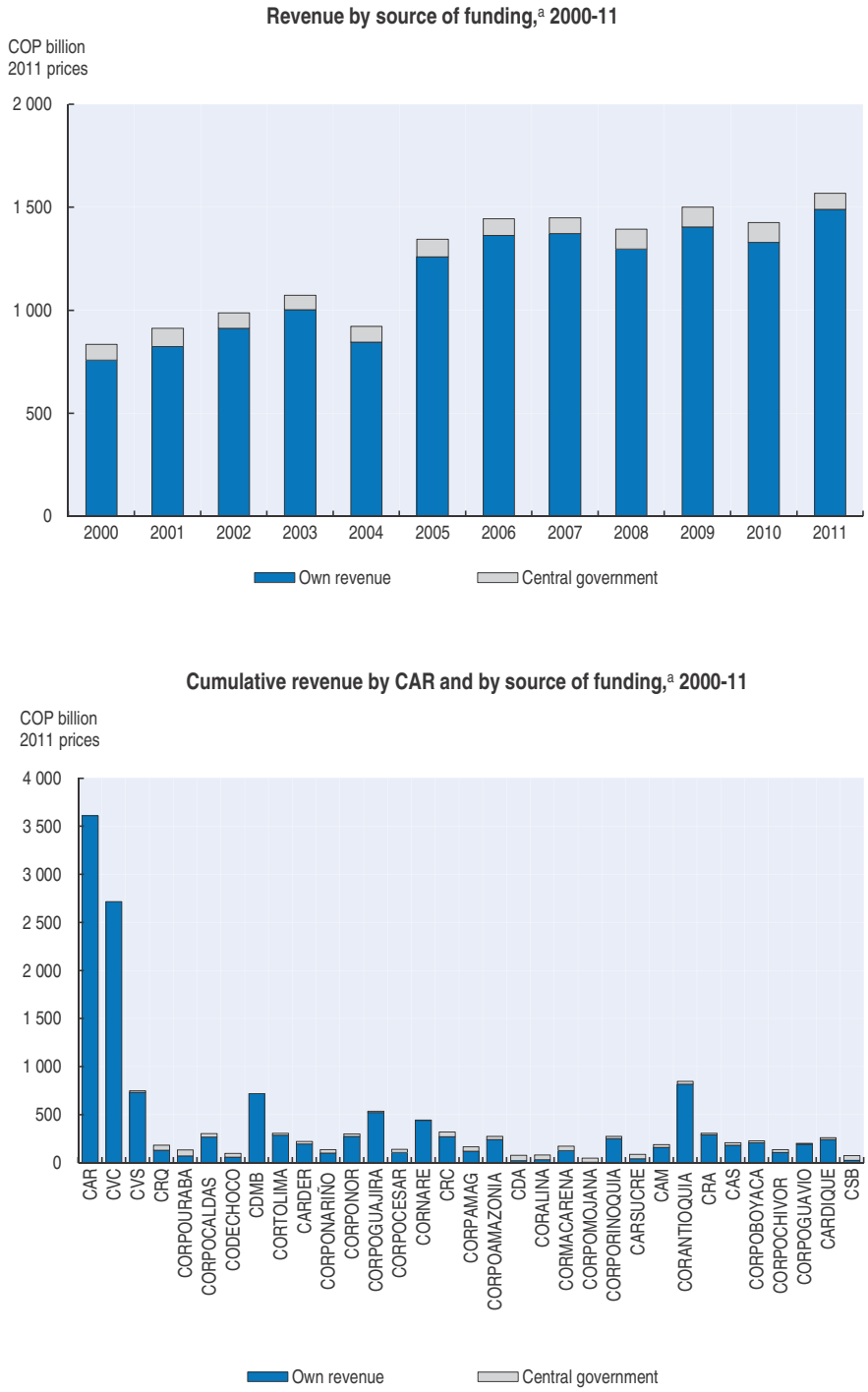
Public spending on SINA has not kept pace with overall public spending. Colombia has traditionally had a low level of public spending. Following the adoption of the 1991 Constitution, public spending increased from 17.5% of GDP in 1990 to 26.4% of GDP in 2000 and 28.2% in 2012 (IMF, 2013).[10] The annual budget of SINA increased[11] due to the rise in CAR resources (Figure 3.7). However, several reforms to reduce the public sector deficit

Figure 3.7. **Trends in CARs revenue**



a) The lack of harmonised budgeting procedures limits the reliability of these data.
Source: MADS, 2013.

StatLink http://dx.doi.org/10.1787/888932998006

affected the environment disproportionally. Between 2000 and 2012, the share of the national budget allocated to SINA decreased from 0.6% to 0.3% (MHCP, 2012c).

Public environmental expenditure also faces a challenge in terms of spending efficiency. Critical issues that need to be dealt with include prioritisation of environmental investment projects, improvement in the design of investment projects, co-ordination of environmental investment with other public expenditure programmes, and corruption. There is a need to improve evaluation of environmental investment projects. Ex ante cost-benefit analysis is sometimes carried out, but ex post evaluation is rare.

Although CARs are responsible for the bulk of national environmental public expenditure, there are limits to their financial independence. For example, CARs have been asked by the government to use their own funds to support investment in water and sanitation infrastructure, which, in principle, is the responsibility of departments and municipalities. This reduces the funding available for environmental management by up to 36% in at least 20 CARs (Rudas, 2008a). In addition, CARs' technical capacity was weakened in the early 2000s by a presidential directive that no more than 33% of total CAR funds could be used for operating expenses. This led to a reduction of staff levels by 20-40% (Rodriguez Becerra, 2009).

The distribution of resources among the 33 CARS is wide and relatively stable. Seventeen CARs have revenue below COP 25 billion (as a group they account for about 15% of total revenue), 14 have revenue between COP 25 and COP 75 billion (as a group they represent about 40% of total revenue) and two account for nearly half the combined revenue of all CARs. In 2011, about 70% of total CAR revenue was concentrated in nine CARs (Figure 3.7), a similar proportion to that in the mid-2000s.

There is a lack of information on key sectors' contributions to environmental protection. Environmental protection expenditure by the manufacturing sector nearly doubled, from 0.05% to 0.1% of GDP, between the first and second half of the past decade (DANE, 2012). Interestingly, while the PND envisions the private sector undertaking a large part of the investment needs for the five locomotives of growth, there is no official figure for the related environmental spending. Ecopetrol, the main oil company, reported COP 988 billion in environmental expenditure for 2010, or twice the contribution from the manufacturing sector. However, this figure is not included in DANE statistical reporting and it remains to be seen whether the definition and methodology used meet international standards.

8. Eco-innovation

Innovation has generally been impeded by a variety of obstacles: a small research sector, low educational standards, low tertiary attainment, inadequate infrastructure, a high level of inequality and suboptimal information and communication technology and scientific infrastructure. Gross domestic expenditure on R&D remained at about 0.15% of GDP per year between 2006 and 2011, much lower than the OECD average of 2.3% (OECD, 2013a). R&D is heavily dependent on the public sector: in 2009, 77% of R&D was financed by the public sector, 19% by the private sector and 4% from abroad. More positively, Colombia has capitalised on its integration in international networks: in 2008-10, 50% of science articles were produced jointly with researchers abroad.

The government has recognised the need to strengthen innovation and identified it as one of the five locomotives of growth in the 2010-14 PND. A goal was set to increase gross

expenditure on R&D to 0.5% of GDP by 2014. The 2012 royalty reform (Box 3.3) provides one means to move in this direction with the establishment of a science, technology and innovation fund. Part of the increased R&D effort could be directed towards green growth, but this would require environmental criteria to be established for allocating resources under the fund. Development of the 2014-18 PND provides an opportunity to embed eco-innovation more strongly in Colombia's innovation strategy.

Colombia does not have a formal eco-innovation strategy and eco-innovation is not very prominent in the 2010-14 PND. Nevertheless, some building blocks have been established. MADS has identified some priorities for eco-innovation, including sustainable use of biodiversity, alternative energy sources, material recycling and green production processes (MADS, 2012). The Sustainable Production and Consumption Policy identified economy-wide resource efficiency targets, some of which are reflected in the 2010-14 PND. The strategies developed in this Policy provide guidance for eco-innovation in the private sector. Eco-innovation is also addressed in the CONPES 3700 document on climate change. The need for socially related innovation is recognised in policies to empower communities to manage their local environments.

Eco-innovation is seen as a stimulus for the environmental goods and services sector and a potential export market. The administrative department of Science, Technology and Innovation (Colciencias) is designing strategic plans for green-related sectors, including water and forest resources, biodiversity, alternative energy and biofuels (OECD, 2012a).

The government has applied a number of other instruments to stimulate the environmental goods and services sector. A strategy of green public procurement was developed, with some support from the United Nations Environment Programme. Public sector purchases account for 16% of GDP. A major impediment was the legal requirement that only economic considerations should be taken into account in public procurement (OECD, 2012b). The procurement reform and the establishment of the new central procurement agency, Colombia Compra Eficiente in 2012, are expected to facilitate green public purchasing. MADS has developed guidelines to include green criteria in procurement. In 2005, in the framework of the national strategic plan on green markets, the government launched a Colombian environmental label. Since then, it has defined 9 technical norms and certified 71 goods and services. In 2012, the government and the Colombian banking association, Asobancaria, signed the Green Protocol, a voluntary agreement involving 11 of Asobancaria's 24 member banks. The Green Protocol focuses on three areas: providing lending for green projects, improving the environmental performance of the signatories and introducing environmental screening in credit risk analysis of investment projects.

Notes

1. As of October 2013.
2. Although the VAT is supposed to be an *ad valorem* tax, in practice it was equivalent to a flat tax because the Ministry of Mines and Energy regularly changed the tax base.
3. Electric buses and taxis for public transport benefit from a reduced 5% VAT rate. All electric vehicles are exempted from the one-off tax.
4. Arauca, Guainía, La Guajira, Nariño, Norte de Santander and Vichada.

5. In 2012, the Incentive for Rural Capitalisation covered expenses for permanent crops, soil improvement and water management projects, machinery for agricultural and livestock production, infrastructure, biotechnology development and silvo-pastoral systems.
6. Water and waste services are jointly billed through a system established by the Drinking Water and Basic Sanitation Commission.
7. This activity is the main source of income for around 15 000 families (Defensoría Delegada para los Derechos Colectivos y del Ambiente, 2010).
8. Investment and current expenditure of the public sector (central government, municipalities, departments and CARs) and manufacturing industry. Includes expenditure on: i) pollution abatement and control, covering air protection, waste and wastewater management, protection and remediation of soil and groundwater, and other environmental protection activities (R&D, administration, education); and ii) biodiversity and landscape protection. May include expenditure on risk management.
9. SINA, the national environmental system, comprises the CARs, Sustainable Development Corporations, Environmental Research Institutes, Urban Environmental Units and MADS.
10. Measured as general government total expenditure as a share of GDP. General government includes central government, local government, social security funds and other government expenditure.
11. This increase is difficult to quantify as aggregated data on CARs' own revenue are not always reliable.

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PART I

Chapter 4

International co-operation

This chapter reviews Colombia's progress in achieving international commitments on environment. It looks at its co-operation with other countries in Latin American and the Caribbean and its participation in international forums, notably on climate change, sustainable development and marine issues. The chapter also addresses environmental co-operation in trade agreements and reviews progress in mainstreaming environment in official development co-operation.

Assessment and recommendations

Colombia has adopted an increasingly proactive approach to establishing international environmental policy objectives and has mainstreamed the environment in its international co-operation strategy. Part of this process has involved increased donor co-ordination, more interministerial co-operation and the engagement of civil society organisations. Colombia's main international environmental policy objectives focus on common and shared regional issues, global environmental challenges and how best to benefit from, and contribute to, international environmental activities.

Marine and coastal areas make up nearly half of Colombia's territory. They include a rich variety of marine ecosystems that require international co-operation for effective management. Many sensitive areas are under increasing pressures from both land-based and marine sources. The pressures will increase if Colombia's offshore oil and gas reserves are exploited. This would intensify the need to strengthen provisions for prevention of and response to oil spills, which have major shortcomings. Further efforts are also needed for the conservation and sustainable use of fish resources.

Colombia is a party to many, though not all, regional and global agreements for the protection of coastal and marine environment. In part to comply with international conventions, Colombia adopted a National Environmental Policy for Sustainable Development of Ocean and Coastal Areas and Islands in 2000, and established a National Programme of Research, Evaluation, Prevention, Reduction and Control of Marine Pollution from Marine and Land-Based Sources in 2004. They have provided a good framework for addressing these issues. Now would be a good time to assess progress and consider what additional measures might be needed. Combating the threat of aquatic invasive species necessitates the development of infrastructure for ballast water processing, which will require significant funding.

Leaving aside the marine environment, Colombia is a party to the major global environmental conventions and treaties. It also participates actively in numerous global environmental institutions. It has supported the concept of sustainable development globally and regionally, and integrated it into its national policy framework. Colombia championed the idea of Sustainable Development Goals to succeed the Millennium Development Goals after 2015. The proposal was adopted at the Rio+20 conference and proposals are being developed for submission to the UN General Assembly.

Colombia contributed less than 0.5% of global GHG emissions in 2010. However, emissions could increase by 50% by 2020 compared to 2000 – without taking account of deforestation, which remains a large source of emissions. As a non-Annex I party, Colombia was not required to achieve a specific GHG emission reduction for 2008-12. Nevertheless, it signed the Copenhagen Accord and made preliminary commitments for 2020 to increase the share of renewables in total power capacity, achieve zero net deforestation in the Colombian Amazon conditional on international financial support, and increase the use of biofuels in transport. The impact of the 2010 La Niña phenomenon

spurred efforts to develop a comprehensive climate policy addressing both mitigation and adaptation. Colombia is developing a low-carbon development strategy. However, these efforts have been hindered by a lack of analytical capacity, although this has been partially offset by international co-operation. Colombia has also benefited, and could benefit further, from the Clean Development Mechanism (CDM), nationally appropriate mitigation actions (NAMAs) and REDD+ (Reducing Emissions from Deforestation and Forest Degradation).

Colombia has benefited from international co-operation in developing a policy to strengthen its resilience to climate change, to which it is highly vulnerable. A national adaptation plan is expected to be adopted in 2014. A conceptual framework, guidelines for preparation of the plan, and five strategic priorities were agreed in 2012. Finalisation and implementation of the plan will face a variety of obstacles, not least co-ordinating the institutions involved and establishing financing mechanisms. The establishment of the national system of climate change should support co-ordinated action.

As a mega-biodiverse country, Colombia has been active in international initiatives to promote the conservation and sustainable use of biodiversity and it has received significant resources for protected areas. Its efforts to protect wetlands and the marine environment have received international recognition. Governmental initiatives have been complemented by co-operation involving non-government organisations. Colombia pioneered the establishment of a bio-trade programme to support rural communities and small and medium-sized enterprises in marketing natural resource-based products internationally. However, compared with other Latin American countries, Colombia appears to have scope to further develop bio-trade.

In the context of expanding trade relations, Colombia has entered into a growing number of bilateral and regional free trade agreements. Some contain provisions intended to safeguard and/or enhance the environment. However, increased trade can exacerbate some environmental pressures. Ex post evaluation of these agreements should be conducted, as foreseen in some of them.

The government is facing serious issues curtailing illegal trade of endangered species. Many habitats, including designated parks and reserves, are in areas affected by civil unrest and drug trafficking, and effectively are off limits for wildlife surveillance and enforcement. At the borders, lack of sufficiently trained customs inspectors further constrains control efforts. Despite public and private initiatives, it is estimated that 40-50% of all timber is harvested illegally, and it is thought that a significant fraction is traded.

Colombia is now one of the largest foreign direct investment (FDI) beneficiaries in Latin America, the largest share being in the oil and mining sector. This has intensified concerns about natural resource extraction, including by FDI, and its impact on ecologically sensitive areas and the rights of indigenous people. The *OECD Guidelines for Multinational Enterprises* have been invoked to address one environment-related instance in the coal sector. Colombia's outflows of FDI have also rapidly increased over the last decade, indicating a need for government to work with the private sector to promote good corporate behaviour in activities abroad. Several corporate social responsibility and sustainability initiatives are being undertaken through the Ministry of Commerce.

Official development assistance (ODA) provides a relatively small contribution to public environmental expenditure, though it has provided significant support in some areas, notably biodiversity. In recent years, environment-focused aid to Colombia has

increased, reaching about one-quarter of bilateral ODA in 2011. While aid strictly targeting environment has fluctuated, the greatest increase has been for aid targeting environmental sustainability in other sectors, such as government and civil society, sustainable forestry, water and sanitation, and, more recently, climate change. Colombia has benefited significantly from international environmental financing mechanisms such as the Global Environment Facility. It has also made good use of international financial institutions, particularly for environment-related infrastructure and natural disaster management. Finally, Colombia plays a leading role in South-South co-operation, including on environment-related issues.

Recommendations

- Reinforce efforts to develop a proactive policy for international environmental co-operation; continue to establish clear priorities that take account of Colombia's domestic needs and comparative advantage in contributing to international efforts to address environmental issues; fully engage public and civil society partners in these efforts; continue to promote South-South co-operation on environmental issues.
- Strengthen international co-operation and capacities for preventing and responding to spills of oil products and harmful substances; strengthen efforts to control land-based sources of marine pollution, especially those affecting the fragile ecosystems of the Caribbean.
- Assess the need to strengthen measures to protect the marine and coastal environment by: i) reviewing implementation of the National Environmental Policy for Sustainable Development of Ocean and Coastal Areas and Islands; ii) assessing the results of the National Programme of Research, Evaluation, Prevention, Reduction and Control of Marine Pollution from Marine and Land-based Sources; and iii) considering the potential benefits of adhering to other multilateral environmental agreements in this area.
- Finalise and adopt the policies on climate change mitigation and adaptation set out in the 2010-14 PND; assess what additional measures will be needed to achieve the objectives; strengthen scientific and economic analytical capacity to support implementation and further development of climate policies; continue to engage in international co-operative activities that can help develop such capacity and provide financial support for climate-related initiatives (e.g. CDM, NAMAs, REDD+).
- Assess the environmental impact of free trade agreements; consider how bio-trade could be expanded; strengthen the capacity of the customs service to control illegal trade in endangered species and other environmentally sensitive products.
- Promote compliance with the *OECD Guidelines on Multinational Enterprises* and Recommendation on Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas; consider including environmental provisions in bilateral investment treaties.

1. Objectives and policy framework

Colombia's policy objectives in the field of international environmental affairs have been articulated in a variety of high-level policy statements and in position papers for international negotiating forums. They have also been formulated in national strategy documents, mainly National Development Plans (PNDs, 2002-06, 2006-10, 2010-14), and

International Co-operation Strategies (2003-06, 2007-10, 2012-14). Some of the main objectives are to:

- Work with other countries in Latin American and the Caribbean to address shared and common problems.
- Contribute to global efforts to promote sustainable development, to implement the Rio conventions (on climate change, biodiversity and desertification) and other multilateral environmental agreements and to contribute to the development of new multilateral environmental agreements.
- Use international mechanisms to help achieve domestic environmental policy objectives, including multilateral environmental agreements, trade, investment and official development assistance (ODA); and align domestic and international objectives.

In 2012, the government adopted an International Co-operation Strategy which reiterated the international objectives of the 2010-14 PND.[1] Regarding environment, the strategy listed several issues requiring international co-operation: integrated management of biodiversity and ecosystem services, integrated management of water resources, climate change mitigation and adaptation, sustainable management of urban areas, renewable energy, and marine and coastal areas. While the PND had singled out climate change and biodiversity as the major challenges and opportunities, the strategy did not set priorities among the issues (Government of Colombia, 2012a). The strategy also specified areas where Colombia offered to share its experience, including water resource and hazardous waste management, air quality control, climate change, sustainable production and consumption, and economic instruments for environmental management.

Over the greater part of the last decade, the International Co-operation Directorate of the Presidential Agency for Social Action and International Co-operation has been in charge of co-ordinating international co-operation in Colombia (OECD, 2012a). In 2011, a new Presidential Co-operation Agency was created to: align aid with PND objectives; engage and co-ordinate all sectors and territorial entities and monitor aid flows and projects to improve aid effectiveness; diversify the sources of aid; manage USD 2.2 billion in official development assistance (ODA) by the end of 2014 (including USD 130 million for the environment sector); integrate external assistance into the national budget (only 10% of ODA is channelled through the national budget); achieve a better regional balance in the projects implemented; and consolidate South-South co-operation.

The Ministry of Environment and Sustainable Development (MADS) participates in the formulation of international environmental policy. It has the lead operational role with respect to developing and implementing Colombia's international environmental activities. In 2012, the International Affairs Office of MADS was restructured and its staff doubled to more than 20 people. Strategic planning of projects, including identifying potential sources of co-operation and financing, has been developed, along with a system monitoring co-operation initiatives. This exercise resulted in the approval of 27 projects for USD 155 million (including technical and financial co-operation) between January 2012 and October 2013 and the formulation of 41 projects for USD 371 million. Part of these resources will be allocated to forest conservation projects in the Colombian Amazon, environmental land use planning and conservation of tropical dry forest in the Caribbean and the lower Magdalena, and sustainable livestock production (MADS, 2013a).

MADS co-operates with other ministries in its international activities. Areas of co-operation include biodiversity, deforestation, environmental co-operation mechanisms in

free trade agreements, climate change, hazardous waste and chemicals management, natural areas, cleaner production and consumption, and integrated water management. MADS also works with the national police force's environmental police subdivision and makes efforts to co-ordinate with various institutions, including the Colombian Navy and the Customs Office, which play key roles in combating illegal trade and environmental crime.

Interministerial co-operation and engagement of non-government organisations (NGOs) and other elements of civil society, such as industry federations and representatives of indigenous groups, have taken on increased importance in recent years. This is due in part to the fact that broad public participation has become a requirement for country participation in international funding mechanisms established under environmental conventions and international platforms (e.g. the UN-REDD programme) and free trade agreements.

2. Bilateral and regional co-operation

Colombia is a party to formal bilateral environmental agreements, as well as to government-to-government agreements in the areas of trade, energy, agriculture, and science and technology that have environmental components.

Bilateral environmental agreements typically involve annual or biennial meetings, ad hoc workshops and joint training sessions, and often joint project initiatives. US-Colombia co-operation involves a six-year (2011-16) environment strategy financed by USAID. It includes investment in environmental governance, biodiversity and climate change (adaptation, mitigation and clean energy). Other US support assists Colombia with its efforts on low-carbon development and the reduction of greenhouse gas (GHG) emissions from deforestation and forest degradation. The European Union and Colombia co-operate within the framework of a multiyear strategy that in recent years has emphasised forest management, biodiversity and climate change. A bilateral agreement with Germany signed in October 2012 includes support to protected areas, coastal management and institutional strengthening. There is also a Colombia-Chile bilateral agreement on science and technology that deals in part with capacity building and hazardous waste management (see Sections 5 and 6).

Colombia is a party to neighbourhood commissions promoting integration and bi-national development with Venezuela, Brazil, Panamá, Peru, Ecuador and Jamaica. The commissions focus particularly on border region socio-economic development and environmental issues such as sustainable development of the Amazon, harmonisation of environmental legislation, illegal trafficking in endangered species, ecotourism and creation of marine and terrestrial protected areas. Technical bilateral committees oversee co-operation.

In other bilateral co-operation, Colombia has carried out exchanges of experts in the areas of fisheries and aquaculture and on capacity building on environmental licensing with Brazil, Cuba, Mexico and Peru, and on genetics, nutrition, pathology, breeding and feeding with Norway and Sweden.

Colombia is party to a broad spectrum of regional institutions and programmes. Some are regional components of global conventions and agreements; others emerged from country initiatives within Latin America and the Caribbean, such as the Cartagena and Lima conventions (see Section 3).

Within Latin America, the Amazon Cooperation Treaty Organization (ACTO), whose member states are Colombia, Brazil, Bolivia, Ecuador, Guyana, Peru, Suriname and Venezuela, agreed in 2010 to foster actions to preserve, protect, conserve and sustainably use the forest, biodiversity and water resources of the Amazon (ACTO, 2011). Colombia also is a member (along with Bolivia, Ecuador and Peru) of the Andean Community of Nations, which has an environmental work programme based on the Andean Environmental Agenda for 2012-16. This includes implementation of a regional biodiversity strategy and co-operative activities on water resources and climate change. Within the Pacific alliance,[2] Colombia co-operates with Chile, Mexico and Peru on climate change and green growth. The Organization of American States (OAS) and the Inter-American Development Bank also support regional environmental projects that involve Colombia.

The Forum of Ministers of the Environment of Latin America and the Caribbean dates back some 30 years. Ministers meet every one to three years to plan and review co-operative work and discuss current issues and future needs. Support is provided by the regional office of the United Nations Environment Programme (UNEP). In early 2012, the forum met to co-ordinate positions preparatory to the United Nations Rio+20 conference.

2.1. Transboundary water issues

Colombia has an extensive river system, draining principally north to the Caribbean, west to the Pacific and east into Amazonia. The major transboundary rivers have their origins in Colombia and flow into Venezuela and Brazil. To the south, a number of rivers cross into Colombia from Ecuador and Peru.

Colombia supports regional efforts on integrated watershed management, including provision of insight and training for national water management priorities. In 2005, it joined Bolivia, Brazil, Ecuador, Guyana, Peru, Suriname and Venezuela in a project on Integrated and Sustainable Management of Transboundary Water Resources in the Amazon River Basin (OAS, 2005). Funding is provided by the Global Environment Facility (GEF), the OAS and UNEP, which is the implementing agency. The project has produced a shared vision for the Amazon Basin among the eight countries, an analysis of the major environmental issues and threats, and an examination of the political and legal framework necessary for the sound development and management of the region. Colombia has also received support from the United Nations Economic Commission for Europe Convention on the Protection and Use of Transboundary Watercourses and International Lakes to strengthen negotiating capacities for managing transboundary watersheds.

In 2006, the Andean Council of Ministers of the Environment and Sustainable Development approved a five-year Andean Environmental Agenda with water resources as one of three major thematic areas. Supported by an array of international organisations, including the World Bank, the OAS and UNEP, the work programme includes a component on the promotion of integrated management in cross-border river basins, including pilot projects and advisory services. In 2011, the Andean Council of Foreign Ministers approved an Andean Strategy for the Integrated Management of Water Resources (CAN, 2011).

2.2. Transboundary air pollution

Transboundary air pollution ranks low on Colombia's list of environmental priorities. With prevailing air currents from the east, most airborne pollutants that are generated in Colombia and reach higher elevations are carried out over the Pacific without affecting

neighbouring nations. Colombia's biggest concern in this respect, albeit in a limited one, is smoke and particulate matter from fires in the Venezuelan and Brazilian Amazon.

According to the World Bank (2010), assessing occurrences of transboundary air pollution in Colombia and the rest of Latin America is constrained by a "limited capacity to assess, monitor and manage air quality in the region". Two years earlier, the Forum of Ministers of the Environment of Latin America and the Caribbean had identified these limitations and launched a process of technical consultations and planning which resulted in the creation of the Network on Atmospheric Pollution in Latin America and the Caribbean, with national focal points designated by Colombia and other members, and support from UNEP's regional office. Activities within the Network include technical exchanges, promotion of skills development and identification of alternative approaches to reducing air pollution. Consideration is also being given to the development of a framework agreement on atmospheric pollution that would ultimately lead to a regional convention.

Given the wide diversity of views among the potential parties as to the scope and commitment of a framework agreement (let alone a binding convention), it is unlikely that either of these instruments will be negotiated in the near future. The discussions and early activities within the network have, however, raised the visibility of air pollution as a priority issue for Colombia and its neighbours, including transboundary impacts.

3. Marine issues

3.1. Marine pollution

With 3 000 km of mainland coasts and islands in the Caribbean Sea and the Pacific Ocean, nearly half of Colombia's territory is made up of marine and coastal areas.[3] Some 11% of the population lives in coastal areas (mostly in the Caribbean), which contribute 40% to GDP (MMA, 2000; Invemar, 2012). Many marine ecosystems are represented on the Colombian coast, including coral reefs, sea-grass beds, beaches, rock reefs and cliffs, mangrove and coastal lagoons, and estuaries. These ecosystems are under increasing pressure from human activities. The main sources of marine pollution include untreated municipal wastewater, mining, industrial and port discharges, waste disposal and agricultural run-off (Vivas-Agua, 2012). The Magdalena, Atrato and Sinu rivers are major carriers of sediments and pollutants into the Caribbean Sea, while the San Juan, Mirá and Patá rivers contribute the most to discharges in the Pacific (Invemar, 2012). Pollution loads are higher in the Caribbean Sea, which receives run-off from the Magdalena River watershed, where most of the population lives and most economic activities take place. Recently concerns were raised about the impact of coal loading at port after a case of dumping at sea.[4]

Colombia has historically not been a seafaring nation. Most of its marine activities, including commercial fishing, are carried out within its extensive territorial waters. Marine and coastal areas have been given low priority, as development was concentrated in the central regions. Coastal settlements and economic activities have been developed with little planning, which has generated negative environmental impacts and affected the availability and quality of marine and coastal resources, the quality of life of the population and its economic development (DNP, 2005). In 2000, the Colombian Ocean Commission started developing a national policy on ocean and coastal areas. Adopted in 2007, it aims at safeguarding Colombia's maritime interests, including protection of the marine and coastal environment (CCO, 2007).

To date, Colombia has been spared large tanker spills, the last having occurred off Punta Manglares on the Pacific coast in 1976[5] (ITOPF, 2008). Pipeline ruptures and illegal taps have been the major causes of oil spills. However, proximity to the Panama Canal and growing ship traffic increase the risk of marine pollution. Maritime freight traffic in Colombia more than doubled in the past decade, driven by increasing exports of oil and coal. Some estimates expect such traffic to increase by more than 60% by 2018 with the entry into force of trade agreements with the United States and China (DIMAR, 2012). High levels of oil concentrations due to maritime traffic and oil activities are regularly reported in Cartagena Bay, in the Tolú and Coveñas areas in the Caribbean and in the Buenaventura and Tumaco ports area in the Pacific (Vivas-Agua, 2012). The risk will grow, as the petroleum industry plans to exploit Colombia's untapped offshore oil and gas potential.[6] The government recently banned drilling in certain tracts close to the tourist area and marine reserve of the San Andrés archipelago in the Caribbean Sea. This decision was taken after a regional government agency managing the Seaflower Marine Reserve took legal action against the National Hydrocarbons Agency to halt leases for oil exploration in the reserve, invoking the UN Convention on Biological Diversity, among other grounds.

Colombia is party to a number of global and regional agreements for the protection of coastal and marine environment that provide information, management guidelines, and technical and financial support to buttress national and regional efforts (Table 4.1). However, it has not ratified other important accords, including the 1982 Law of the Sea Convention, the 1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, the 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, the 1976 Convention on Limitation of Liability for Maritime Claims, the 2001 International Convention on the Control of Harmful Anti-Fouling Systems on Ships, the 1991 Environmental Protocol to the Antarctic Treaty or the 1999 Protocol to the Cartagena Convention Concerning Pollution from Land-Based Sources and Activities.

In part to comply with international conventions, Colombia adopted a National Environmental Policy for the Sustainable Development of the Ocean and Coastal Areas and Islands, which aims to strike a balance between economic development and ecosystem conservation through integrated marine and coastal spatial planning (MMA, 2000). It was followed by the 2004 National Programme of Research, Evaluation, Prevention, Reduction and Control of Marine Pollution from Marine and Land-based Sources, with a ten-year horizon (Garay, 2004). The monitoring system of marine and coastal water quality has developed strongly over the past decade and provides the basis for an annual report. It should serve as a valuable tool to assess the implementation of the programme, a task which is proceeding slowly (CTN CM, 2012).

A national contingency plan for responding to spills of oil products and harmful substances in marine waters, rivers and lakes was adopted in 1999. However, shortcomings, including fragmentation of operational responsibilities, lack of preventive measures and limited operational and financial capacities, hindered the effective implementation of the plan and, as a result, compliance with Colombia's international commitments (Cardenas, 2007; Gordillo, 2007). A revised plan seeking to develop response capacities and strengthen international co-operation was proposed in 2009 but has to be revised again in line with the recent law on disaster risk management (CTN CM, 2012).

The General Maritime Directorate of the Ministry of Defence (DIMAR) is the Colombian Maritime Authority responsible for implementing International Maritime Organization conventions. According to the directorate, despite a doubling of the maritime security budget over 2000-12, Colombia complies with fewer than half of requirements of the main conventions,[7] including those related to the International Convention for the Prevention of Pollution from Ships (MARPOL) (DIMAR, 2013). The lack of port reception facilities has been identified as an obstacle to the effective implementation of this convention, despite the adoption of a dedicated strategy in 2000 (Camelo, 2011). Since the new port policy (CONPES 3744, 2013) calls for significant infrastructure development, Colombia should address the environmental externalities of port activities. Additional efforts will be needed on garbage facilities, as the wider Caribbean region has been designated a special area under MARPOL Annex V.

As a party to the Latin American Agreement on Port State Control (Viña del Mar, 1992), Colombia co-ordinates efforts with 13 Latin and Caribbean countries to ensure that foreign vessels visiting national ports are in compliance with international conventions, and to assess the conditions of the ships and crews. Under the agreement, Colombia committed to inspect 20% of foreign ships entering its ports. In 2010, the inspection rate was 12%.

The issue of aquatic invasive species has been identified as one of the greatest threats to global marine biodiversity and ecosystems. Since 2003, Colombia has played a leading role in the Global Ballast Water Management Programme (GloBallast) of GEF, the International Maritime Organization (IMO) and the United Nations Development Programme (UNDP). GloBallast aims to reduce the transfer of harmful aquatic organisms and pathogens in ships' ballast water and prepare for implementing the related 2004 IMO convention. A strategic framework and a national action plan (2008-12) were adopted, followed by a national strategy and an action plan (2011-14) for the control and management of ships' ballast water and sediments (Plata, 2011). Risk assessments and sampling programmes have been carried out in five of Colombia's ten main ports. Every ship entering the waters under Colombia's jurisdiction, and its ports, is required to submit an IMO ballast water reporting form and present a ballast water management plan to the DIMAR (IMO, 2012). However, Colombia has no infrastructure for ballast water processing, and significant funding is needed to build it (Camelo, 2011).

Colombia co-operates with other Caribbean countries to implement a regional strategy for managing the invasion of lionfish in the Wider Caribbean as part of the UNEP Caribbean Environment Programme and its activities for implementing the Protocol on Specially Protected Areas and Wildlife of the Cartagena Convention. In 2013, Colombia adopted a plan for the management and control of lionfish in the Colombian Caribbean and a protocol for specimen capture, extraction and disposal (Resolution 675 of 2013).

Colombia is not a party to the 1999 Protocol to the Cartagena Convention Concerning Pollution from Land Based Sources and Activities.[8] With less than 30% of the population of coastal areas having access to sanitation, ratifying the protocol could help mobilise funding and technical support to improve the wastewater management system (Invemar, 2012). As part of the UNEP Caribbean Environment Programme, a 2006-11 regional project supported by GEF called Colombia, Costa Rica and Nicaragua: Reducing Pesticide Runoff to the Caribbean Sea helped address one important component of the land-based-sources problem by promoting good agricultural practices and developing capacity for monitoring pesticide residues (AUGURA, 2011).

Table 4.1. **Selected environment-related marine conventions**

	Colombia	Brazil	Chile	Costa Rica	Ecuador	Mexico	Nicaragua	Panama	Peru	Venezuela
International Maritime Organization (IMO) conventions on marine pollution										
1969 International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties		x	x		x	x	x	x		
1973 Protocol Relating to Intervention on the High Seas in Cases of Pollution by Substances Other than Oil		x	x			x	x			
1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter		x	x	x		x		x	x	
1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter			x			x				
1978 Protocol relating to the 1973 International Convention for the Prevention of Pollution from Ships	**x**	x	x		x	x	x	x	x	x
Annex I/II Regulations for the Prevention of Pollution by Oil/ for the Control of Pollution by Noxious Liquid Substances in Bulk										
Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form	**x**	x	x		x		x	x	x	x
Annex IV Prevention of Pollution by Sewage from Ships	**x**	x	x		x		x	x	x	x
Annex V Prevention of Pollution by Garbage from Ships	**x**	x	x		x	x	x	x	x	x
Annex VI Prevention of Air Pollution from Ships		x	x					x		
1990 International Convention on Oil Pollution Preparedness, Response and Co-operation	**x**	x	x		x	x			x	x
2000 Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances	**x**		x		x					
2001 International Convention on the Control of Harmful Anti-Fouling Systems on Ships		x				x		x		
2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments		x				x				
2009 Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships										
Liability and compensation										
1992 Protocol to the 1969 International Convention on Civil Liability for Oil Pollution Damage	**x**		x		x	x		x	x	x
1992 Protocol to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage	**x**				x	x		x		x
2003 Protocol on a Supplementary Fund (optional)										
1976 Convention on Limitation of Liability for Maritime Claims						x				
1996 Protocol to Amend the 1976 Convention on Limitation of Liability for Maritime Claims										
1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea										
2010 Protocol of 2010 to Amend the 1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea										
2001 International Convention on Civil Liability for Bunker Oil Pollution Damage								x		
2007 Nairobi International Convention on the Removal of Wrecks										
Regional conventions										
1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention)	**x**			x		x	x	x		x
1983 Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region	**x**			x		x	x	x		x
1990 Protocol Concerning Specially Protected Areas and Wildlife (SPAW) in the Wider Caribbean Region	**x**							x		x

Table 4.1. **Selected environment-related marine conventions** *(cont.)*

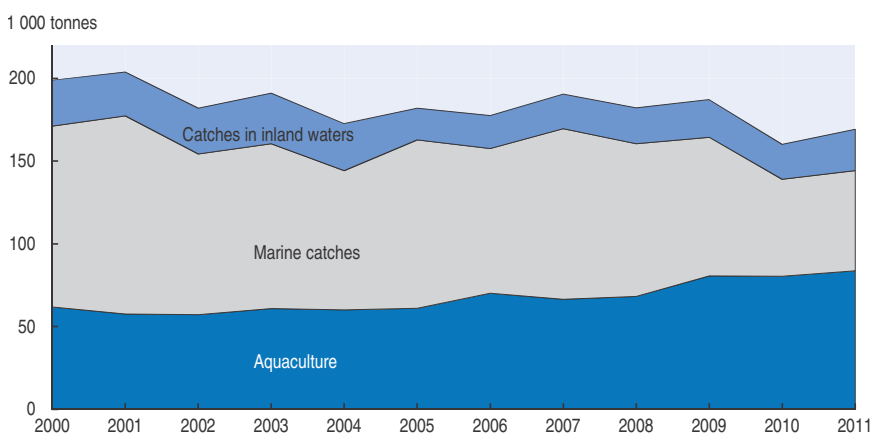
	Colombia	Brazil	Chile	Costa Rica	Ecuador	Mexico	Nicaragua	Panama	Peru	Venezula
1999 Protocol Concerning Pollution from Land-Based Sources and Activities (LBS)								x		
1981 Convention for the Protection of the Marine Environment and Coastal Zones of the South-East Pacific (Lima Convention)	**x**		x		x			x	x	
1981 Agreement on Regional Co-operation in Combating Pollution in the South East Pacific by Hydrocarbons and Other Harmful Substances in cases of Emergency	**x**		x		x			x	x	
1983 Protocol to the 1981 Agreement on Regional Cooperation in Combating Pollution in the South-East Pacific by Hydrocarbons and Other Harmful Substances	**x**		x		x			x	x	
1983 Protocol for the Protection of the South-East Pacific Against Pollution from Land-Based Sources	**x**		x		x			x	x	
1989 Protocol for the Conservation and Management of Protected Marine and Coastal Areas of the South-East Pacific	**x**		x		x			x	x	
1989 Protocol for the Protection of the South-East Pacific from Radioactive Pollution	**x**		x		x			x	x	
2002 Convention for Co-operation in the Protection and Sustainable Development of the Marine and Coastal Environment of the Northeast Pacific	**x**			x		x	x	x		

Note: X = accession, ratification, etc.
Source: IMO, UNEP.

3.2. Marine resources (fisheries)

The fishing sector does not play a large role in Colombia's economy, accounting for 0.2% of GDP, but it provides food and employment to local communities. Between 2000 and 2011, catches decreased by 38% while aquaculture production (dominated by tilapia from inland freshwaters)[9] grew by 35% to reach half of Colombian fishery production (Figure 4.1). The Pacific Ocean provides more than 95% of the volume of marine catches. Tuna catches (skipjack and yellowfin), which account for more than three-quarters of this production, are mostly exported (FAO, 2013).

Figure 4.1. **Fish production**[a]
2000-2011



a) Fish catches and aquaculture in inland and marine waters, including freshwater fish, diadromous fish, marine fish, crustaceans and molluscs.
Source: FAO (2013), *FAO Fisheries and Aquaculture Information and Statistics Service.*

StatLink http://dx.doi.org/10.1787/888932998025

There is evidence that fisheries and aquaculture have adverse impacts on aquatic biodiversity through overfishing; illegal, unreported and unregulated (IUU) fishing; use of non-selective fishing gear; and discharges of nutrients (INVEMAR, 2012). Unsustainable management of the resource, lack of knowledge, poor technological conditions and institutional and regulatory deficiencies have limited the sector's development and competitiveness (MADR and IICA, 2012). In recent years, Colombia has started to revise the policy and regulatory framework for the conservation and sustainable use of fishery resources. The main measures taken include proposed legislation on fisheries and aquaculture (2010), the creation of the National Aquaculture and Fisheries Authority (2011) and a national research agenda for fisheries and aquaculture (MADR and IICA, 2012). These efforts were also driven by an increasing number of port state measures implemented by major trade partners.

Colombia has been a member of the Inter-American Tropical Tuna Commission (IATTC) since 2007. It is a co-operating non-contracting party to the International Commission for the Conservation of Atlantic Tunas (ICCAT). These regional fishery management organisations establish conservation and management measures for tuna species and associated marine resources (dolphins, sea turtles, sharks). Colombian vessels carry observers from the IATTC to oversee catch limits, fishing techniques and by-catches of regulated species. In recent years, several Colombian vessels have been identified as engaging in IUU fishing (e.g. not respecting closure periods, not being registered in the regional vessel register, shark finning, discarding trash at sea) (US Department of Commerce, 2013). Responding to these concerns, Colombia has adopted regulations to better control its domestic fishing capacity and improve enforcement. In 2013, with IATTC support, it established the Fishery Observers Programme (2013) to put observers on board and in ports.

Shark fishing is prohibited in the Colombian Caribbean (San Andrés, Providencia and Santa Catalina Archipelago) and shark finning is banned throughout Colombia. In 2010, Colombia adopted a National Action Plan for the Conservation of Sharks, Rays and Chimaeras (Caldas, 2010). In 2011, discoveries were made in Colombia's Malpelo marine wildlife sanctuary of thousands of sharks that had been slaughtered for their fins (Yale School of Forestry and Environmental Studies, 2011). The Colombian navy seized an Ecuadorian fishing boat with an illegal catch. Later in the year, Costa Rican fishermen were detained after another large shark kill was discovered (International Whale Protection Organization, 2012). Following the second incident, Colombia and Costa Rica agreed at presidential level to join forces to combat illegal shark fishing and finning in their waters.

Colombia has signed a memorandum of understanding on the Conservation of Migratory Sharks adopted by the parties to the 1979 Convention of the Conservation of Migratory Species of Wild Animals; supports the voluntary International Plan of Action on Shark Conservation of the Food and Agriculture Organization (FAO); and has signed the 2007 UN General Assembly Resolution on Sustainable Fisheries, which includes provisions on sharks. It has also endorsed the Global Shark Conservation Initiative of a coalition of international NGOs. Colombia played an active role in bringing five commercially valuable shark species and manta rays under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) during the 2013 meeting of the parties (CITES, 2013). The country also led the creation of a working group to address trade in and conservation of queen conch.

Other marine species under threat in Colombian waters include turtles and marine mammals (e.g. humpback whales). Colombian NGOs have played a lead role in raising public awareness. They engage in a variety of activities to promote conservation of threatened species. This includes promoting an improved policy and legal framework to support effective conservation strategies, creating new protected areas and addressing the pressures that are adversely affecting turtles and marine mammals, especially coastal development (including port construction and an expanding tourism industry that is disrupting nesting beaches and reproductive cycles).

4. Global environmental co-operation: sustainable development and the Rio conventions

Colombia is a party to most major global environmental conventions and treaties. It also participates actively in global institutions active in the field of environment, including UNEP, the World Bank, GEF, the UNDP, the FAO, the UN Educational, Scientific and Cultural Organization (UNESCO) and the UN Conference on Trade and Development (UNCTAD), as well as the non-government International Union for Conservation of Nature (IUCN), Conservation International (CI), the Nature Conservancy (TNC) and the World Wildlife Fund (WWF). Co-operation often takes place through regional offices in Latin America and the Caribbean.

4.1. Sustainable development

As a developing country, Colombia accords great importance to the concept of sustainable development and its implied balancing of economic and environmental values. It maintains that the international community must continue to implement the principle of differentiated responsibility of countries at different levels of economic development in the financing and implementation of environmental management programmes.

Colombia has supported sustainable development nationally (Chapter 2) and internationally. It participated actively in all UN conferences related to sustainable development: the 1972 UN Conference on the Human Environment in Stockholm, the 1992 UN Conference on Environment and Development in Rio de Janeiro, the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg and the 2012 UN Conference on Sustainable Development in Rio (Rio+20). Among other activities, Colombia played a prominent role in the Latin American regional preparatory meetings for each of these global forums.

Following the 1992 Rio conference, the government promoted the Agenda 21 plan of action to achieve sustainable development adopted at the meeting, and sought to incorporate central elements into Colombia's national environment and development policies. In 2000, Colombia joined other nations in adopting the Millennium Development Goals (MDGs), which include environmental sustainability. MDG objectives and indicators for Colombia were specified in a document issued by the Council for Economic and Social Policies (CONPES) in 2005 (CONPES Document 91). A 2012 assessment showed significant progress on all indicators but pointed out the challenge of overcoming gaps between regions (Government of Colombia, 2012b). Out of nine targets under MDG 7 on environmental sustainability, two were already achieved (phase-out of ozone-depleting substances, access to safe drinking water for the rural population), three were likely to be achieved (protected areas with management plans, urban population with access to safe drinking water and to basic sanitation), two were unlikely to be achieved (reforested area,

households living in slums) and the status of two others was unclear (protected areas in proportion of total territory, rural population with access to basic sanitation) (Table 4.2). Limitations in data quality and availability have been an impediment to the assessment of progress towards the MDGs. This led the government to review the MDG objectives and indicators in 2011 (CONPES Document 140).

Table 4.2. **Millennium Development Goal 7: Environmental sustainability**

Indicators[a]	Baseline	Current status[b]	2015 target
Reforested area (ha/year)	(2003) 23 000	(2010-11) 17 415	(National) 23 000
Consumption of ozone-depleting substances (ODP tonnes)			
CFC	(Avg 1995-97) 2 208.2	(2011) 0	(MDG) 100% reduction by 2010
HCFC	(Avg 2009-10) 225.6	(2011) 217.4	(MDG) Freeze by 2013; 10% reduction by 2015; 35% reduction by 2020; 67.5% reduction by 2025; 97.5% reduction by 2030; phase out by 2040
Areas designated in the national system of protected areas in % of total territory	(1999) 4.5%	(2011) 6.1%	(National) 6.6%
Protected areas with management plan (%)	(1999) 17.4%	(2011) 92.9%	(National) 100%
Population with access to safe drinking water (%)			
Urban population	(1993) 94.6%	(2011) 97%	(MDG) 97.3%
			(National) 99.2%
Rural population	(1993) 41.0%	(2011) 73%	(MDG) 70.7%
			(National) 78.2%
Population with access to basic sanitation (%)			
Urban population	(1993) 81.8%	(2011) 90%	(MDG) 90.9%
			(National) 96.9%
Rural population	(1993) 51.0%	(2011) 68%	(MDG) 75.5%
			(National) 72.4%
Households in slum areas (%)	(2003) 19.9%	(2011) 14.7%	(National) 12.36% (2014); 4% (2020)

a) Excluding additional indicators for which no target was set for 2015: proportion of land area covered by forest and natural forest and GHG emissions.

b) Figures should be taken with caution as various data reports provide different information and several methodological changes have occurred since the indicators were defined in 2005. Protected areas: terrestrial and marine areas (see also Chapter 7).

Source: Government of Colombia (2012), "Informe de Seguimiento a los Objectivos de Desarrollo del Milenio 2012"; UNEP Ozone Secretariat.

In 2002, the environment ministers of Latin America adopted a Latin American Caribbean Initiative for Sustainable Development at a special meeting held in conjunction with the WSSD. The initiative has since guided much of the work of the Forum of Ministers of the Environment, including regional preparations for Rio+20, which saw Colombia and Guatemala propose development of a suite of sustainable development goals in furtherance of the MDGs (Box 4.1).

4.2. Climate change

In 2010, Colombia contributed 0.4% of global GHG emissions excluding land-use change and forestry. Its economy has become less carbon intensive during the past decade,

Box 4.1. **Colombia's initiative on sustainable development goals**

At the UN General Assembly in September 2011, Colombia presented a proposal to establish sustainable development goals (SDGs) as part of the results of the UN Conference on Sustainable Development in 2012 (Rio+20). The proposal was endorsed by Guatemala, then by Peru and the United Arab Emirates before gaining support from many other countries.

The objective is to build a goal-oriented framework to support the implementation of Agenda 21 and the Rio principles. SDGs should contribute to poverty eradication, catalyse implementation, address gaps in implementation of sustainable development measures, integrate the three dimensions of sustainable development, be few in number and easily communicated, and improve ability to track progress. SDGs should build upon the MDGs and their application should allow for varied country and regional circumstances and priorities. A list of indicative thematic areas was proposed, including poverty eradication, food security, water and sanitation, energy, sustainable and resilient cities, oceans, enhanced capacity of natural systems to support human welfare, sustainable consumption and production patterns, and enhanced employment and livelihood security.

The resolution to establish an inclusive and transparent intergovernmental process to developing global SDGs to be agreed by the UN General Assembly was adopted as part of the outcome document of the Rio+20 conference. The Open Working Group on Sustainable Development Goals will submit a report to the UN General Assembly at its sixty-eighth session (September 2013 to September 2014) containing a proposal for SDGs for consideration and action.

Source: MADS (2012), "Concept Note on Sustainable Development Goals", Governments of Colombia, Peru, and United Arab Emirates; United Nations (2012), *Report of the United Nations Conference on Sustainable Development*, Rio de Janeiro, Brazil, 20-22 June.

but this trend is expected to reverse with growing motorisation rates and increased use of coal for power generation (Chapter 1).

Colombia is particularly vulnerable to climate change. It has one of the highest rates of disaster occurrences in Latin America, mostly floods and landslides. Between 2000 and 2010, the country surpassed historical levels of flooding along the major rivers. At the same time, some regions of the country suffered the driest periods in 30 years. Colombia will face increased climatic variations in the future that will cause additional alterations to those already evident in coastal zones, glacial areas, climate-sensitive ecosystems and hydrological systems (Adaptation Fund, 2012). It is expected that Colombia's Caribbean region will change from a semi-humid climate (i.e. current conditions) to semi-arid, and finally arid by the end of the 21st century. In the Colombian Andes, parts of the Cundinamarca, Boyacá, Tolima, Huila and eastern Valle del Cauca departments are expected to change from semi-humid to semi-arid (Government of Colombia, 2010). Preliminary estimates suggest that the annual cost of climate change impacts (loss of agricultural production, reduced water availability for hydroelectricity, damage to homes, loss of ecosystems) could reach 1.9% of GDP by 2050 (ECLAC, 2013).

Policy objectives and framework

Colombia ratified the UN Framework Convention on Climate Change (UNFCCC) in 1995 and the Kyoto Protocol in 2001. As a non-Annex I party, it was not required to achieve a specific GHG emission reduction in 2008-12. It is, however, committed to take measures to

reduce its GHG emissions and to report periodically on its emission levels and remedial efforts. Colombia submitted national communications to the UNFCCC in 2001 and 2010, including GHG emission inventories for 2000 and 2004. It signed the Copenhagen Accord and made preliminary commitments for 2020 to ensure a 77% share of renewables in total power capacity (unilateral action), and, subject to support from developed countries, achieve zero net deforestation in the Colombian Amazon and increase the share of biofuels (ethanol and biodiesel) in the fuel mix by 20%.

Colombia started developing an outline of its climate policy in 2002. It also participated in international climate change discussions; for example, it was an early supporter of the Cartagena Dialogue for Progressive Action, an informal grouping of now some 40 developed and developing countries with a shared interest in achieving consensus on the best way forward in confronting the climate change risk and committed to becoming or remaining low carbon societies. Colombia is also part of the Independent Alliance of Latin America and the Caribbean (AILAC) seeking an ambitious outcome in the UNFCCC negotiations. It is one of seven countries establishing the Global Commission on the Economy and Climate, in September 2013, to accelerate the transition to a low-carbon economy. Since 2012, Colombia has been an active board member of the Green Climate Fund, the financial mechanism established by the UNFCCC to catalyse climate finance. However, not until 2010, after floods associated with La Niña phenomenon, did climate change gain political momentum in Colombia. The 2010-14 PND stated that by 2014 Colombia should: *i)* be implementing a national policy on climate change; *ii)* have created a national system of climate change; *iii)* have formulated a national adaptation plan with a financing strategy; and *iv)* have formulated a low carbon strategy including emission reduction from deforestation and implemented sectoral mitigation plans. In 2011, CONPES approved the Strategy for the Articulation of Policies and Actions on Climate Change (CONPES 3700). The document established a new institutional framework for co-ordinating climate change policy (Chapter 2). However, as of mid-2013, the decree creating a national system of climate change had yet to be passed.

Mitigation

Pending the publication of a GHG emission scenario and mitigation options developed as part of the Colombian Strategy for Low Carbon Development, only partial studies are available (Cadena et al., 2009; ECLAC, 2013). They suggest that total GHG emissions could increase by 50% by 2020 compared to 2000, without considering changes in emissions from deforestation. Emissions from fuel combustion would increase by more than 75% and emissions from agriculture by more than 30%. Among mitigation options considered in the partial studies, reducing the oversupply of aging urban public buses, increasing private car occupancy and improving energy efficiency measures could yield positive net benefits to the economy (negative cost) provided that financial, regulatory and knowledge barriers are overcome. Building mass transit systems and increasing the share of biofuels were assessed as having the greatest mitigation potential but would entail large upfront capital costs. Agriculture, forestry and land-use change also present important mitigation opportunities due to their high contribution to GHG emissions. The lack of an adequate scientific and economic base has been a key obstacle in the development of climate policies. Colombia should strengthen its analytical capacity, building upon technical and financial support it receives from various international sources.

Although Colombia has not yet developed a comprehensive policy on climate change, it has initiated a broad range of projects on climate mitigation. Priority has been given to the development of projects under the Clean Development Mechanism (CDM) of the Kyoto Protocol. When adhering to the Copenhagen Accord, the government suggested that CDM projects could have an emission reduction potential of 54.8 million tonnes of CO_2 equivalent (Mt CO_2 eq) by 2012. In the first quarter of 2012, the national portfolio included 190 CDM projects representing a reduction potential of 23 Mt CO_2 eq per year, much less than expected. As in other countries, high transaction costs of CDM projects and volatility of carbon prices have hampered the development of CDM projects in Colombia (Cadena et al., 2011). Of the total portfolio, 80 projects had been approved by MADS, Colombia's Designated National Authority, and 42 had been registered by the UNFCCC. Only 14 had Certified Emission Reductions (CERs) issued, for 2.5 Mt CO_2 eq (MADS, 2013b). The mechanism successfully supported the development of mass transit systems: the TransMilenio in Bogotá was the first CDM transport project to be approved by the UNFCCC and served as a benchmark for other large cities in Colombia and elsewhere. In 2012, while the CDM portfolio was dominated by projects in the industrial sector, the waste sector provided for larger actual emission reductions. Recent projects cover reforestation of land dedicated to extensive cattle grazing. However, there is no explicit project on agriculture. Colombia should investigate opportunities in this sector (e.g. improving methods of raising agriculture and livestock).

As part of the Mitigation Action Plans and Scenarios (MAPS) programme,[10] Colombia benefits from collaboration with other developing countries to develop models and assess mitigation actions, including in agriculture. A working group on nationally appropriate mitigation actions (NAMAs) was established to agree on measurement, reporting and verification approaches and to register NAMAs in the UNFCCC pilot NAMA registry. Colombia has a number of NAMAs in progress. It has recently presented an official submission to the NAMA Facility for transit-oriented development and for solid waste management.

Since the early 2000s, Colombia has implemented a number of policies and measures to improve energy efficiency. They include a regulatory framework on energy efficiency standards (2000), a law for the promotion of energy efficiency and renewables (2001), an intersectoral commission to formulate and co-ordinate energy-related policies (2004) and the 2010-15 National Plan for Rational and Efficient Energy Use and Non-conventional Energy Sources (NCRE, i.e. renewables other than large-scale hydro), known as PROURE. However, these measures have not been effective at scaling up the adoption of efficiency technologies. Major impediments include direct and indirect subsidies for electricity consumption (Chapter 3), a lack of incentives for electricity distributors to foster energy efficiency investment among customers, a lack of institutional continuity and weak enforcement of new standards (CIF, 2010). PROURE sets an objective of saving 14.8% of electricity consumption by 2015: 8.7% in the residential sector, 3.4% in the industrial sector and 2.7% in the commercial sector. The objective is expected to be reached mostly through lighting substitution and replacement programmes for appliances and industrial motors (MME, 2010). Fuel subsidies, which are a major obstacle to improving energy efficiency in the transport sector, have been significantly reduced in recent years. However, implicit subsidies remain (Chapter 3). Together with the price difference between petrol and diesel, they have contributed to higher carbon emissions from the transport sector.

In 2012, Colombia joined nine countries, plus the World Bank, European Commission and UNEP, in a new Climate and Clean Air Coalition focused on reducing emissions of three so-called short-lived climate pollutants: black carbon (soot), methane and hydrofluorocarbons. Colombia is also participating in the Global Methane Initiative seeking to reduce emissions of methane through containment or capture.

Colombia has significant renewables potential that remains to be tapped. Hydropower is the major source of power generation but low storage capacity makes the system vulnerable to serious drought in El Niño periods. Since the mid-1990s, regulatory incentives have been designed to remunerate capacity expansions that increase security of supply and reliability of the interconnected system. This policy has favoured conventional technologies (hydro, gas and coal) and hindered the development of NCRE (CIF, 2013). The 2010-14 PND calls for a reform of the energy sector promoting investment in NCRE. PROURE sets objectives of raising the share of NCRE in power capacity from 1.5% to 3.5% by 2015 and 6.5% by 2020 in the national interconnected system, and from 8% to 20% by 2015 and 30% by 2020 in off-grid areas. In 2011, the Colombian energy regulator introduced a resolution to extend the payment for "firm" energy to wind power. However, the amount may not be sufficient to attract private investment (Robinson et al., 2012). While developing policy instruments to promote renewables, Colombia should consider mechanisms that internalise, environmental and social costs of projects (Dyner et al., undated).

Colombia has made significant progress in developing its national strategy for reducing emissions from deforestation and forest degradation (REDD+). It developed a national REDD readiness preparation proposal with the support of multiple institutions, including civil society organisations, the Forest Carbon Partnership Facility, UN-REDD and other donors (see Section 6) (UN-REDD, 2013). The programme is the result of more than three years of preparation involving broad participation by national and regional government bodies, NGOs and other civil society groups, indigenous peoples, small farmer communities, Afro-Colombians and the private sector. UN-REDD will support national efforts to: i) organise and consult; ii) develop a national forest reference emission level; and iii) design systems for national forest monitoring and information on safeguards. Colombia has made good strides in developing a forest monitoring system. However, the formalisation of an institutional structure for REDD+ is still needed, as is the development of reference levels and a safeguard information system as part of UNFCCC requirements for participation in a future REDD+ mechanism. Reviewers of the programme have recommended including actors involved in the main activities causing deforestation, such as mining companies and representatives of small farmers and livestock ranchers, in the institutional framework. They also underline the importance of good co-ordination among donors.

Adaptation to climate change

International technical and financial assistance has significantly helped establish climate change adaptation as a long-term approach in Colombia's policy making. Among the most important initiatives, a programme on defining the vulnerability of bio-geophysical and socio-economic systems due to sea level change in coastal zones, and related adaptation measures, finalised in 2003 with support from the Netherlands, was a significant input to the first national communication to the UNFCCC. It led to the development of the National Environmental Policy for Sustainable Development of Oceanic, Coastal and Island Areas. The 2006-11 GEF Integrated National Adaptation Project

(INAP) assessed adaption measures in high mountain ecosystems and island areas and human health concerns from the expansion of vectors for malaria and dengue. Through INAP, climate change and variability scenarios were developed at the national level and then re-scaled using detailed information based on an upgraded hydrometeorological monitoring network in mountainous regions. In 2010, the project on Integration of Ecosystems and Adaptation to Climate Change in the Colombian Massif received support from the UN Millennium Fund, the Spanish government, the UNDP, the FAO, the UN Children's Fund and WHO's Pan American Health Organization. The project provided an initial assessment of Colombian vulnerability to climate change and evaluated opportunities to introduce climate change considerations into national policy documents, including the 2010-14 PND. More recently, the Climate and Development Knowledge Network (CDKN) developed a tool to assess agricultural vulnerability to climate change in the Upper Cauca River Basin. It also supported the coastal District of Cartagena in mainstreaming climate change adaptation into its land-use planning and helped the Ministry of Transport to mainstream adaptation into its sectoral planning. The UNDP co-ordinates a project aimed at integrating climate resilience into development and land-use planning in the capital, Bogotá, and surrounding regions.

Despite positive developments, important challenges remain, including mainstreaming climate change adaptation into all sectors; assessing the long-term impacts of climate change, particularly on long-lived infrastructure and path-dependent developments of land-use patterns; establishing a clear division of responsibilities between a future national climate change system, the National Disaster Risk Management System and the National Environmental System; understanding the impact of climate change on important ecosystem services; and understanding the links between environmental quality and resilience in order to create opportunities for projects that both benefit climate resilience and protect the environment (OECD, forthcoming). While donor support is currently important, Colombia should develop sustainable mechanisms of domestic financing to the extent possible. As required by the PND chapter on environmental sustainability and risk prevention, the conceptual framework and guidelines for the national adaptation plan were published in August 2012. Five strategic priorities were identified to guide adaptation planning: raising awareness; generating information and knowledge to assess climate risk; carrying out land-use planning; implementing adaptation actions; and strengthening response capacities. The national adaptation plan is expected to be finalised in 2014.

4.3. Biological diversity

Colombia is one of the world's few mega-diverse countries (Chapter 7). It has placed ever greater importance on international mechanisms to support domestic actions to protect and manage its natural resources. Colombia is party to 18 multilateral environmental agreements related to biodiversity. It ratified the Convention on Biological Diversity (CBD) in 1994, became a party to the Cartagena Protocol on Biosafety in 2003 and was the first signatory of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization in 2011. In 2012, Colombia adopted a new National Strategy for Integral Management of Biodiversity and Ecosystem Services to align national objectives with the 2011-20 Aichi Biodiversity Targets.

In support of the Convention on Wetlands of International Importance (Ramsar), Colombia has formally designated five wetlands totalling 458 525 ha. The estuarine system

of the Magdalena River delta is the largest. It has been recognised by the UNESCO Man and the Biosphere Programme, as have as four other nature reserves. In 2004, the environment ministers of Colombia, Costa Rica, Ecuador and Panama established the Eastern Tropical Pacific Corridor, agreeing to protect 2.1 million km2 of islands and marine areas. This led to two new UNESCO World Heritage sites, one in Panama and the other in Colombia: the Malpelo Fauna and Flora Sanctuary. Colombia is a regional and global leader in establishing marine parks and sanctuaries. Coralina, the Corporation for the Sustainable Development of the Archipelago of San Andrés, Old Providence and Santa Catalina, was awarded top honours at the 2010 Nagoya meeting of parties to the CBD for the establishment of the Seaflower Biosphere Reserve and marine protected area. However, expanding marine protected areas in line with the Aichi objectives was set back by the ruling of a court in The Hague on a jurisdictional dispute with Nicaragua (Chapter 7).

NGOs play important roles in nature conservation in Colombia. For example, WWF Colombia, in co-operation with NGOs in Venezuela and Ecuador, has been working to protect wildlife and habitats in the Northern Andes Eco-regional Complex, extending from the Colombia-Venezuela border in the north to Peru in the south. It also works with government organisations and other NGOs for the conservation and sustainable use of biodiversity in Colombia and Venezuela in the Orinoco Basin and in the Chocó Eco-regional Complex, which runs along the entire Colombian Pacific coast, from south-west Panama to north-west Ecuador. The Nature Conservancy is supporting important initiatives in the Magdalena river basin and the Amazon, and has also technically supported Colombia's biodiversity offset strategy. Conservation International has focused efforts on marine conservation and integrated watershed management, among other themes. The IUCN also has a long-standing programme with Colombia on biodiversity conservation. Private sector initiatives also contribute to efforts to establish reserves for critical or representative ecosystems in Colombia.

Colombia has pioneered the establishment of a biotrade programme in support of the CBD objectives. With UNCTAD support, MADS and the Humboldt Institute launched a sustainable bio-trade programme, Biocomercio Sostenible, in 1999 (UNCTAD, 2012). The programme established a network throughout Colombia, through which technical assistance is provided to rural communities and medium-sized enterprises. The resource focus has included natural ingredients; helicons and foliage; Amazonian fruit; honey and derivatives; sustainable agriculture; handicrafts; ecotourism; and flora and fauna (e.g. caiman, flowers). Since 2008, the National Technical Committee on Competitiveness and Biodiversity has managed the country's bio-trade programme. Other key actors are the Fondo Biocomercio (bio-trade fund), which helps businesses carry out bio-trade activities and gain access to international markets; the Sinchi Institute; and Corporacion Biocomercio Sostenible, an NGO that promotes the use of biodiversity with emphasis on bio-trade.

At the regional level, following successful completion of an UNCTAD-supported pilot phase in 2000-01, the environment ministers of the five Andean countries agreed to establish a fully fledged programme on bio-trade to support sustainable development, linked especially to Agenda 21 and the UN Millennium Declaration. Subsequently, the General Secretariat of the Andean Community, the Andean Development Corporation and UNCTAD entered into partnership to create the Andean BioTrade Programme. The objectives include promoting local and national capacity to develop bio-trade businesses, identifying market opportunities, mobilising finance for bio-business and supporting

South-South and regional integration and co-ordination in the field. The programme provides technical assistance in the form of training, workshops and technical missions. Colombia also benefits from the Amazon BioTrade Programme, a partnership between ACTO and UNCTAD that is financially and technically supported by the Netherlands, Germany and the United Nations Foundation. According to the Humboldt Institute, the Colombian market in bio-trade products is estimated to be worth USD 25 million a year (Fondo Biocomercio, undated). However, in 2007-08, the volume of sales generated in biodiversity-based sectors in Colombia was much lower than in other Latin American countries (UNCTAD, 2012).

4.4. The UN Convention to Combat Desertification

About 17 % of Colombia's total area is affected by desertification, land degradation and drought (UNCCD, 2012). The Caribbean, Andean and Eastern Plains regions are the most affected, which means the vast majority of economic activities are located in areas vulnerable to desertification. Colombia ratified the UN Convention to Combat Desertification in 1999. It formulated a national action plan in 2004 and is now reviewing it to align it with the 2008–18 strategic plan of the convention (MAVDT, 2004). Progress was made in developing a soil information system using remote sensing and a geographic information system, and projects have been implemented to restore degraded lands in some of the most affected departments (Cesar, Nariño, Boyacá and Cauca). The main challenges to implementing the national action plan include strengthening institutional capacity, developing synergies between the Rio conventions and implementing the monitoring programme for land degradation and desertification, including integration of the combat against desertification in sectoral agendas (MADS, 2012).

5. Trade, investment and environment

5.1. Trade and environment

Colombia has liberalised trade over the past decade. Between 2000 and 2011, trade in goods and services rose from 33% of GDP to 39%, but it remains below the respective OECD and Latin America averages of 58% and 43% (Chapter 1). Export growth was underpinned by higher sales of mineral-based commodities (crude oil and oil products, coal, ferronickel and gold). The United States is Colombia's biggest trade partner while the European Union is its second export market and third largest source of imports after the United States and China.

Colombia has adopted a strong trade policy that promotes closer integration with Latin America and the Caribbean, as well as the rest of the world. It has signed, and continues to actively negotiate, agreements with the aim of ensuring preferential access to strategic markets (WTO, 2012). As of mid-2013, it was party to nine free trade agreements (FTAs) that were in force (concerning goods) with 16 countries, mostly in the Americas. In 2013, additional trade agreements were signed with Korea, Costa Rica, Panama, Israel and the Pacific Alliance, and negotiations were under way with Turkey and Japan (MCIT, 2013). The FTA with the United States, which came into force in 2012, incorporates an environment chapter and a comprehensive implementation mechanism (Box 4.2). Other FTAs that include environmental provisions include those with Canada, Chile, the EU (under provisional application since August 2013) and Korea, as well as those being negotiated with Turkey (OECD, 2012b). Among Colombia's 22 bilateral investment treaties

Box 4.2. **Environment in the Colombia-US Trade Promotion Agreement**

In 2007, Colombia and the United States signed a Trade Promotion Agreement, which entered into force in 2012. It was estimated that it could raise US exports to Colombia by USD 1.1 billion and Colombian exports to the United States by USD 487 million. The agreement includes an environment chapter specifying commitments that will be subject to the same level of accountability as other areas, such as market access and intellectual property rights. The key elements of the environment chapter are that it:

- Requires both countries to at least maintain current levels of environmental protection at home and to strive for higher environmental standards, as well as effective enforcement of environmental laws.
- Requires both countries to live up to the commitments made in international environment agreements to which both countries are parties, and sets up a formal dispute settlement process within the agreement that makes each party answerable to the other if either fails to meet these commitments.
- Ensures that the public can continue to provide its perspective on whether the agreement's environmental commitments are being met, and how practices can be improved as the agreement is implemented; to that end, the United States and Colombia will set up a formal mechanism for interested stakeholders to submit their views on implementation of the environment chapter.
- Provides for a public submission process through an independent secretariat for effective enforcement of the Parties' environmental laws.
- Establishes an Environmental Affairs Council of senior-level officials to consider and discuss the implementation of the environment chapter, which is required to involve the public in its work.
- Specifically recognises the priority placed on protecting and conserving Colombia's rich biological diversity.

An Environmental Co-operation Agreement (ECA) was signed in April 2013 to facilitate the achievement of the environment chapter's obligations. It lists possible priority areas for environmental co-operation, including strengthening environmental governance and enforcement capacity; strengthening the conservation and sustainable use of natural resources; promoting mechanisms to support the conservation and sustainable use of biological diversity; supporting more efficient production processes and technologies, including those that reduce toxic chemical emissions; strengthening capacity to review and evaluate the environmental effects of trade agreements; and increasing access to cleaner energy.

Source: US International Trade Commission (2006), *US-Colombia Trade Promotion Agreement: Potential Economy-Wide and Selected Sectoral Effects*; Office of the United States Trade Representative (2013) *www.ustr.gov/uscolombiatpa/environment*; US Department of State (2013), *Environmental Cooperation Agreement between the Government of the United States of America and the Government of the Republic of Colombia*.

in force, signed or being negotiated, the one with Turkey will be the first to include environmental provisions.

FTA environmental provisions have resulted in various co-operation projects, including biodiversity and climate change education, funded by Canadian fast-start financing; bio-trade initiatives; and development of the Colombian Cleaner Production Centre with support from Switzerland (George, 2013). Some projects have been led by the private sector; examples include production of higher quality coffee and implementation

of environment-friendly farming practices (OECD/WTO, 2013a and 2013b). In 2011, to promote innovation and seize opportunities arising from trade agreements, the Ministry of Commerce, Industry and Tourism launched the Productive Transformation Programme, which aims at improving the productivity and competitiveness of sectors with high export potential and at diversification into higher value-added exports. It includes activities such as the organisation of sustainability workshops and the development of a portfolio of sustainable goods and services.

The United States conducted an ex ante assessment of the environmental impacts of its FTA with Colombia but did not assess the impacts in Colombia. It noted only that the agreement could have several positive environmental consequences. The EU's sustainability impact assessment listed potential significant impacts, including deforestation and reduced biodiversity from expansion of agriculture and timber industries, and increased discharge of pollutants from manufacturing, agriculture and mining (George and Serret, 2011). Both the US and EU FTAs include provisions for ex post assessment of their environmental impacts.

5.2. Investment and environment

Foreign direct investment (FDI) inflows started increasing in 2005 and reached a record level in 2011 of almost USD 14 billion (Bank of the Republic, 2013). Colombia is one of the largest FDI beneficiaries in Latin America (OECD, 2012b). The EU and US are the major sources of investment, with the largest share absorbed by the oil and mining sector. The growth of investment has intensified the debate about the conflicts between natural resource extraction, including by FDI, and policies for the protection of ecologically sensitive areas and the rights of indigenous and Afro-Colombian peoples. FDI outflows also rapidly increased, from USD 4.7 billion in 2005 to USD 7.8 billion in 2011, suggesting a need to monitor and influence the environmental behaviour of Colombia's overseas firms.

In December 2011, Colombia became the 43rd adherent to the OECD Declaration on International Investment and Multinational Enterprises. As a new adherent, Colombia committed to providing national treatment to foreign investors and promoting responsible business conduct. In accordance with the *OECD Guidelines for Multinational Enterprises*, part of the OECD Declaration, Colombia established a national contact point (NCP), responsible for promoting observance of the guidelines, in June 2012. Located in the Ministry of Trade, Industry and Tourism, it has a monopartite structure[11] and a multi-stakeholder advisory board with four members, representing the private sector, NGOs, labour unions and academia. The board advises the NCP and oversees its activities. The ministry allocated resources to hire a person to head the NCP. In addition, public funds are being used to promote national activities in Bogotá and other cities around the country (OECD, 2012c). Since 2000, NCPs of the *OECD Guidelines for Multinational Enterprises* have considered two instances in Colombia, one of which was related to a coal company breaching the guidelines on several chapters, including the one on environment (OECD, 2011). The outcome of the process was mixed (Box 4.3).

In light of the importance of the mining sector, in 2011 Colombia adhered to the OECD Recommendation on Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas (OECD, 2012b). It complements the Guidelines for Multinational Enterprises and provides detailed recommendations for implementing responsible supply chains of minerals, including how companies can help respect human rights and avoid contributing to conflict through their mineral purchasing decisions and

Box 4.3. *OECD Guidelines for Multinational Enterprises*: Cerrejón Coal

Cerrejón Coal, one of the largest open-pit coal mines in the world (accounting for nearly 40% of Colombia's coal production), is co-owned by BHP Billiton (Australia), Anglo-American (UK) and Xstrata (Switzerland, now Anglo-Swiss Glencore Xstrata). In 2007, a case was filed against the company through the Australian NCP and later the Swiss NCP. The submission claimed the company had breached the General Policies, Disclosure and Environment sections of the *OECD Guidelines*. It also claimed that Cerrejón has attempted to depopulate an area of the La Guajira peninsula by destroying the township of Tabaco and forcibly expelling the remaining population through a purported expropriation.

In 2007, the UK NCP organised a meeting in London with local Cerrejón Coal management, the Australian and Swiss NCPs, the companies and the complainants. A proposed third-party review initiated by Cerrejón Coal was accepted by the NCPs. Published in 2008, the review recognised Cerrejón's efforts to diminish the environmental impact of its operations. Its recommendations to the company included: further contribute to local development and poverty reduction in the region; engage in a fully participatory consultative process in development projects; and ensure that its emission monitoring was transparent.

In July 2008, the Australian NCP sent a draft final statement to the parties for comments. BHP Billiton and Xstrata claimed that local Cerrejón management had built the capacity and knowledge to conduct a proper resettlement process and that there was no need for third-party mediation. However, although the resettlement process was specified in writing, no mutually agreed negotiation scheme was agreed with the complainants.

One positive outcome was the 2008 agreement reached between Cerrejón Coal and the township of Tabaco, which included USD 1.8 million in indemnities and USD 1.3 million for sustainable projects. However, similar agreements have not been reached with the other five affected communities. Cerrejón has appointed an on-site social responsibility manager and engaged an independent organisation to monitor progress in the other communities. The company took steps to provide environmental information to the local communities. The Swiss NCP supported the final statement of the Australian NCP and took it as a basis for formal closure of the specific instance. Complainants objected to this closure, as the concerns of the five communities had not been resolved and virtually no progress had been made on the resettlement. The final statement of the Australian NCP acknowledged this.

Source: OECD (2007), "OECD Watch: Two Cases Related to Colombia".

practices. Colombia leads a pilot project for the implementation of the Gold Supplement in the country (OECD, 2013a).

The concept of responsible business conduct is relatively new in Colombia (OECD, 2012b). The Colombian authorities consider legislation to be an adequate means of communication between the government and the business sector, and maintain that the government can help companies implement both binding rules and recommendations and thus improve their performance. Enforcement mechanisms could benefit from the development of a comprehensive policy on responsible business conduct to ensure effective co-ordination and dialogue with the private sector. Since its establishment, Colombia's NCP has worked extensively to make the Guidelines known and raise awareness of the implementation procedures. It has also supported the efforts of the government to develop an action plan on sustainable investment. The NCP developed a

strong working relationship with several OECD partners and leading Responsible Business Conduct instruments, including the UN Global Compact, the National Institution for the Protection and Promotion of Human Rights, the Global Reporting Initiative, ISO26000 and the Group of Friends of Paragraph 47 (OECD, 2013a).

5.3. *Endangered species*

In 1981, Colombia signed and ratified CITES, the 1973 Washington Convention on International Trade in Endangered and Threatened Species of Wild Fauna and Flora. It has been an active and supportive party, serving recently as the South American representative on the CITES Standing Committee. In conformity with its obligations, Colombia has submitted timely reports to the CITES Secretariat, designated national focal points on various aspects of wildlife trade and enacted wildlife management legislation to give effect to CITES obligations and recommendations. Colombia is listed in Category 1 (of 3) by the CITES Secretariat, in its national legislation project, as "generally meeting CITES requirements for national legislation".

Over 1996-2010, Colombia was the world's second largest exporter of Appendix II[12] live reptiles (2.9 million) and reptile skins (9.6 million). However, exports of live reptiles decreased substantially over 2006-10 (CITES, 2012). In 2012, ANLA issued 2 470 permits for import, export and re-export of CITES species (ANLA, 2012). According to Colombia's 2011 biennial report to CITES, over 2009-10, seizures totalled 1 310 specimens listed in Appendix I,[13] 66 904 specimens in Appendix II and 2 021 specimens in Appendix III[14] (MADS, 2011). Illegal traffic affects, in order of importance, birds, mammals, reptiles, amphibians, gastropods, fish, arachnids, crustaceans and anthozoans (MAVDT, 2008). In 2002, Colombia adopted a National Strategy for the Prevention and Control of Illegal Wildlife Trafficking (MMA, 2002). Concerns about traffic in sloths raised the need for establishing a dedicated strategy in 2008. An information system for tracking illegal wildlife traffic was established but seems to have been implemented in only a few CARs (Mancera, 2008).

The government faces serious difficulties in curtailing illegal trade of endangered species. Many habitats, including designated parks and reserves, are in areas affected by civil unrest and drug trafficking, and effectively off limits for wildlife surveillance and enforcement efforts. At the borders, lack of sufficiently trained customs inspectors further constrains control efforts.

5.4. *Forest products*

Columbia is a net exporter of wood and wood products. However, the amount of trade (by value and by volume) is not large, and the sector does not make a large contribution to GDP. It is forbidden to export unprocessed logs from Columbia, and processed wood and wood products are nearly all destined for domestic markets. Wood needed by industry comes from certified plantations, which have to be reforested.

Illegal logging is prevalent, especially in the primary forest. This has a significant impact on a variety of high-value, exotic and endangered tree species. Due to armed conflict in the areas concerned and the lack of manpower for forest supervision, there is little long-term management or control over the resource. Attention was drawn to the country's illegal logging industry in early 2012 when the Colombian military seized two separate shipments, one of 300 tonnes and another of 150 tonnes, in the Pacific port city of

Buenaventura. The maximum penalty for trafficking illegal timber is nine years in prison, rising to 13 years if the timber is an endangered species.

Globally, illegal logging represents 20-25% of timber production and trade. In Colombia, it is estimated that 40-50% of all timber is harvested illegally (Chapter 7). In 2009, the Colombian government, together with 24 public and private sector organisations, civil society representatives and consumers, signed a Pact for Legal Timber in Colombia. The pact is also linked to the global forest governance project of the European Union, FLEGT (Forest Law Enforcement, Governance and Trade), which seeks to reduce the purchase of illegal tropical timber by EU countries; Colombia's coffee-growing zone and the north-east Andes are among its target areas.

Over thirty Colombian firms with forestry plantations have been accredited as having good conservation practices under a voluntary forestry certification programme established by the international Forest Stewardship Council.

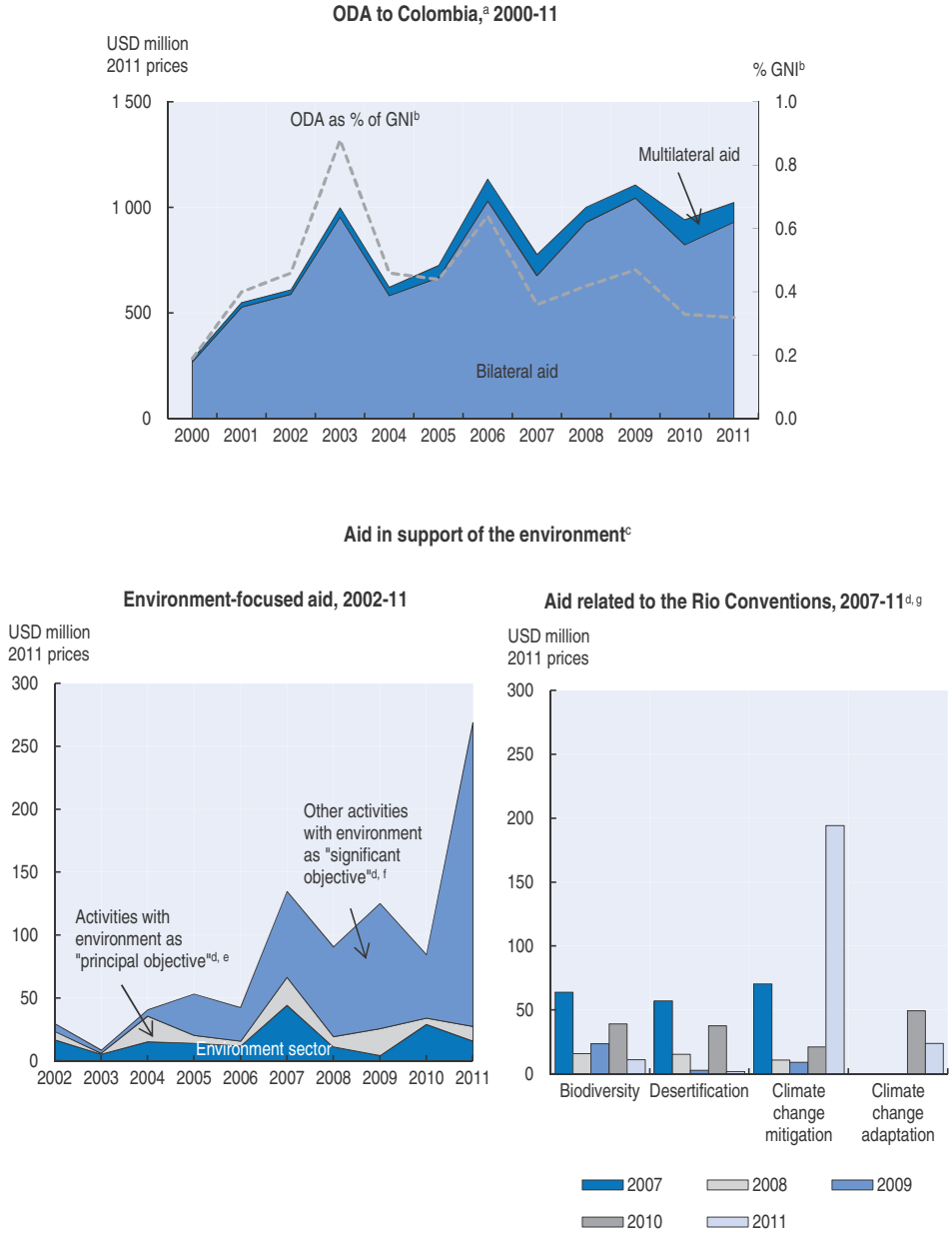
Colombia became a member of the International Tropical Timber Organization in 1994 but has yet to sign a 2006 ITTO successor agreement. It is a signatory to the 1983 International Tropical Timber Agreement. Within ACTO, Colombia participates with Brazil, Bolivia, Ecuador, Guyana, Peru, Suriname and Venezuela to improve forest law enforcement in the Amazon Basin.

6. Official development assistance

In 2009, Colombia became an upper middle income country, after almost 20 years as lower middle income. In 2011, official development assistance (ODA) amounted to USD 1 billion, making Colombia the second largest recipient in Latin America and the Caribbean, after Haiti. However, this represented only 0.3% of its gross national income (Figure 4.2). Over the past decade, aid to Colombia more than tripled, mostly driven by US support for Plan Colombia on narcotics control, peace and human rights. However, with the improved security situation, foreign assistance increasingly supports policies in other areas, including environment. The United States continues to be the largest donor but its share in bilateral aid decreased from more than 75% in 2003-06 to slightly above 50% in 2010-11.

Overall, environment-focused aid[15] to Colombia increased, reaching about one-quarter of bilateral ODA[16] in 2011 (Figure 4.2). Aid activities strictly targeting the environment sector[17] have fluctuated, with a peak in 2007 reflecting a high level of support to the national park administration by the Netherlands that year. In 2007, international sources provided half of the national park system funding, explaining the relatively high level of biodiversity-related aid (Chapter 7). Since 2002, Spain, Switzerland and the United States have been other important donors to the environment sector, contributing to the strengthening of environmental policy. Since about the middle of the last decade, the greatest increase has been recorded for aid targeting environmental sustainability in other sectors, such as government and civil society (United States and Germany), sustainable forestry (Germany), and water and sanitation (Spain in 2009). In the wake of the Copenhagen pledge to increase climate financing by USD 30 billion in 2010-12, climate change has received growing attention, with a significant contribution to sustainable transport from France in 2011 (Figure 4.2). Co-operation agreements with the Korea International Cooperation Agency on climate change and with China on water management were signed in 2012.

Figure 4.2. **Official development assistance**



a) Net ODA disbursements.
b) Gross National Income.
c) ODA commitments by DAC member countries.
d) The marker data do not allow exact quantification of amounts allocated or spent in support of the environment. They give an indication of such aid flows and describe the extent to which donors address these objectives in their aid programmes.
e) Aid activities where environment is an explicit objective of the activity and fundamental in its design.
f) Aid activities where environment is an important, but secondary, objective of the activity.
g) Most activities targeting the objectives of the Rio Conventions fall under the definition of "environment-focused aid" but there is no exact match of the respective coverages. An activity can target the objectives of more than one of the conventions, thus respective ODA flows should not be added.
h) Climate change adaptation markers have been introduced in 2010.
Source: OECD (2013), *OECD International Development Statistics* (database).

StatLink http://dx.doi.org/10.1787/888932998044

Colombia has also derived substantial external financial support for environmental activities through multilateral channels. Since GEF was established in 1991, it has provided a total of USD 117 million in grants (supplemented by USD 510 million in co-financing). Of the 36 National projects, 21 addressed biodiversity (63% of GEF funding), 10 climate change (one-fifth of GEF funding, but nearly half of total funding, including co-financing), 2 persistent organic pollutants and 3 multifocus. In the 2010-14 programming period, Colombia has been allocated USD 53 million of GEF funding, of which 70% for biodiversity and 25% for climate change projects. Colombia has also benefited from GEF's Regional and Global Projects component, having participated in 22 such projects (GEF USD 93 million, co-financing USD 301 million), which included conservation of biodiversity and management of the Caribbean Sea in support of the implementation of the Cartagena Convention.

Multilateral development banks have represented a major source of funding for environment in the form of loans and credit guarantees. For example, since 2000, the Inter-American Development Bank (IDB) has approved more than USD 1 billion in loans for the water and sanitation sector and USD 450 million on environment and natural disasters. Since 2003, the World Bank has provided loans totalling USD 800 million to support environmental policy and sustainable development (World Bank, 2010).

The government is taking an active part in international initiatives for developing financing mechanisms and leveraging funds for climate action. In 2010, the Clean Technology Fund (CTF) allocated USD 150 million in concessional finance to Colombia to catalyse greater investment in sustainable urban transport systems and energy efficiency projects, as well as in NCRE. CTF funding is expected to leverage USD 1.1 billion in co-financing. As of April 2013, USD 38 million of CTF funding had been committed (CIF, 2013). In 2011-12, the Forest Carbon Partnership Facility provided USD 200 000 in grants to build capacity for reducing emissions from deforestation and degradation and approved USD 3.6 million for the preparation process (IEG, 2012). In 2013, the UN-REDD Programme Policy Board approved USD 4 million in funding for Colombia's national programme, which is estimated to cost more than USD 25 million (UN-REDD, 2013). Following the 2010-11 La Niña phenomenon, the adaptation fund approved a USD 8.5 million grant to reduce risk and vulnerability to climate change in the region of the Momposina Depression, a sedimentary basin in the north. Multilateral banks also provide loans in support of energy and transport infrastructure, climate change mitigation and adaptation policies. Between 2005 and 2010, the World Bank and the IDB provided almost USD 1 billion in investment loans to finance the development of integrated mass transit systems for large cities (CIF, 2010). The effectiveness of this support would be improved by better co-ordination of climate actions through the adoption and implementation of the national climate policy.

Colombia plays a leading role in South-South co-operation. In 2009, it led the creation of the task team on South-South co-operation hosted by the working party on aid effectiveness of the OECD Development Assistance Committee. The platform brings together middle-income countries, donors, civil society, academia and regional and multilateral agencies to map the synergies between South-South co-operation and aid effectiveness and to identify good practices. Colombia also hosted the 2010 high-level event on South-South co-operation in Bogotá. Since 2010, Colombia has managed a USD 27 million budget for the implementation of South-South and triangular co-operation (OECD, 2013b). For example, it is engaged with countries of the Caribbean Basin in risk management; with Spain in land planning, protected areas and institutional strengthening in Haiti; and with the Development Bank of Latin America to improve public services

(energy, water and sanitation) in deprived areas of Mesoamerica (MRE, 2010; OECD, 2009; Government of Colombia, 2010). Colombia has also shared its good practices on developing mass transit systems with Chile and on developing a system for mapping aid flows with other Latin American countries. The country intends to diversify and expand South-South co-operation to other regions, including South-east Asia and Africa.

Notes

1. The PND defines international co-operation priorities as: i) integrated risk management and re-establishment of communities affected by natural disasters; ii) equal opportunities for democratic prosperity; iii) economic growth and competitiveness; iv) environment and sustainable development; v) governance; and vi) victims, reconciliation and human rights.
2. A regional economic integration bloc created in 2011.
3. As several maritime boundary disputes persist, estimates of Colombia's maritime territory range from 44% to 47% of its total territory.
4. Colombia's National Environmental Licensing Authority suspended the licence for coal loading at port of the second-largest coal exporter after 870 tonnes of coal was dumped in the Caribbean Sea (ANLA Resolución No. 0123 6 February 2013). The suspension was lifted after approval of the company's revised contingency plan (ANLA AUTO No. 1008 11 April 2013).
5. A spill of about 10 000 tonnes spread for more than 320 km off the Ecuador-Colombia border.
6. In January 2013, offshore production was limited to a single site in La Guajira department, but several licences had been or were being assigned by the National Hydrocarbons Agency.
7. International Convention for the Safety of Life at Sea (1974), International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (1978), MARPOL, International Convention on Load Lines (1966), Convention on the International Regulations for Preventing Collisions at Sea (1972) and International Convention on Tonnage Measurement of Ships (1969).
8. The protocol sets out parties' obligations, including establishment of regulations to control effluents from domestic sewage and development of plans to reduce and control agricultural non-point sources. It came into force in 2010.
9. Shrimp farming on the Caribbean coast, which represented about 30% of the volume of aquaculture production and more than half its value in 2007, has since been reduced significantly due to the appreciation of the peso and consequent increase in the cost of production and reduced borrowing capacity of fish farmers. Most farms on the Pacific coast were closed in 2000 due to disease outbreaks.
10. See *www.mapsprogramme.org*.
11. Composed of one or more representatives of one Ministry.
12. CITES Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. International trade may be authorised by the granting of an export permit or re-export certificate.
13. CITES Appendix I lists species that are the most endangered among CITES-listed animals and plants. They are threatened with extinction and CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial.
14. CITES Appendix III lists species included at the request of a party that already regulates trade in the species and that needs the co-operation of other countries to prevent unsustainable or illegal exploitation. International trade is allowed only on presentation of the appropriate permits or certificates.
15. Within the OECD Creditor Reporting System Aid Activity Database, countries use a policy marker to identify activities that have environmental objectives. Since 2004, DAC members have screened more than 90% of their sector-allocable aid to Colombia.
16. Bilateral aid allocable by sector represented slightly above 90% of total bilateral aid, on average, over 2002-11.
17. Activities classified as general environmental protection, i.e. environmental policy and administrative management, biosphere protection, biodiversity, site preservation, flood prevention/control, environmental education/training, environmental research.

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PART II

Progress towards selected environmental objectives

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PART II

Chapter 5

Waste

This chapter reviews Colombia's policy and institutional framework for waste management. It takes stock of policy initiatives to reduce waste generation, encourage recycling and ensure safe disposal of municipal and hazardous waste. The chapter also highlights progress in integrating informal waste pickers into municipal waste management. It discusses the environmental and economic implications of specific measures, such as extended producer responsibility and waste collection charges.

Assessment and recommendations

The institutional framework for waste management in Colombia is well developed, but would benefit from improved co-ordination. National, regional and local authorities have well-defined responsibilities in waste management. MADS is responsible for developing policies and regulations on waste management in co-operation with the Ministry of Housing, Urban issues and Territorial Development which oversees the provision of municipal waste management services. Regional and municipal environmental authorities have broad responsibilities in waste management. Municipalities are formally responsible for ensuring the delivery of municipal waste management services, which are mostly provided by companies on contract. However, given the number and scope of responsibilities involved, as well as the degree of differing (if not opposing) interests, better horizontal and especially vertical co-ordination among these institutions is needed to improve the effectiveness and enforcement of waste policies.

Colombia has made significant progress in developing its policy frameworks for municipal and hazardous waste management. Policy principles and objectives have been established, municipalities are required to prepare Integrated Solid Waste Management Plans and technical regulations and guidelines have been issued. However, the policies and action plans that were developed in parallel to address waste issues at national, regional and municipal levels do not provide comprehensive and consistent guidance. As a consequence, opportunities to increase the environmental effectiveness and economic efficiency of waste policies (by developing an efficient waste infrastructure network, for example) remain unexploited. Positive policy developments include the 2010 Policy on Sustainable Production and Consumption, efforts to promote cleaner production, an ambitious policy on extended producer responsibility (EPR) and attempts to establish green public purchasing.

Although some gaps remain, Colombia has an extensive regulatory framework for waste management. In the last decade, regulatory activity has accelerated for hazardous waste management, which had been less developed than municipal waste management. Most aspects of waste management are now regulated. However, there is no overarching legal framework for waste management to provide comprehensiveness and consistency among the numerous legal instruments adopted.

Information has improved but it is still insufficient for policy purposes. Good legal and institutional instruments to collect data on municipal solid waste and hazardous waste have been established. But lack of co-ordination between institutions responsible for data collection and analysis, and insufficient enforcement of reporting obligations, result in data gaps and unreliable data, especially in the case of hazardous waste. There is no information available on non-hazardous industrial waste or major waste streams such as those from forestry and agriculture, or from construction and demolition. This hampers policy evaluation and evidence-based policy development.

Progress in strengthening waste management is uneven. Municipal waste collection rates have improved, but generation continues to grow and collection is still characterised by low levels of separate collection and of source separation by households. Waste disposal capacity has increased and the number of dump sites has been reduced. However, landfills in several large cities have reached their maximum capacity and concerns about the environmentally sound management of landfills remain. At the same time, current policies create perverse incentives to send waste to landfills, and there is a need to develop instruments to reduce waste generation and to increase the rate of recycling. While recycling is increasing, it still represents a small share of waste collected. A positive recent development in this regard was the integration of informal waste pickers into the municipal waste management system of Bogotá.

Significant progress has been achieved in some areas of hazardous waste management, such as the collection and disposal of medical waste and the collection of specific types of hazardous waste through EPR programmes. Transboundary movements of hazardous waste are limited; import and transit of hazardous waste are forbidden, and Colombia complies with the requirements of the Basel Convention. Management of hazardous waste in the oil, gas and mining sectors has been uneven, and remediation of contaminated sites insufficient. Obstacles to good waste management include shortcomings in planning, resource allocation, inter-institutional co-ordination and awareness raising. Insufficient enforcement of regulations is of particular concern – for example, 30% of landfill sites do not comply with environmental standards.

The design of economic instruments related to waste does not enable policy objectives to be achieved. The user charging system has evolved but provides perverse incentives and falls short of covering the full costs of service provision. Other economic incentives include tax exemptions to encourage private investment in waste management and an advanced recycling fee that helps internalise external costs of waste management. Waste management is financed by a mix of user contributions, government subsidies and development aid. Subsidies for waste provide incentives to increase the efficiency of municipal waste management, but there are several shortcomings, some of them related to subsidy design in general in Colombia.

Overall, waste management suffers from limited financial resources. This affects implementation of waste policies in key areas such as closure of dumps and temporary landfills, remediation of contaminated sites and development of recycling infrastructure (including for waste subject to EPR).

Recommendations

- Consolidate and streamline existing laws and regulations with a view to establishing a comprehensive and coherent legal framework for waste management.
- Develop a long-term national waste strategy to reorient waste policy from a pollution control to a preventive approach; articulate a coherent policy response to key challenges (such as the shortage of landfill capacity, low recycling rates and the integration of informal waste pickers and community schemes in municipal waste management systems); provide guidance for the development of regional and municipal objectives and action plans.

Recommendations *(cont.)*

- Improve information collection and management, especially concerning hazardous waste, by strengthening enforcement of reporting obligations and increasing co-ordination between the bodies involved in data collection, analysis and dissemination.
- Promote increased investment in waste infrastructure capacity, in line with projected future demand; enforce environmental standards for landfills; promote environmentally sound management of waste.
- Increase recycling rates by significantly strengthening education and training efforts, expanding separate collection, widening EPR programmes to include packaging waste and reinforcing existing programmes.
- Reform economic instruments with a view to strengthening incentives for waste minimisation and recycling, and improving recovery of waste infrastructure costs, taking account of the impacts on poor households adversely affected by the related price rises.

1. Institutional framework

The institutional framework for waste management is characterised by a multiplicity of actors. Responsibility for developing, regulating and implementing waste management policies is shared by several institutions both horizontally (i.e. by the various sectoral ministries involved) and vertically (by national, regional, municipal administrations).

The Ministry of Environment and Sustainable Development (MADS) is responsible for developing policies and regulations on waste management. It is also charged with encouraging the development of industry restructuring plans that include environmentally sound technologies to reduce the health and environmental risks associated with waste and to enhance recycling and reuse.

Other ministries play important roles on waste management. The Ministry of Housing, Urban Issues and Territorial Development (MVCT) is responsible for developing policies and regulations on water and sanitation services, including municipal waste management. It must ensure the proper integration of its waste policies with environmental policies developed by MADS. It also oversees the financing of water and sanitation and provides technical assistance to providers of waste collection services and local authorities. The Ministry of Health and Social Protection plays a regulatory role in the area of hazardous waste management, issuing laws and decrees providing general instruction to hazardous waste generators on the safe management of solid waste to avoid any harm to human health, under Law 9 of 1979 on Health.

Several national agencies have regulatory, enforcement and information management roles. The Commission for the Regulation of Drinking Water and Basic Sanitation (CRA) regulates service provision, including service charges: for example, CRA Resolution 351 of 2005 established that waste must be collected at least twice a week. The Superintendence of Domestic Public Services (SSPD) enforces service provision and supervises the administrative and financial affairs of waste management service providers, including direct municipal provision; it also monitors the compliance of waste management service provision with national environmental standards and manages the information system related to the provision of sanitation services. The National Authority for Environmental Licences (ANLA) is responsible for environmental licensing of large projects, which

includes setting the waste management conditions for obtaining an environmental licence, but it is not responsible for licensing smaller scale waste management projects. It is also responsible for enforcing extended producer responsibility (EPR) programmes. The Institute for Hydrology, Meteorology and Environmental Studies (IDEAM) publishes statistics on the generation and management of hazardous waste, using data that generators have to transmit annually to the Autonomous Regional Corporations (CARs).

Sub-national environmental authorities have broad responsibilities in waste management. There are 33 CARs and seven Urban Environmental Authorities, corresponding to metropolitan areas of more than 1 million population (Chapter 2).[1] They are characterised by a high degree of political, administrative, regulatory and financial autonomy. The CARs and the Urban Environmental Authorities are responsible for planning and enforcing regional and municipal waste management policies (including those on hazardous waste) and for licensing waste management activities at local level and issuing permits, e.g. permits for landfill sites. Depending on the need to protect human health and the environment in a particular region, they can establish stricter or more specific requirements for the construction and operation of plants. Since CARs also collect and evaluate information on hazardous waste generation and transmit it to IDEAM, they have significant and broad responsibilities. However, their efficiency, effectiveness and capacities have been called into question (see Chapter 2). Most CARs lack human and financial resources as well as technical expertise in some areas, including waste management. Their decision-making process for licensing and permitting, including for waste management facilities such as landfills, has also been called into question. The private sector has criticised their lack of transparency. Their tendency to capture by local interests has been cited by some critics as well, all of which indicates the need for a clearer, more accountable political framework.

Municipalities are formally responsible for the delivery of municipal waste management services, which are mostly provided by companies on contract. Law 142 of 1994 on public services and Decree 1713 of 2002 establish that municipalities must provide efficient waste collection, transport and management services that do not harm human health and the environment. The services cover household waste as well as waste generated by small businesses and industry within the municipality. Most municipal waste management services are provided by private companies, not by direct municipal services. The shares of contracted companies in service provision are about 68% for waste collection, 100% for waste transport and 82% for waste treatment. In addition, private operators collect municipal waste charges in 47.6% of municipalities.

Colombia recognises the need for a more integrated approach to waste management, with improved co-ordination among institutional actors. Several institutional bodies and administrative levels share responsibility for waste management. But co-ordination between these entities is limited, and their interests sometimes conflict. This situation reduces the effectiveness of Colombia's waste management policy. In response to this challenge, the authorities developed policies focusing on increasing integration of waste management, particularly the Policy for Integrated Management of Municipal Solid Waste (1998) and the Environmental Policy for Integral Management of Hazardous Waste (2005). Strategies and action plans associated with these policies were developed by the National Council for Economic and Social Policy (CONPES, 2008), showing the government's

willingness to strengthen the co-ordination of institutions responsible for waste management and to improve current practices.

2. Municipal solid waste management

2.1. Policy and legal framework

Colombia's policy framework for municipal waste management has been evolving over the last two decades. Basic principles were established in 1994, through Law 142 on public services. In 1998, the Policy for Integrated Management of Municipal Solid Waste included objectives on minimising waste generation, diverting waste from final disposal towards recovery (30% within five years) and disposing of waste in appropriate landfills or transfer stations (50% of municipalities within five years). In 2002, Decree 1713 (amended 2003 and 2005) defined waste and set out requirements for management of municipal waste, in particular regarding collection, recycling and disposal.

In 2008, additional policy guidelines and strategies were developed by the National Planning Department and approved by CONPES. CONPES Document 3530 (CONPES, 2008) identified recent developments and key issues in the waste sector, defined criteria for optimal financial, technical, legal, institutional, environmental and trade strategies, and provided an action plan for implementation, encouraging, among other aims, sustainable (social and environmental) practices for recycling. Instructions have been provided to all stakeholders involved in municipal waste management according to the following objectives:

1. Develop adequate regulations for waste management and ensure their proper implementation.
2. Establish technical conditions that facilitate the development of waste management activities.
3. Encourage the development of competent waste management companies in municipalities where providers of such services do not yet exist, especially those of fewer than 10 000 households.
4. Set criteria to achieve financial efficiency.
5. Develop programmes for reuse and recycling of materials.

Colombia's legal and policy framework mandates the development of Integrated Solid Waste Management Plans (PGIRS). PGIRS should aim to ensure proper waste management, mainly by closing open dumps and disposal sites that do not meet regulations, and developing new sites in accordance with environmental regulations established by the regional environmental authorities. PGIRS should include cost evaluation, financing plans and contingency plans. The formulation of PGIRS must include the development of recycling projects and the participation by informal recyclers and community schemes, which is a key challenge of Colombia's waste management system (Box 5.1).

Technical regulations and guidelines complement the policy principles and objectives on proper management of municipal waste. In 2000, Resolution 1096 established the basic technical requirements for collection, incineration and landfilling of municipal waste. Best practice guidelines specify minimum technical requirements for the formulation, design, construction, operation and maintenance of waste management infrastructure in order to ensure a high-quality service. In 2005, Decree 838 provided environmental authorities issuing licences for the construction and operation of landfills with instructions and

environmental criteria to be fulfilled. Also in 2005, Resolution 1390 established guidelines and standards for closing, decommissioning and restoring or upgrading landfill sites that did not meet environmental standards. In 2012, as a result of an instruction in CONPES 3530, the MVCT issued detailed technical regulations (MVCT, 2012) for environmentally sound management of municipal waste, including emission standards and good practices for waste collection, transport and treatment. It is not yet possible to evaluate the extent to which the technical regulations are being followed, partly because information is incomplete. For example, authorities report that 92% of waste disposed of now goes to sanitary landfills, but it is not clear whether all these landfills follow the 2012 technical guidelines.

The extensive regulatory framework still has some gaps. Several waste streams (construction and demolition waste, non-hazardous mining waste, agricultural waste, sludge from wastewater treatment plants) are not supervised by any authority and their management is not yet subject to specific regulations. No procedures, standards or guidelines for environmentally sound management have been established for these waste streams. In addition, no specific provisions have been made for the collection and management of the hazardous fraction of municipal waste. Recycling is hardly mentioned in Law 1450 of 2011 on issuance of the 2010-14 PND, which merely recommends "organising partnerships" with recyclers and "recognising their environmental contribution".

2.2. Progress in achieving municipal waste management objectives

The objective of waste minimisation has not been met, and municipal waste generation keeps growing. Since 2005, municipal waste generation grew at about 3% per year, increasing nearly in line with private consumption (Figure 5.1). SSPD estimates for 2010 and 2011 show a decrease, but this seems to be due to the quality of the information reported. The SSPD estimates that total generation of municipal waste[2] reached 9 million tonnes in 2011, or 200 kg per person, less than half the OECD average of 530 kg (SSPD, 2013). Another estimate, by the MVCT, gives a range of 180-290 kg per capita per year (MVCT 2012). The SSPD estimates that the three largest cities (Bogotá, Medellín and Cali) generate 65% of all municipal waste. The concentration of waste generation in urban areas is related to the rapid rate of urbanisation, the higher and increasing standard of living in urban areas, higher collection rates and better recording of waste collected. The increase in municipal waste generation is strongly linked to economic growth and the associated rises in standard of living and consumption. Projections suggest that waste generation will more than double by 2025 (Hoornweg and Bhada-Tata, 2012).

Waste collection rates have improved, but collection practices prevent environmentally sound waste management. From 1993 to 2012, the urban population benefitting from waste collection services increased from 83% to 97% despite urban population growth. In rural areas, only 22% of the population benefits from waste collection systems. Overall, 80% of Colombia's population was served by a waste collection system in 2012. Municipal waste is mixed, including waste produced by households and small enterprises, non-hazardous as well as hazardous, organic as well as inert and non-recyclable as well as recyclable. All waste streams are destined for the same landfills. Only hazardous waste covered by EPR regulations is separately collected and not mixed with other municipal waste.

Box 5.1. **Social issues in waste management: Integrating informal waste pickers into the municipal system**

Informal recycling is a key feature of Colombia's municipal waste management system. For over 60 years, informal recyclers (waste pickers called *recicladores*) have provided a useful service, helping overcome the lack of waste separation at source in Colombian cities and towns. The recycling of paper and cardboard, plastics and metals relies upon the collection efforts of an estimated 26 000 informal and independent recyclers. In Bogotá alone, some 14 000 people rely on informal recycling for their livelihoods. Informal recyclers account for an estimated 55% of all recycled municipal waste.

The last decade witnessed a protracted process to formalise informal recyclers. In 2002, a legal battle arbitrated by the Constitutional Court began, involving government authorities and the Association of Waste Pickers of Bogotá (ARB), which represented more than one-third (5 000) of the city's informal recyclers. The court issued several judgements recognising that waste pickers merited special protection, and mandating the government to regulate the activity and incorporate informal recyclers formally into the municipal waste management system. In 2010, the formalisation of waste recyclers was one objective of the National Development Plan (PND). In 2011, the municipality of Bogotá launched public bidding for the provision of municipal waste services, which would effectively have denied informal recyclers access to waste. In December of that year, the court blocked the bidding process and gave Bogotá's mayor three months to present a concrete proposal for the integration of waste pickers into the municipal waste management system, including viable financial and social plans.

After months of negotiations, the role of the waste pickers was officially recognised and included in the bidding process. In March 2013, for the first time, waste pickers, now formally recognised as providers of a public service, were paid for their services. Bogotá's government pays them COP 87 900 per tonne of recyclable solid waste that they collect and transport to any of the 141 authorised scrap dealers. The payment is made every two months to debit cards – which meant that many informal recyclers had to open their first bank account in order to receive the payment. This income is in addition to what they earn selling partially processed, clean recyclable material to scrap dealers, who pay them per kilo. Payments per tonne of material collected and transported almost match those paid to private operators. The first waste pickers to benefit from the system saw their earnings double or even triple. About 4 000 of Bogotá's 14 000 waste pickers registered for the payment programme. As of May 2013, negotiations were continuing between the municipality and ARB to improve the integration of waste pickers into the waste management system.

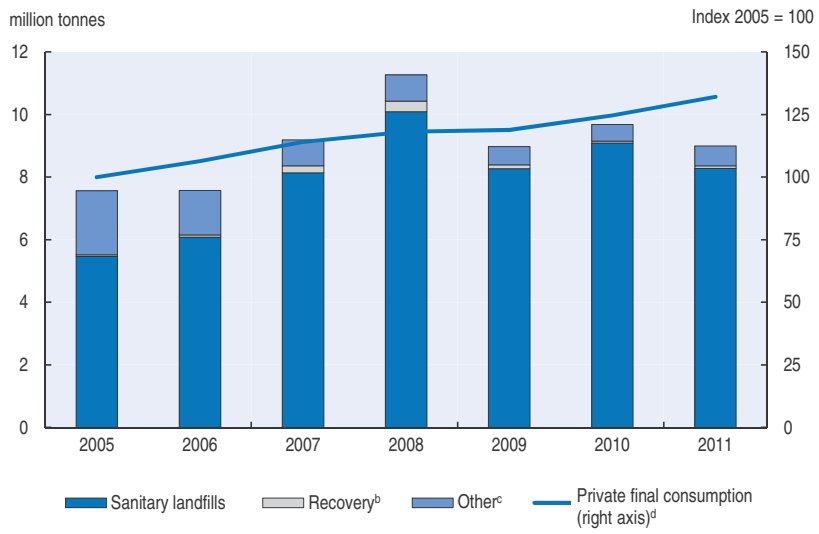
Source: Vieira (2013), *Waste Pickers in Colombia Earn Formal Recognition*; WIEGO (2013), *IMPACT: Colombia's Triumphant Recicladores*.

Recycling is increasing, but still represents a small share of waste collected. Estimates made in recent years by MADS, the SSPD (Correal Sarmiento, 2007) and Aluna Consultores Limitada (2011) indicate that recycling rates are between 10% and 16% of waste collected, or close to 2 million tonnes per year. Half of the 2 million tonnes was metal waste, with paper and cardboard (35%), plastics (11%) and glass (4%) making up the rest. Over half of recycling is carried out by informal recyclers (Correal Sarmiento, 2007). The low level of separate collection of municipal waste means that current recycling capacity for metal, paper and glass is sufficient – indeed, paper and cardboard are imported for recycling. There are 29 authorised recycling companies or associations in Colombia, all but one located in Bogotá (CEMPRE, 2013).

Waste disposal has improved, but there are concerns about the management of landfills and transfer stations. In 2011, landfilling[3] accounted for about 92% of municipal waste treatment, twice the OCDE average (Figure 5.1). The number of open-air dumps has been reduced, with 279 having been closed by 2009 (World Bank, 2009). About 7% of total waste collected, or 1 700 tonnes per day, is inappropriately disposed of using open dumps, open burning or dumping into water bodies, mostly in rural municipalities lacking collection systems. Landfills in several large cities, including Bogotá and Barranquilla, have reached their maximum capacity. Transfer stations and temporary storage sites[4] receive about 3% of all waste disposed of, 700 tonnes a day (SSPD, 2013). The World Bank (2009) reports that the percentage of waste disposed of in adequate landfills may have been overestimated, as many sites, including transfer stations and temporary storage, are classified as sanitary but do not operate as such. The SSPD (which focuses on projects and activities which are complex or of significant size, located in sensitive areas and targets of complaints) reports that in 2009-10, about 30% of the disposal sites that had been monitored did not comply with environmental standards and regulations (SSPD, 2011).

Obstacles to good waste management include shortcomings in planning, resource allocation, inter-institutional co-ordination and awareness-raising. By 2009, only about 500 municipalities, around half of the total, had developed PGIRS. Existing plans tend to focus on final disposal and pay scant attention to waste minimisation, separate collection and recycling and the attendant need to raise community awareness. Human and financial resources are insufficient, particularly for enforcement. There is also poor co-ordination among institutions.

Figure 5.1. **Generation and treatment of municipal waste**[a]



a) Waste collected by or for municipalities; includes household and commercial waste, and similar waste handled at the same facilities.
b) Mainly composting, vermiculture and recycling carried out by treatment plants not complying with adequate technical standards. Excludes recovery from households, commerce and industrial sources (about 1.8 millions tonnes in 2010).
c) Includes waste disposal in non-controlled sites and water bodies, and waste burning in open areas.
d) Based on values expressed in constant prices.
Source: MADS, 2012; SSPD (2013), *Informe Nacional de Disposición Final 2012*.

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3. Hazardous waste management

3.1. Policy and legal framework

In the last decade, Colombia has developed a policy framework for hazardous waste management. In 2005, the Ministry of Environment, Housing and Territorial Development, predecessor to MADS, developed the first national policy on hazardous waste management (MAVDT, 2005). It was accompanied by an action plan for 2006-10. A second action plan was developed for 2011-14. The action plans specify objectives, activities, instruments to be used and stakeholders involved.

The key policy objectives relate to hazardous waste reduction, sound management and international commitments. Colombia set an objective of reducing the amount of hazardous waste generated by 5% by 2010 and 40% by 2018, from the 2005 base year. This was to be achieved through cleaner production strategies and integrated hazardous waste management plans. Promoting environmentally sound management of hazardous waste is a second objective. Three waste streams were prioritised in the 2010 Action Plan (medicines, lead-acid batteries and pesticides), and nine waste streams for 2018. Several guidelines, manuals and reference documents can be found on the MADS website[5] regarding environmentally sound management of hazardous waste. A third objective is the fulfilment of commitments under the Basel and Stockholm conventions. Colombia adopted a national plan for the Stockholm Convention aiming to eliminate persistent organic pollutants (POPs) and manage waste containing ozone-depleting substances, with a goal of reducing such waste by 40% by 2018 through reduced consumption or bans (e.g. on CFCs in refrigerators). The policy framework also includes three cross-cutting objectives: raising awareness of hazardous waste issues and educating and training professionals in hazardous waste management; developing capacity in the public sector; and developing new regulations for hazardous waste management.

Colombia started to develop a regulatory framework for hazardous waste management nearly two decades ago. In 1996, through Law 253, Colombia adopted the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. In 1998, Law 430 set the basic requirements for the management of hazardous waste, including minimisation of hazardous waste generation, construction of adequate and sufficient infrastructure for hazardous waste management, adoption of proper management techniques to minimise impacts on human health and environment, specification of liability and duties for hazardous waste producers and managers, and implementation of the Basel Convention. In 2000, Decree 2676 regulated the management of hospital and similar medical waste; it included the principles of biosafety, integral management, minimisation, non-garbage culture, use of clean technology and waste prevention, as well as the precautionary principle.

Regulatory activity has accelerated in the last decade. In 2005, Decree 4741 specified the characteristics of hazardous waste, albeit in a form less detailed and extensive than OECD Decision 2001(107)/Final or the Basel Convention.[6] The decree also set out the responsibilities of the various actors along the waste management chain: waste generators, transporters, managers of waste facilities, environmental authorities. In 2007, Resolution 1362 established a register of hazardous waste generators, who must report to the CARs on the types and quantities of hazardous waste generated, where it is sent for recovery or disposal and the type of treatment to which it is subject. In 2008, Law 1252 specified norms and requirements related to hazardous waste management, forbidding

the import of hazardous waste and the production, storage or disposal of hazardous waste in protected areas and areas having high-value ecosystems. Since 1993, hazardous waste generators are subject to environmental licencing and, in 2010, Decree 2820 specified facilities that need to be licensed by the CARs: those managing waste electrical and electronic equipment (WEEE) (except repair and reconditioning activities) and batteries; those treating sewage sludge (more than 20 000 tonnes a year); and sanitary landfills. Between 2007 and 2010, several resolutions set forth rules on EPR implementation for seven categories of products: pesticides, medicines, lead-acid batteries, used tyres, batteries, light bulbs (fluorescent, sodium and mercury High Intensity Discharge bulbs), computers and peripherals. In addition, in 2013, Law 1672 established the public policy for WEEE management.

The regulatory framework is well developed, but still has some shortcomings. For example, Decree 4741 does not provide detailed technical requirements for storage, transport, recovery or disposal of hazardous waste, and Decree 2676 does not mention specific technical requirements, referring instead to standards developed by MADS.

3.2. Progress in achieving hazardous waste management objectives

Information on hazardous waste generation is improving but remains incomplete. Since 2007, entities generating more than 1.2 tonne of hazardous waste per year have been required to report annually[7] to CARs on the quantity, types and treatment of hazardous waste generated (Resolution 1362 of 2007), and in 2008 a data collection and reporting system was established. Thus detailed information on hazardous waste is now available, but it is incomplete because small waste generators (of less than 120 kg per year) are not required to report. In addition, many entities required to declare their waste generation are not reporting to CARs, which in turn do not always transmit the information received to IDEAM due to lack of resources to evaluate it – in 2011, IDEAM received information on 8 500 of the estimated 15 000 companies and public institutions that should have reported. There is no active enforcement of reporting obligations.

The current information on hazardous waste generation is contradictory and inconsistent. IDEAM and MADS reported that hazardous waste generation reached 200 000 tonnes in 2011, but Colombia reported 280 000 tonnes to the Basel Convention secretariat for that year, and other Colombian authorities estimate that 400 000 tonnes is closer to reality. Beyond absolute numbers, there is a problem with the relative size of the various hazardous waste streams. Official sources say the main types of hazardous waste are waste oil/water, hydrocarbon/water mixtures and emulsions (Y9), 47%;[8] medical waste (Y1), 10%; waste mineral oil unfit for originally intended use (Y8), 6%; waste from industrial pollution control devices for cleaning of industrial off-gases (A4100), 5.6%; and waste resulting from production, formulation and use of ink, dye, pigment, paint, lacquer and varnish (Y12), 4.3%. It is doubtful that medical waste really is the second largest hazardous waste stream; its reported magnitude is probably due to correct reporting of medical waste and gross under-reporting of other streams. Moreover, data on the main types of hazardous waste generated are not consistent with data on the main hazardous waste producing activities (Figure 5.2). For example, metal smelting is the second largest activity producing hazardous waste but waste from the metal industry is not among the top five waste streams.

Efforts to prevent and minimise hazardous waste generation have been considerable, yet insufficient. The new policy framework for hazardous waste seems to have raised

awareness among waste generators and government authorities, and policy measures (mostly regulations) have led to significant progress. Nevertheless, it is likely that hazardous waste generation has significantly increased as a result of economic growth in the past few years. For example, hazardous waste produced by oil and gas extraction represented 435% of hazardous waste in 2011, and the generation of such waste increased by 73% between 2009 and 2011 (IDEAM, 2012). In addition, increases in the price of gold have led to an expansion of informal mining, with the attendant increase of mercury use. Indeed, Colombian authorities recognise that the 5% hazardous waste reduction objective for 2010 was not met.

The management of hazardous waste does seem to be improving, however. In 2011, 21% of hazardous waste was managed through recovery (including incineration with energy recovery), 43% was treated and 36% went to final disposal (landfilling). The rest went to temporary storage without treatment (Figure 5.3). It is not known with certainty whether more waste is being recovered or disposed of, or what the final destination is for the significant amounts of waste subject to "treatment" and "temporary storage". The government is developing regulations outlining new environmental standards for hazardous waste landfills. An increasing number of waste generators are recovering their waste: between 2009 and 2011, the share of total hazardous waste recovered in industrial installations rose from 35% to more than 80%. Since 2009, recycling of lead waste (mainly from lead-acid batteries) and, to a lesser extent, WEEE has increased. Dismantling and refurbishment of WEEE, particularly computers and cell phones, is taking place, while parts for recovery of precious metals and elements such as circuit boards requiring specialised technology are exported for recycling. The effectiveness of e-waste collection is low – in 2012 only about 150 tonnes of computers were collected (Box 5.2), out of an estimated total (in 2007) of 6 000 to 9 000 tonnes (Ott, 2008). One strong area is the management of medical waste, which, as a result of specific regulations (Decree 267) and good enforcement, is systematically collected and treated in special incinerators at high temperatures: 30 000 tonnes of medical waste was incinerated at high temperature in 2010 (MADS, 2012).

Colombia's ambitious extended producer responsibility (EPR) policy is contributing to hazardous waste collection but much less to recycling. The first EPR regulation entered into force in 2007 – it targeted pesticides and packaging contaminated with pesticides. By 2010, six additional regulations had been launched targeting medicines, lead-acid batteries, small batteries, used tyres, computers and light bulbs (Box 5.2). In addition, there are voluntary EPR programmes for end-of-life cell phones, used oil, and toner and ink cartridges. In July 2013, a law on WEEE was approved by Congress.

EPR regulations establish targets only for the collection of waste products, but not for their recycling. As a result, a significant amount of waste collected by EPR programmes is accumulating without an immediate solution for its recycling. By 2012, some 24 000 tonnes of end-of-life products were collected, especially lead-acid batteries and used tyres (10 000 tonnes each) and pesticides (3 400 tonnes). A limited share of the waste collected is recycled in Colombia but most of it has to be either disposed of (pesticide containers, for example, are incinerated), stored (small batteries) or exported for recycling. When creating the EPR policy, the government seems to have focused only on the regulatory aspect and underestimated the technological and financial requirements, especially as regards recycling infrastructure. In addition, lack of co-operation with neighbouring countries prevents the development of an efficient recycling network that could take advantage of economies of scale and thus achieve cost savings by avoiding intercontinental exports.

Box 5.2. **Products subject to extended producer responsibility**

Colombia's first EPR regulation entered into force in 2007. It targeted obsolete pesticides, and packaging contaminated with pesticides, used in agriculture, industry, households, and health and veterinary services. The regulation requires each producer, distributor and importer of pesticides, or their active ingredients, to take back used pesticide containers. It set a target for the amount collected of 20% in 2008, increasing by 5% per year to reach 75% of all pesticide containers put on the market in 2019. Producers, distributors and importers of pesticides have to present a plan for the recovery of obsolete pesticides to ANLA indicating how the target will be met. The regulation also establishes requirements for storage of the waste. Consumers are obliged to deliver their obsolete pesticides to specific places defined by the producers in the plan.

In 2009, two further EPR regulations were established for lead-acid batteries and medicines. They require producers to establish and agree on a collective plan to meet targets set by the government. Concerning lead-acid batteries, the collection rate should gradually increase by 10% per year, from 40% in 2011 to 90% of batteries put on the market in 2017. Concerning medicines, the collection target relates to the population covered: the target should cover 10% of the consumers in 2010 and reach 70% by 2016, a yearly increase of 10%.

In 2010, four new regulations were approved for small batteries, used tyres, computers and light bulbs. Quantities of small batteries and accumulators collected should increase from 4% of the amount put on the market in 2012 to 45% by 2016 (an annual rate of 4%) and then by 5% annually to 2021. Targets for used tyres are that quantities collected should increase by 5% a year from 20% in 2012 to 65% in 2021; for computers, 5% a year from 5% in 2012 to 50% in 2021; and, for light bulbs, 5% a year from 5% in 2012 to 60% in 2023.

By 2012, the implementation of those regulations led to an estimated 24 000 tonnes of hazardous waste being collected. The amount varies widely by type of product. Progress with each type of product should be analysed independently, as their level of hazardousness varies.

Waste collection as a result of EPR programmes Resolution N°	Year	Product	Number of programmes	Number of companies involved	Total amounts accumulated by 2012 (tonnes)
693	2007	Pesticides	93	90	3 393
371	2009	Medicines	38	365	33
372	2009	Lead-acid batteries	32	32	10 000 (estimated)
1457	2010	Used tyres	2	69	10 000 (estimated)
1297	2010	Small batteries	13	33	100
1511	2010	Light bulbs	3	87	200
1512	2010	Computers	14	54	150
		Mobile phones	1	Operators & producers	200
		TOTAL	**196**	**730**	**24 000 (estimated)**

Source: MADS (2012), Colombia's response to the *OECD Environmental Performance Review* questionnaire.

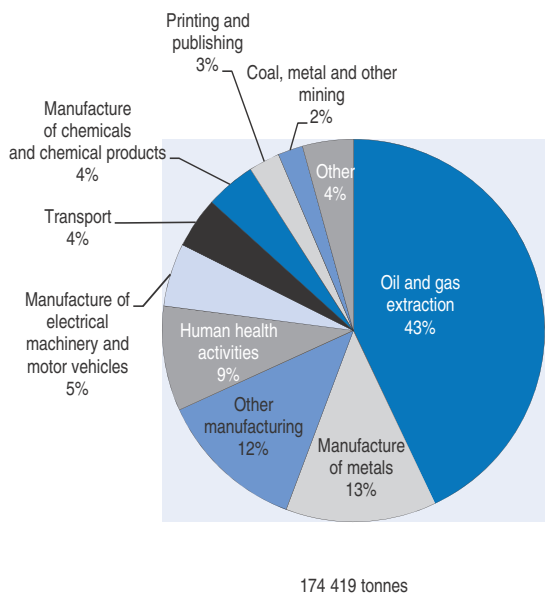
There has been significant progress in developing the capacity to manage hazardous waste. The number of facilities for managing hazardous waste increased from nine in 2006 to 50 in 2010 (UNDP, 2012). Modern high-temperature rotary kilns meeting international

environmental standards have been built to incinerate waste contaminated with ozone depleting substances. Colombian authorities report that the present capacity for disposal or recovery of the main hazardous waste streams is sufficient, though specific information on the processes and capacities of existing facilities is not available.

Management of hazardous waste in the oil, gas and mining sector has been uneven. The oil and gas sub-sector is characterised by large companies that are highly regulated. Indeed, the largest part of recovered hazardous waste corresponds to waste streams generated in this sector (Y9 and Y8, waste oil/water, hydrocarbon/water mixtures, emulsions and mineral oil unfit for originally intended use). At the same time, more than 50% of small mining companies fail to report waste generation (ANDI, 2013), and illegal mining is responsible for large releases of hazardous chemicals to the environment – for instance, annual releases of between 77 and 150 tonnes of mercury (Chapter 6). Reducing the significant environmental and health impact of small-scale mining and illegal mining would require a substantial increase in resources allocated to enforcement of regulations.

Figure 5.2. **Generation of hazardous waste by type of activity**

2011[a]



a) Waste which, due to its corrosive, reactive, explosive, toxic, flammable, infectious or radioactive characteristics, can result in risk, damage, or unwanted effects to human health and the environment (Law No. 1252). Data include amounts reported by companies registered in the Registry of Producers of Hazardous Waste and transmitted to the IDEAM by the environmental authorities (Autonomous Regional Corporations, Urban Environmental Authorities and Sustainable Development Corporations). In 2011, 79% of records were transmitted to the IDEAM.

Source: IDEAM (2012), *Informe Nacional, Generación y Manejo de Residuos o Desechos Peligrosos en Colombia - Año 2011*; MADS, 2012.

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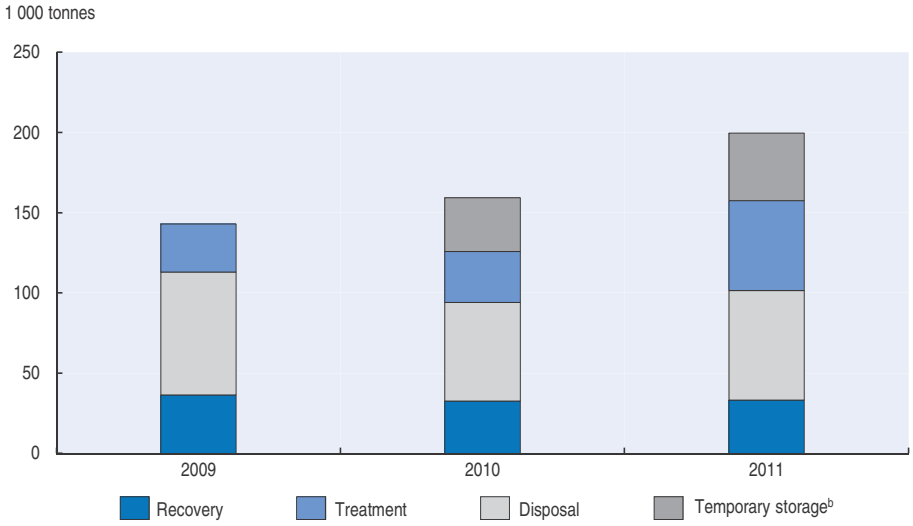
Remediation of contaminated sites is insufficient. Industrial companies are responsible for remediating sites contaminated by their activities; licences of industrial activities, including mining, must include provisions for financial liability for after-care in case of cessation of activity. Accordingly, Colombian environmental authorities have obliged some oil and chemical companies to restore some sites whose contamination they

Figure 5.3. **Hazardous waste management by type of treatment**
2009-11[a]



a) Waste which, due to its corrosive, reactive, explosive, toxic, flammable, infectious or radioactive characteristics, can result in risk, damage, or unwanted effects to human health and the environment (Law No. 1252). Data include amounts reported by companies registered in the Registry of Producers of Hazardous Waste and transmitted to the IDEAM by the environmental authorities (Autonomous Regional Corporations, Urban Environmental Authorities and Sustainable Development Corporations). In 2011, 79% of records were transmitted to the IDEAM.
b) Data available as from 2010 only.
Source: IDEAM (2012), *Informe Nacional, Generación y Manejo de Residuos o Desechos Peligrosos en Colombia - Año 2011*; MADS, 2012.

StatLink http://dx.doi.org/10.1787/888932998101

were deemed responsible for. Municipalities are responsible for cleaning and paying for the remediation of other types of contaminated sites. Environmental authorities have made an inventory of publicly owned sites contaminated by pesticides, but no remediation has yet taken place due to insufficient enforcement of regulations and a lack of funding. A strategy for managing these sites, particularly "orphan" sites, is needed (see Chapter 2). Colombian authorities plan to develop additional policy measures to prevent and remediate site contamination, targeting in particular sites contaminated by the oil industry and pesticides. A pilot project has been launched to tackle the issue of sites contaminated by POPs: three sites have been identified in the Atlántico and Cesar departments, analyses have been made and one site has been partially remediated by the export of 200 tonnes of contaminated soil to Germany for treatment (MADS, 2012).

Transboundary movements of hazardous waste are limited. Colombia complies with the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, to which it has been a party since 1996. Imports of hazardous waste are banned under Law 1252 of 2008, which is in full compliance with Article 4 of the convention. Exports of hazardous waste take place when no adequate treatment capacity is available in Colombia, as is the case of oil contaminated with PCBs, fluorescent tubes and obsolete pesticides. Between 2007 and 2011, 1 230 tonnes of hazardous waste were exported for final disposal, mainly to European countries (Belgium, Finland, France and Germany) (MADS, 2012). WEEE is dismantled in Colombia before being exported to Canada for recycling. Colombia uses the notification and movement documents as well as the hazardous waste classification and coding system that are common to the OECD and the

Basel Convention. It reported to the Basel Convention that 133 tonnes of hazardous waste was exported in 2008, 495 tonnes in 2009, 162 tonnes in 2010 and 316 tonnes in 2011 (Basel Convention Secretariat, 2011). According to Colombian authorities, illegal traffic of waste does exist at the border, but there is no information about its scale.

4. Other policy developments

The sustainable consumption and production (SCP) policy has contributed to waste minimisation in terms of both quantity and degree of hazard. MADS published the policy in 2010 as a follow-up to the commitment to SCP expressed in the 2010-14 PND. The policy aims to shift production and consumption patterns in Colombia towards increased environmental sustainability while enhancing businesses' competitiveness and contributing to people's welfare. Box 5.3 describes achievements under the policy. The government's view is that promoting production and consumption policies is a win-win strategy to tackle waste minimisation and management issues. The basics of the EPR policy were developed within the SCP policy framework.

Box 5.3. **Colombia's sustainable consumption and production policy**

The United Nations Economic Commission for Latin America and the Caribbean has declared Colombia's SCP policy to be the most comprehensive in the region. The policy builds on several national thematic policies, including the Cleaner Production Policy (1997), the National System of Competitiveness (2006), the Environmental Programme for Companies and Industries (2007) and the National Logistics Policy (2008).

Colombia's SCP policy includes guidelines for implementation and instruments for evaluation and follow-up of environmental commitments. The policy targets specific sectors, such as construction, agribusiness, tourism, small and medium-sized enterprises and the public sector.

The policy has contributed to the following environmentally related accomplishments:

- recycling of 14 million gallons of used motor and industrial oil;
- recycling and/or disposal of 3 million components of cellular phones;
- elimination of chlorofluorocarbons from refrigerators produced in Colombia;
- elimination of imports of products containing halon gas;
- a 90% reduction in the baseline of carbon tetrachloride (CCI4), frequently used in fire extinguishers and cleaning agents;
- reduction of toxic waste in mining processes involving mercury and other hazardous substances.

Source: UNEP (2012), *Global Outlook on SCP Policies: Taking Action Together*.

Colombia's efforts to promote cleaner production are contributing to improved industrial waste management. It has established a National Centre for Cleaner Production and Environmental Technology, one of whose objectives is to promote better waste management in industry. The centre signs voluntary agreements with industrial sectors and supports concrete actions to prevent and minimise waste generation. In 2011, the centre provided technical assistance on waste management to 32 companies and trained professionals on hazardous and municipal waste management – a significant effort, since

Colombia suffers from insufficient expertise in hazardous waste management, professional training and laboratory analysis. The centre also provides technical assistance in implementation of the EPR policy, mainly through collection projects for WEEE, batteries and light bulbs, and has developed standards for sustainable buildings, particularly concerning energy efficiency and recyclability of materials. However, a study (Blackman et al., 2006) concluded that the achievements of the Colombian cleaner production policy were difficult to assess due to the lack of baseline and indicators within the voluntary agreements. Companies did not meet their commitments to invest in clean technology due to the lack of financial resources, strong command-and-control regulations and a clear legal status for the agreements. The centre, with support from public authorities and the private sector, has established an information system that facilitates the commercial exchange of residues and industrial sub-products, thus promoting recovery, recycling and reintroduction of materials in the production chain; the system is known as the Exchange for Residues and Industrial Sub-products, or BORSI.

Colombia's environmental authorities are attempting to introduce green public purchasing. MADS is testing the introduction of this policy tool before its extension to other government bodies is proposed. In 2010, a study based on methodology of the UNDP was carried out to prioritise green public purchases (MAVDT, 2010). Seven products and sectors were identified: vehicles, coffee, paper, computer equipment and printers, cleaning products, publications and buildings. One obstacle to the wider introduction of green public purchasing was that public procurement rules used price as their only criteria. The recent procurement reform is expected to facilitate green public purchasing. Developing education and training of public purchasers and eco-labelling would also support this purpose.

5. Economic aspects of waste policies

Waste management is financed by a mix of user contributions, government subsidies, and development aid. Unit-based charges, which vary by type of users as well as household income level, are used to partly recover the cost of municipal waste management services. In 2010, private industry spent COP 91 billion (including COP 66 billion to pay waste management service providers), which represented 16% of all environmental expenditure by the manufacturing sector. That same year the government spent COP 220 billion on waste management, which represented 7% of all public environmental protection expenditure (Chapter 3). Colombia has received financial and technical support from the World Bank, UNEP and individual countries, including Canada (remediation of contaminated sites) and Switzerland (EPR for WEEE and sustainable public procurement).

Waste management in Colombia suffers from limited financial resources. User charges do not fully cover the costs of operations, due partly to the charge system (with significant subsidies for large sections of the population) and partly to low charge collection rates – on average less than 80% of billed amounts are collected (SSPD, 2011). Service providers spend about COP 1.25 trillion, but only 6% of that is investment. Government revenue finances most investment in waste management, as service providers are able to cover only about 4% of investment in the sector (SSPD, 2011). Developing ambitious and effective waste policies was not a priority of past governments, and only limited financial resources from the public budget were allocated to waste management. Constraints on financial resources have resulted reliance on landfilling as the cheapest and simplest option for managing waste. The government is reviewing waste

management policy to make it financially (as well as environmentally and socially) sustainable, moving from a reactive to a preventive approach.

The current economic structure of the sector impedes recycling. The sector does not attract private investors because recycling markets are underdeveloped and final disposal is cheaper than recycling. The fact that there is relatively little separation at source and separate collection of municipal waste significantly increases recycling costs, and sales of recycled material are not sufficient to cover these costs. Moreover, Colombian social norms do not prioritise source separation by individuals, separate collection, or recycling, so significant education and training efforts will have to be undertaken to ensure the success of a recycling policy.

The subsidy system has several shortcomings. Government subsidies are provided at three administrative levels: municipalities subsidise low-income households, while departmental governments and the central government support service providers, either companies or municipalities. About 90% of households are subsidised through a system that involves an element of cross-subsidy between users and an element of public subsidy by local authorities (Chapter 3). This system suffers from leakage (some of the subsidised households are not poor) and from mis-targeting (some poor households, particularly in rural areas, do not receive the service and thus do not benefit from the subsidy). Some 25% of municipalities receive financial support from the CARs or the MVCT to improve waste management. The subsidies received by the municipalities are related to the volume of waste collected and "treated" (mainly landfilled). In addition to violating the polluter-pays principle, the design of this subsidy system represents a disincentive to minimise waste generation and fails to encourage recycling.

Colombia has a well-defined charging system. In 2005, Resolutions 351 and 352 established methodologies to estimate municipal waste generation (from which waste management costs and tariffs are calculated) and to calculate tariffs. The methodology for calculating tariffs was very precise: it considered the maximum price that might be applied for any specific service (street cleaning, collection and transport, final disposal, administration) and provided adjustments for specific situations. It also ensured that cost savings would be passed on to the users. The charge includes fixed and variable parts, calculated based on the average level of waste generation in each service area. The charge is not service-based because the same amount is charged to every household (in the same socio-economic category) in the same service area, independent of individual waste generation. The charge does vary according to the socio-economic category of the household, however. Households are classified in six socio-economic categories (*estratos*),[9] of which three[10] are entitled to subsidies (determined by the municipalities but subject to national ceilings: up to 70% of the standard rate for households in *estrato 1*, 40% for *estrato 2* and 15% for *estrato 3*), one pays the standard rate (*estrato 4*), and two pay a premium (again determined by the municipalities subject to national floors: at least 50% for *estrato 5* and at least 60% for *estrato 6* households). Premiums are also paid by industrial and commercial users (at least 30% and 50% respectively).

The charging system has been evolving to increase cost recovery and reduce perverse incentives. It was revised in 2007. However, the charge rate remained too low to cover the operating costs of waste management (in particular for closing open-air dumps and upgrading landfills not meeting environmental standards) and to fully internalise the environmental costs of waste generation. A new resolution of February 2013 modified the methodology to set tariffs so as to better align the cost figures used in the tariff formula

with market prices, and to ensure that subsidies do not penalise recycling. One way cost recovery could be increased would be to boost the collection of charges from the current (2010) rate of less than 80% (SSPD, 2011).

Colombia provides financial incentives to increase the efficiency of municipal waste management. The 2011-14 PND aims to achieve economies of scale in waste disposal by developing waste management infrastructure (mainly landfills and transfer stations) serving regional needs. Financial incentives are granted according to the amount of waste disposed of and the capacity of the equipment. In 2011, 70 regional landfill sites were serving 621 municipalities, i.e. more than half of all municipalities, an increase of 8% from the previous year. While this policy helps solve the issue of insufficient waste management infrastructure and to reduce dumping, it may have the perverse effect of encouraging municipalities to landfill more waste.

Tax exemptions are used to encourage private investment in waste management. Since 2001, the purchase of equipment for processing or recycling waste has been exempt from VAT. In addition, the sale of energy generated by agricultural waste is exempted from income tax until 2018.

An advanced recycling fee helps internalise waste management costs. The fee is applied to eight products whose treatment at the end of their useful life is problematic and costly: pesticides, medicines, lead-acid batteries, used tyres, batteries, light bulbs, computers and cell phones. If the government succeeds in attracting private investors in the recycling sector, the EPR policy could be extended to other materials such as packaging waste, as in many other countries.

Notes

1. Bogotá, Buenaventura, Medellín, Cali, Barranquilla, Cartagena, Santa Marta.
2. Excluding recovery from households, commerce, institutions and industry (about 1.8 million tonnes in 2010).
3. 89% in sanitary landfills and 3% in authorised temporary storage sites (*celdas de contingencia*), in the national terminology.
4. Excluding authorised temporary storage sites (*celdas de contingencia*) in the national terminology.
5. *www.minambiente.gov.co*.
6. The hazard characteristics considered are: corrosive, reactive, explosive, flammable, infectious, radioactive and toxic.
7. Annually for large generators (more than 12 tonnes per year), every 18 months for medium-sized generators (more than 1.2 tonnes per year).
8. Hazardous waste is categorised according to the OECD and Basel Convention classification, the Y-code and Core List.
9. The classification criteria include physical characteristics (e.g. type of roof, type of garage, facade conditions), urban environment (e.g road conditions, presence of pavements) and town planning (e.g. location).
10. In those municipalities where service coverage is below 90%, no subsidies can be provided to households in *estrato 3*.

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PART II

Chapter 6

Chemicals management

This chapter examines Colombia's policy and institutional framework for chemicals management. It reviews the framework for testing, assessing and managing the risks associated with chemicals, and for disseminating the related information. This includes provisions for chemical accident prevention, preparedness and response. The chapter also examines Colombia's progress in managing specific chemicals, such as ozone-depleting substances, persistent organic pollutants and mercury, and reviews its participation in international co-operation in chemicals management.

Assessment and recommendations

Significant amounts of domestically produced and imported chemicals are used in Colombia. This fact underlines the importance of establishing a robust policy framework that ensures chemicals' safe use throughout their life cycle. While Colombia has taken some steps to this end, much more needs to be done to establish an effective system comparable to those in OECD countries. A priority should be the establishment of a systematic framework for ensuring that industrial chemicals produced and used in Colombia are tested and assessed and that their risks are managed appropriately.

Colombia has established regulatory systems for several types of chemical products, including pesticides, pharmaceuticals, food additives and cosmetics. In the process it has developed the technical capacities to test, assess and manage the associated health and environmental risks, though the emphasis has primarily been on health impacts. Institutional capacities have also been developed, as well as mechanisms to co-ordinate the activities of the ministries involved, though it is not clear that these arrangements are efficient or coherent. Nevertheless, these initiatives provide a helpful basis for developing a regulatory framework for managing industrial chemicals.

Colombia's experience in managing industrial chemicals has been strongly influenced by, and is largely limited to, activities to implement multilateral environmental agreements on specific chemicals. It has been able to make good use of the financial and technical assistance opportunities within these agreements to better manage the chemicals involved and to build related capacities. Colombia has also made good use of other international initiatives, including the UN Strategic Approach to International Chemicals Management. Within this framework, Colombia prepared a detailed National Profile on Chemical Substances in 2012. It provided a good overview of the situation regarding the management of chemicals and facilitated the development of a National Action Plan for Chemicals Management with a timeline to 2020. A list of 140 chemicals for future priority action has also been established. The key challenge is to implement the Action Plan and target available resources on the chemicals with the greatest potential risks to health and the environment. This should be done with the full participation of all stakeholders, including trade unions, consumers and civil society more generally. Best practices, as brought together in OECD Council Decisions, Recommendations and technical documents, could be used as guidance.

Taking a more systematic approach to chemicals management and addressing the potential risks of a broader range of chemicals will require better information and strengthened capacity for testing chemicals and assessing risks. Better information is needed on chemicals produced and used in Colombia. Maximum use should be made of information on chemical hazards produced by international organisations and industry. In conjunction with the establishment of a notification system for industrial chemicals, Colombia should consider requiring the use of the OECD Guidelines for the Testing of Chemicals (as it has for pesticides) and Principles of Good Laboratory Practice for regulatory

testing. Colombia could also consider adhering to the OECD Council Decisions on the Mutual Acceptance of Data.

Further steps should be taken to provide information about the safe use of chemicals to workers, consumers and other users. Colombia has taken a number of steps in this regard, but the measures need to be strengthened and made more coherent. A start has been made to implement the UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS); these efforts should be stepped up as a matter of priority. Work on the feasibility of establishing a pollutant release and transfer register (PRTR) should continue with a view to setting up such a register. Further efforts should be made to ensure that small and medium-sized enterprises using hazardous chemicals have access to the information they need to handle and dispose of the chemicals safely. Information sources for consumers should also be strengthened.

Provisions are in place for accident preparedness and response. However, they focus on risk related to natural disasters and do not adequately address risk associated with routine operation of chemical facilities. Moreover, they are overly reliant on the efforts of under-resourced regional and local authorities and the chemicals industry itself. There do not appear to be arrangements in place to deal with chemical accidents with a potential cross-border dimension. The national authorities should play a more active role in establishing an effective policy framework and in overseeing and providing guidance for subnational authorities' activities in this area. The guidance developed by the OECD and experience gained by OECD countries provide useful reference in this regard.

Drawing on international support, Colombia has made good progress in implementing the Montreal Protocol and fully complies with its requirements. In addition to action on chlorofluorocarbons, Colombia took steps to control the use of hydrochlorofluorocarbons (HCFCs) in advance of the relevant international agreement. Further efforts are needed to curtail the continued illegal import of banned substances and to manage the collection and environmentally sound disposal of ozone-depleting substances contained in equipment still in use.

Colombia is actively working to implement the Stockholm Convention on Persistent Organic Pollutants (POPs), with support from the international community. A comprehensive national implementation plan, prepared in 2010, identifies stocks of POPs and presents a strategy for managing them, taking account of potential economic and social impacts. A substantial effort will be needed to achieve the plan's objectives, as large quantities of pesticides and PCBs are in storage or use, and significant amounts of dioxins and furans are released to the environment. Colombia is receiving support from GEF and the UN Development Programme to develop its capacity for managing the disposal of PCBs. The pesticide glyphosate has been used to eradicate coca and poppy crops used to produce illegal drugs, although questions have been raised about its effectiveness and its health and environmental impacts. A comprehensive, independent study could help inform policy in this area.

Managing the health and environmental impact of mercury is by far the most challenging chemicals-related issue. The serious health and environmental impact of exposure to mercury have long been known, yet substantial quantities of mercury are released to the environment, mostly in artisanal and small-scale gold mining. A considerable number are employed in this activity and many miners lack feasible alternative employment. Ambient air concentrations in some mining towns are at world

record levels, with concentrations in the associated residential areas ten times the World Health Organization limit for public exposure. A number of projects have been undertaken, often with international support, that have demonstrated how releases of mercury to the environment from mining could be reduced or avoided. These need to be massively scaled up. A law to reduce and eliminate mercury use was adopted in July 2013.

Recommendations

- Develop an overarching legal and institutional framework to manage health and environmental risk related to industrial chemicals; review the laws regulating other chemical products and environmental laws that affect exposure to chemicals, with a view to ensuring their coherence; review the overall efficiency and effectiveness of the institutional arrangements for managing chemical-related risks, including the various co-ordination mechanisms.
- Strengthen capacities for testing and assessing chemicals; ensure that full use is made of existing sources of information on chemical hazards; consider adhering to the OECD Council Decisions on the Mutual Acceptance of Data; compile more accurate, up-to-date information about the production, trade and use of chemicals in Colombia.
- Take further steps to raise awareness about chemical safety and make more information about hazardous chemicals available to users and the public; implement the UN GHS as a matter of priority; establish a PRTR in line with good international practice, ensuring that information is available to the public; make sure mechanisms are in place to provide small and medium-sized enterprises with the information they need to safely handle the chemicals they use.
- Strengthen the participation of consumers and civil society in actions to promote the safe use of chemicals at national, regional and local level; continue to work closely with the chemicals industry to promote the safe use of chemicals.
- Strengthen the policy framework for managing chemical accident prevention, preparedness and response; strengthen the role of national authorities in overseeing and guiding the activities of subnational authorities in this area.
- Reinforce and scale up efforts to reduce and eliminate releases of mercury to the environment, taking account of the economic and social impact; implement recent legislation for this purpose; take steps to implement the provisions of the Minimata Convention in advance of its entry into force.
- Reinforce participation in international initiatives with a view to strengthening policies and capacities for chemicals management.

1. Pressures on health and the environment from chemicals

1.1. The chemicals sector: production, import, export, use

Although information on chemicals is patchy and not recent – the latest data are from 2006-07 – it is sufficient to show that there is substantial exposure to chemicals in Colombia. Hence there is a need for a comprehensive, effective chemicals management system to protect human health and the environment.

In 2007, 28 million tonnes of domestically produced and imported chemicals were used in Colombia. Government institutes[1] categorise the types of chemicals used into seven groups for statistical purposes (Table 6.1).

Table 6.1. **Use of chemicals by statistical group**

Group	Use (1 000 tonnes)
1. Organic chemicals	670
2. Inorganic chemicals	3 648
3. Paints, dyes, pigments, varnishes, colouring agents	2 778
4. Pesticides[a]	28
5. Fertilisers	2 077
6. Oil, natural gas and derivatives	18 570
7. Other chemicals	329
Total	**28 100**

a) 1 000 tonnes of active ingredients.
Source: MADS-UNIDO (2012), *Perfil Nacional de Sustancias Químicas en Colombia*.

As of the beginning of the 2000s, the chemicals sector accounted for 2% of GDP, with the share decreasing to 1.4% in the latter part of the decade. The sector's share of manufacturing value added fell from just over 14% to not quite 12% in the same period.

The domestic chemicals sector is made up of companies producing basic chemicals for agricultural use and synthetic resin, paint and other chemicals for industrial use. Domestically produced oil is one of the feedstocks. The chemical industry is mainly concentrated in the Bogotá-Soacha, Medellin-Valle de Aburrá and Cali-Yumbo corridors. The value of domestic chemical production in 2006 amounted to USD 9.7 billion. That year, 59% of the chemicals used in Colombia were imported, mainly from the United States, Germany, Mexico, China, Japan and Venezuela. The value of imported chemicals was estimated at USD 5.7 billion, equivalent to 25% of total industry imports (ICCA, 2012). Exports of chemicals from Colombia were valued at USD 2.4 billion, or 16% of total industry exports. Local and multinational companies with production facilities in the country are important suppliers of chemicals to the region: 41% of exported chemicals went to member countries of the Andean Community of Nations (CAN) (MADS-UNIDO, 2012).

1.2. Chemicals in the environment

Colombia has not established a system for recording levels of hazardous chemicals in the environment. General environmental information is available in the Environmental Information System of Colombia (SIAC), which includes the Information Subsystem on Use of Renewable Natural Resources (SIUR). SIUR has been strengthened in recent years to cover waste, both hazardous and non-hazardous, as well as certain production sectors' water consumption, water and air emissions and energy consumption. While this information has some relation to chemicals production, SIUR does not cover the presence of specific hazardous industrial chemicals in the environment.

In the absence of a systematic approach, information about hazardous chemicals in the environment is ad hoc. For example, data from the Food and Agriculture Organization (FAO), pesticides sold per square kilometre of cropland is nearly seven times higher than the OECD average. Some information is available about releases of mercury to the environment as a result of artisanal and small-scale gold mining, and of the herbicide glyphosate as a result of the spraying of illegal crops. Both chemicals are released in large quantities (see Section 4). There is also information about oil spills. In 2009, there were 276 spills, of which 51% resulted from terrorist attacks on oil infrastructure, 22% from operational failures, 21% from installation failures and 6% from road accidents (MADS-UNIDO, 2012).

1.3. *Health impact of exposure to chemicals*

There is little if any information on exposure of the population to chemicals, including information on the impacts of chemicals on workers or vulnerable groups such as infants and the elderly. There is some information about acute poisoning by chemicals from the National Health Institute's Sivigila system.[2] In 2012, more than 27 000 cases of acute poisoning were registered, of which 34% (including suicides) were caused by pesticides, 14% by "other chemicals" (which excludes medical products) and 3% by solvents (INS, 2012).

2. Policy and institutional framework for managing chemicals

2.1. *Legal and policy framework*

Colombia has established registration systems to assess the efficacy and potential health and environmental impacts of some chemical products, including pesticides, pharmaceuticals, food additives and cosmetics, before they are marketed. However, it has not yet established a national policy framework for the sound management of industrial chemicals. Experience gained from the regulation of other chemical products provides useful experience and a good basis on which to develop such a framework.

Colombian environmental law contains general provisions (such as the precautionary principle and the polluter-pays principle) that have been applied to chemical safety, to a limited extent, and some general regulations are considered to cover aspects of the use of hazardous industrial chemicals. Table 6.2 gives an overview of the state of regulation of chemicals by use category and life cycle stages. General regulations related to chemicals, petroleum products, hazardous waste and pesticides include 15 laws, 26 decrees and 71 ministerial resolutions; in addition, the Colombian Agricultural Institute has issued 54 resolutions on pesticides.

Table 6.2. **Regulation of chemicals by use category**

	Stages of the life cycle of chemicals						
Category	Import	Manufacturing	Storage	Transport	Distribution/ marketing	Use	Disposal
Organic chemicals	SR[1]	SR[1]	GR	GR	SR[1]	GR	GR
Inorganic chemicals	GR	GR	GR	GR	GR	GR	GR
Paints, varnishes, inks, dyes, pigments	GR	GR	GR	GR	GR	GR	GR
Manure and fertilisers	GR	GR	GR	GR	GR	GR	GR
Agricultural pesticides	SR	SR	SR	SR	SR	SR	SR
Petroleum products	GR	GR	GR	GR	GR	GR	GR
Consumer chemicals	GR	GR	NR	NR	NR	NR	SR

Note: SR = Specific regulation GR = General regulation NR = Not regulated.

1. Specific regulation refers to chemicals subject to international agreements adhered to by Colombia, such as the Montreal Protocol and the Rotterdam and Stockholm conventions.

Colombia has a policy of sustainable consumption and production (SCP) (MAVDT, 2010), which the UN Economic Commission for Latin America and the Caribbean once termed the most comprehensive in the region. The UN Environment Programme devoted a case study to the policy (UNEP, 2012c). The policy includes implementation guidelines along with instruments for evaluation and follow-up of environmental commitments. It targets specific sectors, such as construction, agriculture, tourism and the public sector, and is also directed at small and medium-sized enterprises (SMEs). Given the

potential risks associated with the production and use of chemicals by SMEs, the chemical industry should be a target sector.

The safety of industrial chemicals is sometimes tangentially addressed in other environmental regulations – for example, in relation to air and water pollutants, hydrocarbon use, the safety of industrial installations and tax exemptions for the use of chemicals in production of medicines and pesticides. However, generally the links are weak between laws for managing processes and laws for managing products where the same chemicals might be involved.

In recent years, the Ministry of Environment and Sustainable Development (MADS) has worked with other ministries and the private sector to develop a National Action Plan for Chemicals Management. The Action Plan published in September 2013 lists activities planned for 2013-20 (Box 6.1, Section 5.4). These activities provide a good overview of what needs to be done to improve chemical safety management. However, for most of them there is no timeline for implementation, nor have overall priorities been established. Implementation is envisaged as taking place when opportunities arise and resources become available. That being said, two activities are prioritised for action in 2013: development of a national policy, and establishment of an inter-institutional co-ordination mechanism for chemical risk management.

Activities related to chemical safety in Colombia have been strongly influenced by international initiatives, particularly those of the UN. Most of the laws related to chemical safety have been enacted to comply with multilateral environmental agreements (MEAs) developed in the UN context. They include the Montreal Protocol, the Rotterdam and Stockholm conventions and the Basel Convention. Other international initiatives that have been influential include two by the UN: the Strategic Approach to International Chemicals Management (SAICM) and the Globally Harmonized System of classification and labelling of chemicals (GHS).

2.2. Institutional arrangements and resources

Chemicals management, particularly policy development, is primarily the responsibility of the national government. Ten ministries have responsibilities related to chemicals management (Table 6.3). The Autonomous Regional Corporations (CARs) have some responsibility for monitoring compliance with regulations.

In MADS, two full-time staff members work on chemical substances and three on hazardous waste. In addition, nine contractors work in the Ozone Technical Unit funded by the Montreal Protocol until 2015. The Ministry of Health and Social Protection and the Ministry of Labour have three staff members each assigned to chemicals safety; the Ministry of Transport has two. In addition, in three government institutes nine staff members work on pesticide-related issues. While close to 300 staff in government laboratories work on various pollution- and pesticide-related issues, on average only eight are involved in tasks specifically related to industrial chemicals.

2.3. Inter-institutional co-ordination mechanisms

Many inter-institutional co-ordination mechanisms related to the use and handling of chemicals are in place. Box 6.2 lists those that are formally established by law or decree. In most, only ministries and/or government institutes are members, though some mechanisms also provide for participation by non-government stakeholders, e.g. from scientific institutions or business.

Box 6.1. **The National Action Plan for Chemicals Management 2013-20**

1. Strengthen the institutional framework:
   a) Develop a national policy for risk management of chemicals based on life cycle thinking.
   b) Formalise, through a decree, an inter-institutional co-ordination mechanism to work on the various chemical risk management issues.
   c) Update and strengthen the legal framework and compliance monitoring structure.
   d) Integrate chemicals management into the national government's strategic planning and budgeting process.
   e) Prepare the national government's roadmap to start implementing OECD legal instruments on chemicals management.
2. Develop studies and prepare documents on the adjustments needed for implementing OECD legal instruments on chemicals management. Strengthen technical and operational capacity.
3. Strengthen the national and regional networks of laboratories to comply with the OECD Principles of Good Laboratory Practice for characterisation of chemicals, giving support to governmental control activities.
4. Implement risk management – risk prevention, reduction and control:
   a) Ensure the safe handling of chemicals in workplaces.
   b) Institutionalise chemical risk reduction programmes.
   c) Create national and local capacity to prevent accidents and deal with emergencies.
   d) Create national and local capacity to deal with major technological events.
5. Develop effective tools for inspection, monitoring and control throughout the life cycle of substances:
   a) Control the import, production, storage, transport, use and disposal of chemicals.
6. Collect and disseminate information:
   a) Create records and databases on priority chemicals.
   b) Generate national data on chemicals of global concern (such as mercury).
7. Promote public participation:
   a) Establish programmes on the community's "right to know".
   b) Raise awareness and undertake community education on chemical safety.
8. Control chemicals in trade:
   a) Implement the UN Globally Harmonized System for classification and labelling of chemicals in priority sectors.
   b) Ensure effective implementation of prior informed consent procedures for banned and severely restricted chemicals in international trade.
   c) Control the import of chemicals of national priority.
   d) Control illegal international traffic.

Source: MADS (2013), *Plan de Acción Nacional para la gestión de Sustancias Químicas en Colombia (2013-2020): Enfoque estratégico para la gestión racional de sustancias químicas a nivel internacional-SAICM.*

Table 6.3. **Responsibilities of ministries for chemicals management**

Ministry	Stage of the life cycle of chemicals						
	Import/use	Manufacturing	Storage	Transport	Distribution/ marketing	Use	Disposal
Home Affairs						X	
Foreign Affairs	X						
National Defence	X	X	X	X	X	X	X
Agriculture and Rural Development	X		X		X	X	X
Health and Social Protection	X	X	X			X	X
Labour	X	X	X		X	X	
Mining and Energy	X		X		X	X	
Commerce, Industry and Tourism	X	X			X		
Environment and Sustainable Development	X	X	X	X	X	X	X
Transport	x			X		X	

Source: MADS-UNIDO (2012), *Perfil Nacional de Sustancias Químicas en Colombia*.

Box 6.2. **Inter-institutional co-ordination mechanisms related to the management of chemical risks**

National councils on overarching policy issues

- National Council for Social Security in Health
- National Environmental Council

National commissions

- National Advisory Commission on Industrial and Technological Risk

Councils concerning pesticides

- National Council for Pesticides
- National Intersector Pesticide Committee
- Sectional Pesticide Councils (the only currently active councils)

National technical committee

- National Technical Intersector Committee for Environmental Health

Specific-issue commissions or committees

- Intersector Committee on Sanitary and Phytosanitary Measures
- National Commission on Occupational Health (regarding chrysotile asbestos and other fibres)
- Authority for the Prohibition of the Development, Manufacturing, Stockpiling and Use of Chemical Weapons and their Destruction
- National Narcotics Council

In addition, other co-ordination mechanisms exist which have not yet been formally established. The most important is the working group on chemicals risk management, which is part of the National Technical Intersector Committee for Environmental Health, and works as a co-ordination mechanism between government institutions and non-government stakeholders on chemicals management. The working group has developed the functions of the Committee on Implementation of SAICM in Colombia.

In principle, the existing formal and non-formal co-ordination mechanisms should provide a sufficient basis to co-ordinate policies on various aspects of chemical safety policy. However, their overall effectiveness, efficiency and coherence are difficult to appraise, and thus they merit examination.

2.4. Co-operation with stakeholders

In addition to participating in some co-ordination mechanisms, the chemicals industry is regularly invited to provide information and comments through public consultation processes organised by the government. In such cases, general business associations, such as the National Business Association of Colombia (ANDI), lead the process by co-ordinating industry views and facilitating dialogue between government officials and stakeholders in industry.

With a few exceptions, trade unions and consumer organisations are not very actively involved in the safety management of chemicals. The participation of environmental non-government organisations (NGOs) in discussions on chemicals safety is largely confined to the National Environment Council. Participation by consumers or users is limited to the Sectional Pesticides Councils and the National Council for Social Security and Health. Civil society groups participate in some technical co-ordination groups. However, the government works with a large variety of stakeholders for specific implementation issues such as the phasing out of ozone-depleting substances (ODS). This includes large entities, such as the air conditioning and refrigeration association and the federation of small traders, but also smaller companies and organisations involved in the use of or trade in chemicals.

3. Main instruments and mechanisms of chemical safety policies

3.1. Safety testing

Colombia has limited capacity for testing the safety of industrial chemicals. It does not specify test methods to be used or standards for determining acceptability of safety data produced in other countries. Hence there would be advantages in harmonising approaches with those used internationally. Doing so would help reduce costs by avoiding duplicate testing, and avoid potential barriers to trade in chemicals. In addition, Colombia should make good use of data available from various sources, such as data supplied by industry and databases kept by international organisations concerned with the assessment and management of chemicals, such as the OECD, World Health Organization (WHO), UNEP, the International Labour Organization (ILO) and the EU.

To bring clarity and alignment with best international practices, companies should be required to use the OECD guidelines and principles to generate data to be included in registration of chemicals in Colombia. The *OECD Guidelines for the Testing of Chemicals* are effectively the only internationally recognised test methods for non-clinical testing of the effects of chemicals for regulatory purposes. The OECD *Principles for Good Laboratory Practice* (GLP) are the international standards for quality assurance of testing.

With respect to chemical safety testing undertaken in Colombia, the National Institute of Metrology and the National Agency for Accreditation have responsibilities related to quality assurance. Laboratories can be accredited according to ISO 17025 criteria. However, accreditation based on ISO criteria is not recognised in OECD countries as a basis for regulatory acceptance of non-clinical safety data from other countries. If Colombia wants

such data to be recognised by other countries, it will have to require test facilities to apply the GLP, and the government will need to establish a GLP compliance monitoring authority. Colombia could then ask to join the OECD system of Mutual Acceptance of Data in the Assessment of Chemicals (MAD). Test data generated using the OECD guidelines and GLP are accepted by countries that participate in MAD (OECD, 1981), which involves both OECD countries and non-members as full participants (OECD, 1997). Argentina, Brazil, India, Malaysia, Singapore, South Africa and Thailand have joined, some perhaps because they feel that enhancing the international competitiveness of national laboratories leads to good business opportunities.

Since Colombia is not yet exporting new chemicals, there has been little need to establish a GLP compliance monitoring authority. In light of future developments Colombia could assess if it wants to adhere to the MAD system and evaluate the costs and benefits.

Chemical safety data may require protection of proprietary rights. In this regard, Colombia follows CAN Decisions 351 and 344 (CAN, 1993, 1994) on copyright and industrial property; test data could be considered industrial secrets according to Decision 344. The Superintendencia of Industry and Trade of Colombia also has a mechanism to provide protection of industrial secrets, including intellectual property; it can be used to register patents and industrial designs, and is considered applicable to test data on chemicals (SIC, 2008). Nevertheless, Colombia may wish to assess whether its provisions for protecting proprietary rights to chemical safety data are equivalent to practices in OECD countries (OECD, 1983a).

Finally, there is growing interest internationally in alternative test methods and methods of data generation that could provide an initial screening and help reduce costs and the use of animals. In this regard, Colombia may wish to review the use of data estimation methods based on computer models, as presented in the OECD QSAR Toolbox (OECD, 2013b).

3.2. Hazard and risk assessment of chemicals

Colombia has identified a list of priority chemicals for risk assessment and management. The selection was based on the analysis of 6 500 chemical formulations, pure substances and mixtures recorded in goods and raw materials consumed and produced in Colombia in 2007.[3] This analysis resulted in 772 chemicals including 219 pesticides, being grouped in 7 categories, by function, intrinsic nature, or depending on their use (Table 6.4).

Table 6.4. **Selected groups of chemicals**

Group	Category	Number of substances	%
1	Organic chemicals	144	18.7
2	Inorganic chemicals	177	22.9
3	Paints, dyes, pigments, varnishes, colouring agents	60	7.8
4	Pesticides	219	28.4
5	Fertilisers	28	3.6
6	Oil, natural gas and derivatives	45	5.8
7	Other chemicals	99	12.8
Total		772	100

Source: MADS-UNIDO (2012), *Perfil Nacional de Sustancias Químicas en Colombia*.

Five priority criteria were then applied: hazardous properties; volume used in 2007 (which is not very accurate for individual chemicals); number of regions in which the chemical was used; number of industrial categories in which the chemical was used; and number of emergency events in which the chemical was involved. This resulted in the selection of 140 priority substances.

Priority chemicals covered by the Rotterdam and Stockholm conventions were the first to undergo further investigation. Of the 61 chemicals covered by these conventions, 49 are pesticides. No resources have been made available to further investigate other priority chemicals.

While industry is not required to provide safety data on industrial chemicals before they are marketed or to otherwise assess their potential hazards, there is substantial experience in relation to other chemical products. This experience and capacity provide a good basis for strengthening the assessment of chemical hazards and risks.

Pesticides are subject to pre-market registration, including risk assessment (Box 6.3). The assessment is based on test data on health and environmental effects, as well as exposure analysis provided by the registrant. The registration requirements and risk evaluation criteria were agreed within CAN in Resolutions 436 (amended by Decision 515 in 2002) and 630 (CAN, 1998, 2002a, 2002c). The latter resolution includes an extensive manual covering all aspects of pesticide registration, safety assessment, classification and labelling; with respect to test methods, the OECD Test Guidelines are recommended. Three ministries co-operate in a process which results in an authorisation for use, labelling requirements and, as appropriate, specification of the conditions for use of the pesticide.

Box 6.3. **Safety assessment for pesticides**

Registration is mandatory before pesticides are imported or marketed. Companies must submit studies on product effectiveness and safety. In most cases the studies have been undertaken in other countries. The Colombian Agricultural Institute issues a technical report on the effectiveness of the formulation for protecting specific crops against pests. The Ministry of Health and Social Protection issues a report on human toxicology; in future these reports will be done by the National Institute of Health. The Environmental Licensing Authority reports on environmental aspects. In some cases additional performance tests are required on the effectiveness of the pesticides in conditions specific to Colombia.

The Ministry of Health and Social Protection also oversees registration and assessment of the hazards and risks of pharmaceuticals, food additives and cosmetics (the latter following CAN Decision 516 (CAN, 2002b) and issues approval for use.

If Colombia were to extend the safety assessment of chemical substances to industrial chemicals, it could consult a wealth of detailed information from the OECD on best practices in member countries. For example, a number of Council Acts relate to the assessment of chemicals newly introduced to the market (OECD, 1974, 1977 and 1982) as well as chemicals already on the market that are suspected of being hazardous (OECD, 1987 and 1990). The OECD eChemPortal gives access to safety information about many industrial chemicals in 24 databases from governments and intergovernmental organisations (OECD, 2013a). It would also be important to consider actions to update and

strengthen hazard and risk assessments of chemicals, using methodologies and tools developed by OECD member countries.

3.3. Chemicals risk management

Colombia has established a system for managing risks associated with pesticides (Box 6.4), pharmaceuticals, food additives and cosmetics. Efforts related to industrial chemicals largely focus on risks associated with chemicals specified in UN MEAs. Examples of chemicals risk management tools include standards for maximum concentrations of pollutants allowed in air and water, and for maximum levels of priority pollutants permitted in waste; maximum allowable concentrations for certain chemicals in the working environment; maximum levels of contaminants permitted in food; and the maximum allowable concentration (10%) of non-biodegradable substances in detergents.

Box 6.4. **Risk management of pesticides**

Since 1974, more than 40 decrees or resolutions have been issued to prohibit or restrict the use of pesticides, including all those listed in the Stockholm Convention. Authorisation for the use of a pesticide in Colombia is based on criteria in the Andean Technical Manual for the Registration and Control of Chemical Pesticides for Agricultural Use. A licence, specifying conditions of use, is then issued. ANLA is responsible for verifying that importers of pesticides comply with these conditions, though few resources are available for this purpose.

Planned strategies to further reduce exposure to pesticides include:

- strengthening systems for registration, inspection, surveillance and control of chemicals for agricultural use;
- implementing a programme of good agricultural practice and a national action plan for training, implementation and certification in such practice;
- strengthening monitoring programmes for the identification and reduction of non-permitted uses or applications of restricted pesticides.

3.4. Requirements to provide information on chemicals

Labelling of hazardous chemicals is an important means of directly and simply communicating information to workers and consumers about hazardous properties of chemical products. Labelling encourages users to treat chemicals with appropriate levels of care and caution. The GHS is the global standard in this area. Its basic goal is to ensure that employers, employees and the public receive adequate, practical, reliable and comprehensible information on the hazards of chemicals so that they can take effective preventive and protective measures for their health and safety. Many countries in which safety management systems for industrial chemicals are not yet well developed have started using the GHS. Its rapid implementation in Colombia would be an important step forward in protecting public health (especially of consumers and workers) and the environment against chemical hazards.

A first national training workshop on GHS implementation was held in 2011 with support from the United Nations Industrial Development Organization (UNIDO). It took place in the context of activities carried out by MADS to promote implementation of the SAICM. In 2013, GHS implementation was scheduled to be further addressed in another

SAICM project, with support from the United Nations Institute for Training and Research. Its aim is to build institutional capacity for GHS implementation in the priority sectors of agriculture, transport, consumption and labour. Companies involved in Colombian implementation of Responsible Care, a global voluntary programme by the chemicals industry (Section 3.7), have also started to use the GHS for products they market.

Many countries require companies or suppliers to prepare safety data sheets (SDS) on the chemicals they handle and to provide the sheets to workers and emergency services. In Colombia, regulations on the transport of hazardous goods, and on industrial hygiene and safety, also require SDS to be made available to persons involved in transporting hazardous chemicals. SDS often follow a UN recommended format and include summary information about the chemical's physico-chemical and toxicological properties, including eco-toxicological properties; instructions for its safe handling, storage, use and disposal; and basic accident response measures. It is important to ensure provision of SDS throughout the supply chain so that all downstream users, including those in SMEs, will receive them.

Many countries have established pollutant release and transfer registers (PRTRs) that require industrial facilities to provide information about releases of hazardous chemicals. In 2009, Colombia established a Single Environmental Registry (RUA), which focuses to a large extent on collecting information from companies on the use of natural resources. Some information on releases to the environment is also requested. Gradual implementation of RUA by sector is envisaged. The Institute of Hydrology, Meteorology and Environmental Studies has been assigned to manage the information collected, which is not available to the public. RUA does not meet all the requirements of a PRTR according to good international practice. Colombia is examining the experience in Chile and Mexico with a view to making a feasibility study, with support from Canada, for setting up a PRTR. Using RUA as a starting point, establishing a PRTR in line with good international practice and with public access to the information collected should be a medium-term priority for Colombia. Policies and best practices of OECD countries could support these efforts (OECD, 1996a, 1996b,). Colombia could benefit from a wealth of information on country data and experiences and OECD-wide agreed release estimation techniques provided by the OECD website.[4] This information could assist greatly in launching a PRTR in Colombia.

3.5. Mechanisms for disseminating information on chemical safety

Many government and non-government organisations also provide information on the safety of chemicals. MADS is building a website providing safety information on chemicals and hazardous waste. To date, however it has a limited focus, dealing only with chemicals covered by the Stockholm Convention on Persistent Organic Pollutants (POPs). Colombia should strengthen its policies concerning public availability of safety data on chemicals. To this end, practices followed by OECD countries and reflected in two OECD Council Acts (OECD, 1983b, 1983c) could be of benefit.

The Colombian Safety Council (CCS), an entity supported by business, plays an important role in disseminating information on chemicals. It produces publications, posters and videos related to occupational and environmental safety of chemicals. It also organises training and educational events. The Information Centre on Safety of Chemical Products (CISPROQUIM), also supported by industry, has telephone contact lines to provide information in case of chemical emergencies. It also prepares technical documentation related to chemical safety that can be downloaded from its website. The documentation includes government manuals, SDS and information on the GHS and other UN initiatives.

CISPROQUIM is a useful resource but does not actively disseminating information about the safety of chemicals.

The main source of information for workers about the safe handling of chemicals is the system of entities in charge of occupational risk, known as ARPs or ARLs. There are ten ARLs – effectively insurance companies that cover workplace injuries and illnesses, each with a different focus. Working with government agencies, employers and trade unions, the ARLs are required to undertake activities to prevent industrial accidents and occupational diseases in affiliated companies with ten or more employees. Their main focus is on physical hazards, but they also address chemical risks. Consideration should be given to how the provision of information could be extended to smaller companies, which often lack the resources and capacities to manage chemicals, even those whose hazards are well known.

There are very few sources of information for consumers on the chemicals contained in consumer products. Another important information gap concerns the safe disposal and treatment of chemical waste from industrial and agricultural processes.

3.6. Chemical accident prevention, preparedness and response

In 1988, a National System for Disaster Prevention and Preparedness (SNPAD) was established under the Ministry of the Interior. To support its implementation, a National Advisory Commission on Industrial and Technological Risks was established as an informal working group. ANDI participates in the Commission on behalf of industry. One current activity involves updating the 1999 National Contingency Plan for Responding to Spills of Oil Products and Harmful Substances in Marine Waters, Rivers and Lakes.

In 2012, Law 1523 provided for the establishment of a national risk management policy and a National Unit for Disaster Risk Management was created under the Presidency of the Republic. The policy requires public and private entities undertaking industrial activities to perform risk analysis of the possible effects of natural disasters on their infrastructure, to establish contingency plans and to take risk reduction measures. Specific regulations have been developed that apply to these activities. The policy concerns risks from natural disasters and from human-caused accidents.

With respect to accident prevention, Regional Councils for Risk Management play a role in preventing accidents at chemical facilities, as do municipalities through their zoning policies. Colombia does not have a system for classifying chemical facilities based on the hazardous properties of the chemicals produced, processed or handled. For companies subject to licensing requirements, chemical accident prevention measures are included in licence conditions. The companies may be subject to inspections by CAR authorities to verify compliance with these conditions.

To a large extent, accident prevention is considered to be the responsibility of companies. In the chemicals sector, companies voluntarily participating in Responsible Care, described below, are expected to follow the guidelines on accident prevention specified in this programme. The CCS and ARLs assist companies by providing reference materials for dealing with occupational and environmental safety of factories.

Regional Councils for Risk Management and municipalities have made provisions regarding preparedness for, and response to, chemical accidents. The fire brigade is designated as the first responder in case of accident. Its role is to contain the consequences of the accident and mobilise any additional resources necessary, including the police and

the army. The fire brigade and hospital staff receive special training to help in dealing with the consequences of chemical accidents. Regional Councils for Risk Management and municipalities also prepare contingency plans, based on information provided by companies, and receive assistance from CARs for their implementation. The plans have to specify the information to be provided to the public in the case of an accident.

Although some useful steps have been taken to establish a system of chemical accident prevention, preparedness and response, further efforts are needed. Some cities, such as Barranquilla and Cartagena, have successfully implemented the UNEP-APELL (Awareness and Preparedness for Emergencies at Local Level) programme led by the business sector. However, it is not clear if the CARs are sufficiently equipped to provide adequate oversight of industry's efforts to prevent and respond to chemical accidents. The existing arrangements, and associated resource requirements, should be reviewed and strengthened. Further guidance should be provided to regional and municipal authorities regarding oversight of preparedness plans and response measures. In addition, steps should be taken to align the arrangements in Colombia with those in OECD countries. The OECD Guiding Principles in this field (OECD, 2003a, 2003b, 2011), along with the OECD Safety Performance Indicators for Public Authorities and Communities/Public (OECD, 2008a) and for industry (OECD, 2008b), could serve as useful guidance. Consideration should also be given to applying the polluter-pays principle to chemical accidents (OECD, 1989). Similarly, provision should be made to co-operate with neighbouring countries in the case of chemical accidents that may have cross-border implications, and policies should be developed for the provision of information and participation of the public in decision making. Again, policies of OECD countries could serve as useful references (OECD, 1988a, 1988b).

3.7. Initiatives involving the chemicals industry

The Colombian chemicals industry is not organised in a national association, but many chemical companies belong to ANDI, ACOPLASTICOS (Colombian Plastic Industry Association) and CCS, through which they can subscribe to the global chemicals industry voluntary initiative, Responsible Care. In Colombia, the programme is organised through an initiative called Responsabilidad Integral, in which some 60 chemical companies have committed to work together to significantly and continuously improve their environmental, health and safety performance, and that of their processes and services and of their products throughout their life cycle, with a view to fostering responsible management of chemicals.

3.8. Cleaner production

The National Centre for Cleaner Production and Environmental Technology, established in 1998 with support from the Swiss government, is part of the UNIDO/UNEP network of cleaner production centres.[5] The centre provides guidance and documentation on its website. It is active in the public and private sector alike. Since 1998, it has established alliances with 35 public and private sector institutions, had worked with over 1 400 companies and had trained over 12 000 people in cleaner production (OECD/WTO, 2011). The centre works in several areas:

- doing resource efficiency studies for industrial and institutional entities;
- defining the carbon footprint of products and processes and assessing CO_2 emissions;

- making water footprint evaluations;
- providing advisory services on eco-design and life cycle assessment;
- advising on the development of strategies for reduction of the environmental impact of products and services without reducing their quality or increasing their costs;
- developing and applying indicators to measure progress in improving the sustainability of processes and reducing environmental impacts throughout the life cycle of products;
- identifying ways to reduce greenhouse gas emissions and helping organisations and companies work towards carbon-neutral operations, including through process certification and validation.

The centre has specific activities on chemicals management, such as projects promoting green chemistry and innovative green design, encouraging ways to enter green markets and, in co-operation with UNIDO, implementing chemical leasing (Box 6.5).

Box 6.5. **Chemical leasing projects in Colombia**

Chemical leasing involves a business model in which the customer pays for the benefits obtained from a chemical, not for the substance itself. The economic benefits to the supplier thus are no longer linked with volume of product sold. Chemical consumption becomes a cost rather than a revenue factor for the supplier, providing an incentive to optimise the use of the chemical and recycling. The National Centre for Cleaner Production and Environmental Technology began work on chemical leasing in 2008. Currently 5 projects are in various stages of development. Examples of successful activities are the chemical leasing models used by Ecopetrol in its oil dehydration process and by the Corona Group in industrial wastewater treatment. Other projects involve the galvanoplastic and ceramic industries, covering products such ascaustic soda, metabisulfites and polymers. Progress in these projects is monitored. One challenge in implementing chemical leasing projects is to demonstrate to companies' management that the approach leads to financial benefits, and to make the changes required to realise the benefits.

4. Managing the risks of specific chemicals

4.1. *Ozone-depleting substances*

Colombia is a signatory of the Montreal Protocol, which involves eliminating consumption of 96 ozone-depleting substances. Colombia has made good progress under the protocol and is in full compliance with its obligations. Achievements include eliminating the use of chlorofluorocarbons (CFCs) in refrigerator manufacturing and the manufacture of polyurethane and polystyrene, halting halon imports for use in fire extinguishers, prohibiting the use of methyl bromide in agricultural applications and eliminating the use of carbon tetrachloride and imports of methyl chloroform (UNEP, 2013).

The national programme for reducing ODS is implemented by the Ozone Technical Unit of MADS, with technical assistance from the United Nations Development Programme (UNDP). Licences for the production and import of ODS have been required since 1993 (under article 52 of Law 99). A dozen regulations have been issued to broaden and strengthen measures designed to meet international treaty commitments. Resolutions

have been issued to control the import and export of all ODS covered by the protocol. Mechanisms to control trade in ODS have also been established, with relevant partners.

The Ozone Technical Unit has sponsored and co-ordinated 79 projects providing technical assistance to manufacturing companies and assisting in industrial restructuring of firms using ODS. It has also bought equipment for recovery, recycling and reclamation of refrigerant gases.

As in many countries, consumption of hydrochlorofluorocarbons (HCFCs) rapidly increased to replace CFCs in refrigeration, fire extinguishers, foams, solvents and aerosols. Although HCFCs were initially approved under the Montreal Protocol as a substitute for CFCs, the rapid growth of their use raised concern since they contribute to ozone reduction. To address this, Colombia has required import licences for HCFCs since 2006, before the international phase-out schedule for HCFCs was agreed under the protocol in 2007.Under Article 5, in the case of developing countries such as Colombia, the schedule calls for a freeze in consumption by 2013 at the average 2009-10 level, with subsequent decreases until a 100% reduction is reached by 2040. Funding of USD 6.8 million has been earmarked for the first stage of the phase-out of HCFCs (to 2015) from the UN Multilateral Fund.

Colombia's ODS strategy is now focused on curtailing illegal import of banned substances, collecting and eliminating chemicals contained in equipment still in use and phasing out HCFCs.

A problem remains regarding the growing number of stockpiles of unwanted CFCs and how to destroy them. A 2005 decree treats unwanted ODS as hazardous waste under the Basel Convention, thus regulating their import and export for recycling or destruction. Colombia has started a pilot project to demonstrate a sustainable approach to ODS waste management from collection to destruction. With UNDP financial support and technical assistance, an effort is being made to find a way to use domestic capabilities (e.g. rotary kilns) for environmentally sound and energy efficient ODS destruction. The goal of the 2013-15 pilot project is to destroy 114 tonnes of CFCs collected from about 300 000 refrigerators.

4.2. Persistent organic pollutants

Colombia is actively working on Stockholm Convention implementation. The national effort on POPs was energised by Colombian NGOs working together in the Red de Accíón en Plaguicidas y Alternatives de America Latina (RAPAL), which works with international NGOs such as the Pesticides Action Network International (PAN) and the International POPs Elimination Network (IPEN).

With funding support from the Global Environment Facility (GEF) at the World Bank, a national implementation plan was prepared in 2010 (MADS, 2010). It provides information on existing quantities or releases of the 21 POPs or groups of POPs listed (17 of which are pesticides) and presents a strategy and elements of an action plan for implementation of the convention. The challenge is significant. In 2006, 162 tonnes of POP pesticides were stockpiled at 31 sites; in 2007, between 16 000 and 19 000 tonnes of polychlorinated biphenyls (PCBs) were stored or in use, mostly in the electricity sector (from transformers and condensers); in 2002, 790 tonnes of dioxins and furans were released to the environment.

The plan also identifies challenges for achieving full implementation of the Stockholm convention, highlighting inadequate funding and lack of technical expertise and technology. Nevertheless, progress includes:

- a national inventory of sources and releases of dioxins and furans;
- a preliminary inventory of PCBs;
- consolidation of a national inventory of POP pesticides;
- an evaluation of the regulatory framework, institutional capacity and technical infrastructure available for the management of POPs;
- an economic evaluation of occupational and public health impacts associated with POPs;
- an evaluation of economic and social implications of the use and reduction of POPs.

Follow-up activities to strengthen the national capacity to implement the convention include awareness-raising workshops, workshops on POPs management and updating of the PCB Management Manual.

PCBs

Colombia has taken measures to reduce risks which could result from exposure to polychlorinate biphenyls (PCBs). Decree 4741 of 2005 prohibited the import of equipment or substances that contain PCBs in a concentration equal or superior to 50 mg/kg. In 2008, an action plan on PCBs was developed and in 2011, MADS issued a resolution for the prevention and control of environmental contamination from equipment and waste contaminated with PCBs (MADS, 2008). Colombia is receiving support from the GEF to develop the national capacity for the environmentally sound management and disposal of PCBs.

The Ministry of Health and Social Protection started a programme to monitor PCBs in human blood and milk in a sample of the population in 2013.

Dioxins and furans

Resolution 909 of 2008 regulates the emission of dioxins and furans from fixed sources. Colombia is also:

- controlling and monitoring the generation of dioxins and furans in activities such as waste incineration;
- implementing cleaner production strategies to prevent dioxin and furan formation and release.

DDT

Stockpiles of DDT, arising from its use in the eradication of malaria in the 1970s through 1990s, have been eliminated.

4.3. Mercury

Mercury is widely used in artisanal and small-scale gold mining (ASGM). Such mining is an essential economic activity for some 200 000 poor people, including women and children. It produces 70% of the gold mined in Colombia, which in 2011 amounted to 56 tonnes (USGS, 2012). Many miners have no other feasible alternative employment. However, the process used to extract gold from ore has resulted in very high environmental concentrations of mercury, with major impacts on human health and the environment.

Colombia is not a producer of mercury. The country's Foreign Trade Database (BACEX) reports imports of 54 to 130 tonnes a year of mercury in 2006-10. Around 98% was used in gold mining. The National Mercury Inventory shows 47 tonnes of mercury being released each year to the atmosphere, 15 tonnes to water and 15 tonnes to soil as a result of gold mining and related activities. Further emissions to the environment result from primary production of metals, production of chemicals, waste disposal, wastewater treatment and the use and disposal of materials containing mercury such as thermometers, batteries, light bulbs and light switches.

Analysis by UNIDO suggests that releases of mercury to the environment may be higher than Colombia estimates – as much as 150 tonnes a year in ASGM alone (UNIDO, 2012). The UNIDO report ranked Colombia as the world's third most contaminated country in terms of quantity of mercury released, even though it ranks only 14th in terms of quantity of gold produced (USGS, 2013). Urban air concentrations of mercury in mining towns in Antioquia ranged from 0.3 $\mu g/m^3$ (background) to 1 000 $\mu g/m^3$ in gold shops (the highest concentration ever measured in the world), with an average level of 10 $\mu g/m^3$ in residential areas; this was ranked as the world's highest level of per capita mercury pollution (Cordy et al., 2011; Veiga et al., 2011). The WHO limit for public exposure to mercury is 1 $\mu g/m^3$ (WHO, 2007). The WHO limit for tolerable intake in long-term inhalation is 0.2 $\mu g/m^3$ (WHO, 2003)

The serious adverse health effects of direct mercury exposure are well known: they include neurological and behavioural disorders, renal damage and immunological effects (Webster, 2012). The adverse environmental effects of mercury contamination are also well documented (UNEP, 2002). For instance, in Minamata in Japan consumption of fish contaminated by mercury resulted in many people suffering from malformations and neurological disorders that were fatal in a large percentage of the almost 2 300 people affected (Government of Japan, 2002). The high environmental concentrations in Colombia are therefore of great concern.

Many initiatives have been taken to address health and environmental impacts related to the use of mercury in ASGM, often with international support. These efforts have been hampered, however, by illegal activities, and by concerns about the short-term social and economic effect they would have on the affected populations.

An important measure was the adoption in July 2013 of the Law 1658 to reduce and eliminate mercury use. Among others, it includes provision for:

- phasing-out the use of mercury in all production processes within a ten-year period and for mining within a five-year period;
- setting up a register of mercury users and controlling the import and marketing of mercury;
- developing cleaner technology projects;
- elaborating technical regulations for all stages of the lifecycle;
- prohibiting the establishment of new precious metals mining processing units in areas of residential, commercial, institutional or recreational use and controlling existing ones;
- creating incentives for small-scale gold miners to reduce or eliminate mercury in mining, including through the provision of soft loans;
- formalising artisanal and small-scale mining.

Colombia has benefited from guidance and technical documents prepared within the UN to address the problems related to the use of mercury in ASGM (UNEP, 2012b).

UNIDO has been working with relevant stakeholders in the departments of Antioquia and Choco, where a lot of ASGM takes place, on projects to put in place cleaner technologies that reduce the use of mercury at mining sites (UNIDO, 2012). These relatively small projects demonstrate that solutions are possible: with various technological options, mercury use can be reduced by up to 48%; the use of simple retorts during the heating of the amalgamated ore can allow 15% of the mercury to be recovered. It has also been demonstrated that a technology using cyanide instead of mercury works satisfactorily provided the workers are well trained, as cyanide can also lead to serious health and environmental problems when not properly used (UNIDO, 2012).

UNEP also has many activities concerning the use of mercury in ASGM (UNEP, 2011b). It has produced a Guidance Document on Developing a National Strategic Plan to Reduce Mercury Use in Artisanal Gold and Small Scale Gold Mining (UNEP, 2011a), and it provides experience on how the ASGM sector could be formalised in order to be better able to put cleaner mining methods in place, including case studies from Ecuador and Peru (UNEP, 2012a), which have an ASGM challenge comparable to that in Colombia. Since 2012, MADS has been developing a national strategic plan for the reduction of mercury use in ASGM.

Colombia has taken part in the UNEP process to negotiate a legally binding international instrument related to the phase-out or reduction of all types of mercury use and emissions of human origin. These efforts resulted in the Minamata Convention of January 2013 which was presented for adoption and opened for signature in October 2013. The Convention provides for the ban of production, export and import of almost all mercury containing products by 2020, and for the control of emissions of mercury from coal-fired power plants and from processes like waste incineration. It also includes provisions to reduce, and if possible eliminate, the use of mercury in ASGM. For the population in the mining areas in Colombia, and especially for ASGM workers, the environmental and health benefits which would result from implementation of the convention would be immense. Given the scale of mercury use in Colombia, and the opportunities provided by the Minamata Convention, Colombia should take immediate action to implement the convention, even before its formal entry into force.

4.4. Glyphosate – a special case

Plan Colombia is a programme to eradicate the production of illegal crops, particularly coca and poppy. Among other things, it involves aerial spraying of fields presumed to be planted with the illegal crops, using the herbicide glyphosate (Roundup and generic equivalents). A 2005 study prepared for the Organization of American States (OAS) estimated that 1.4 million litres were sprayed in 2004 (Solomon et al., 2005). A recent report indicates that 100 549 hectares were treated in 2012 (UN Office on Drugs and Crime, 2013).

The US Government Accountability Office concluded in 2008 that "Plan Colombia's goal of reducing the cultivation, processing, and distribution of illegal narcotics by targeting coca cultivation was not achieved" (GAO, 2008). The 2005 OAS report concluded that the human health and environmental risks of the spray programme were not very significant (Solomon et al., 2005). However, the Environmental Studies Institute of the National University of Colombia criticised the 2005 report (Universidad Nacional de

Colombia, 2005). Other studies suggest that glyphosate has to be applied under well-controlled conditions to avoid potential health and environmental impacts, which is difficult when it is applied by aerial spray. WHO assessed adverse human health and environmental effects of glyphosate in 1994. The GHS indicates that glyphosate causes serious eye damage and has long-lasting toxic effects on aquatic life; it recommends the use of protective clothing during application. A Pesticide Action Network monograph of 2009 mentions several laboratory studies published in peer-reviewed journals that identified genotoxic, developmental and endocrine-disrupting effects of glyphosate at low doses (Watts, 2009). Thus questions remain about the effectiveness, efficiency and environmental impact of Plan Colombia, and these merit further investigation.

5. International co-operation in chemicals management

5.1. *Montreal Protocol*

Colombia has been very supportive of international efforts to cope with stratospheric ozone depletion. It acceded to the 1985 Vienna Convention in 1990 and ratified the 1987 Montreal Protocol in 1993; it also ratified the four subsequent protocol amendments. Colombia is an Article 5 (developing) country party and therefore receives support from the UN Multilateral Fund for phasing out the use of the 96 ODS covered by the protocol. Thus far Colombia has received USD 20 million for 65 projects. As a result of these activities Colombia fully met its obligations under the protocol on time. With funding from the Climate and Clean Air Coalition, Colombia conducted a national inventory of hydrofluorocarbons (HFCs), with a view to their phase out.

With funding from the Multilateral Fund and support from Environment Canada and UNEP, a project was initiated in 2002 to train customs officials in the control of ODS commerce. This led to development of a national training manual, provision of analytical equipment to regional customs offices, training workshops and a green customs programme. Under a certification project, 7 000 technicians have had some level of training in ODS handling and recovery, with 5 000 achieving certified advanced status.

5.2. *Rotterdam Convention*

In 2008, Colombia ratified the 1998 Rotterdam Convention on the Prior Informed Consent Procedure for certain Hazardous Chemicals and Pesticides in International Trade. The Convention requires prior informed consent for exports and imports of listed chemicals, currently totalling 47, of which 33 are pesticides. The Ministry of Health and Social Protection and the Colombian Agriculture Institute jointly serve as designated national authority under the convention.

Parties have to decide whether to allow listed chemicals to be imported. Colombia provided the convention secretariat with 41 import responses, requiring consent to import for 13 of them (UNEP, 2010). There are no notifications made of exports of chemical products covered by the convention.

5.3. *Stockholm Convention*

Colombia ratified the 2001 Stockholm Convention on POPs in 2008. It calls for measures to eliminate 18 listed pollutants (including PCBs and a number of pesticides), to restrict the production and use of DDT and some perfluorinated chemicals and to reduce unintentional releases of dioxins and furans.

The Canadian International Development Agency (CIDA) has supported activities to train experts in Colombia on POPs-related issues, which facilitated formulation of the national implementation plan. A GEF project on the development of national capacity for the environmentally sound management and disposal of PCBs started in early 2013. MADS has signed a memorandum of understanding with the regional centre of the Basel Convention for South America on co-operation in environmentally sound management of PCBs.

5.4. *SAICM and other international programmes for chemical safety management*

Colombia has signed other international agreements related to chemical safety as well. For example, it ratified the 1951 FAO International Plant Protection Convention in 1970 and adopted the revised FAO Code of Conduct on the Distribution and Use of Pesticides (a voluntary agreement) in 2002. In 1994 it ratified the 1990 ILO Convention concerning the Safe Use of Chemicals at Work. In 2000 it ratified the 1992 International Chemical Weapons Convention, and it participates in the 2006 UN Strategic Approach to International Chemicals Management.

SAICM is a multigovernment, multistakeholder, global effort led by UNEP and WHO. Its objective is to ensure that, by 2020, chemicals are produced and used in ways that minimise significant adverse impacts on human health and the environment. SAICM is the only global forum where overarching discussions on the management of chemicals take place. MADS and the Ministry of Health and Social Protection are collaborating in implementing a domestic strategy to adopt and advance the SAICM objectives. Colombia has finalised a project called Strengthening National Governance for SAICM Implementation in Colombia, with funding from the Quick Start Programme Trust Fund (QSP) of SAICM, with UNIDO as the implementing agency (SAICM, 2012). The main products of the project are the updated national profile on chemical substances, originally prepared in 1998, and the National Action Plan for Chemicals Management 2013-20. In 2013, another SAICM/QSP project, Supporting SAICM Implementation and GHS in Colombia, is planned with UNITAR as the implementing agency.

5.5. *Bilateral and regional co-operation in chemicals management*

The Andean Community (Bolivia, Colombia, Ecuador and Peru) collaborates on the safety of pesticides and veterinary products. It has agreed on harmonised requirements and procedures for registering and controlling chemical pesticides for agricultural use and on regulations for registering, controlling, marketing and using veterinary products. The requirements provide authorised conditions for use and handling of such products to avoid or minimise damage to health and the environment while facilitating trade in the products within the community. There is also a regulation, CAN Decision 602, on control of chemicals used in illegal manufacture of narcotics and psychotropic substances (CAN, 2004).

Colombia has benefitted from technical assistance projects related to chemicals, notably with the Multilateral Fund, the GEF on implementation of the Stockholm Convention, the QSP Trust Fund on SAICM implementation and UNIDO on chemical leasing.

Notes

1. Banco de Datos de Comercio Exterior (BACEX), Direccion de Impuestas y Aduanas Nacionales (DIAN), Departemento Administrativo Nacional de Estadistica (DANE) and Istituto Colombiano Agrepecuario (ICA).
2. Sivigila, National public health vigilance system, National Institute of Health, *www.ins.gov.co/lineas-de-accion/Subdireccion-Vigilancia/sivigila/Paginas/sivigila.aspx*.
3. Based on the DANE's Central Product Classification.
4. OECD website on PRTRs, *www.oecd.org/env/chemicalsafetyandbiosafety/riskmanagementofinstallationsandchemicals/pollutantreleaseandtransferregisterprtr.htm*.
5. UNIDO Network of Cleaner Production Centers, *www.unido.org/index.php?id=o4460http://www.cnpml.org/*.

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PART II

Chapter 7

Biodiversity

This chapter reviews the current status and trends of Colombia's biodiversity, as well as pressures stemming from a range of sources. It examines Colombia's biodiversity policy and institutional framework, and the priorities and actions outlined in the National Policy for the Integral Management of Biodiversity and Ecosystem Services. The chapter assesses progress in using various instruments, including payments for ecosystem services and biodiversity offsets. It also examines measures to integrate biodiversity conservation into other key policy areas, such as agriculture, forestry and mining.

Assessment and recommendations

Colombia has a greater variety of ecosystems than any other country, and is considered the second most biodiverse country in the world. Much of the biodiversity resides in forests, which cover more than half the territory, considerably more than in most OECD countries. Colombia also has rich biodiversity in its coastal and marine areas.

Colombia's rich biodiversity is under increasing threat. Between 30% and 50% of natural ecosystems have been transformed in some way. This has not translated into significant threats to species, however, possibly due to the large number of species and/or lack of information. The transformation of ecosystems has been driven by a number of developments, notably habitat loss due to land use change. Conversion of forest to pasture for livestock grazing, and to a lesser extent conversion for crop production, continues to be the primary driver of deforestation. Other key drivers include degradation and fragmentation of habitats due to development of infrastructure, extractive industries and hydropower; overexploitation of biological resources due to subsistence and artisanal activities; invasive alien species; and pollution.

A good framework has been established for collecting information on biodiversity, involving MADS and environmental research institutions. Yet, lack of information remains a key obstacle to decision making; better information is particularly needed on habitat change outside forest ecosystems. More precise information on a finer scale is needed to facilitate action in the decentralised environmental management system. Better scientific information will also strengthen the basis for assessing the economic value of ecosystem services. Information about the value of biodiversity and ecosystem services, nationally and globally, should be better researched and communicated so as to strengthen political and public support for biodiversity and development policies.

Until relatively recently, Colombia had a weak policy framework for the conservation and sustainable use of biodiversity, largely driven by developments at international level. The integration of biodiversity into the 2010-14 PND and the adoption of a National Policy for Biodiversity and Ecosystem Services in 2012 are important steps in establishing a more effective framework. The public budget for biodiversity has also been significantly increased in recent years. An action plan is now needed to put the new strategy into operation. Implementation of the strategy would also benefit from an assessment of the efficiency and effectiveness of existing policy instruments.

The National System of Protected Areas has been a major pillar of Colombia's biodiversity policies. The government is committed to achieving the Aichi targets of protecting 17% of terrestrial areas and 10% of marine areas by 2020. Colombia considers that protected areas cover about 12% of terrestrial areas and 9.2% of marine areas. However, the latter estimate is more than that which is currently assessed using IUCN criteria and includes an area which has been the subject of an international dispute. This suggests that a significant effort will be required, particularly for marine areas. Expansion of protected areas should integrate under-represented ecosystems and those under

greatest threat (e.g. forests in the central Andean valleys, dry forest in the Caribbean savannahs and páramos) into the national system, continue to strengthen institutions and management capacities and reinforce financing. In this regard, there is scope to expand the use of economic instruments.

More than one-quarter of the total area under protection is in indigenous reservations or collective territories. This underlines the importance of adequate provision for fair and equitable benefit sharing from the use of genetic resources, in line with the Convention on Biological Diversity and the Nagoya Protocol. Some steps have been taken, including the establishment of some rights of indigenous people in legislation. However, given the expected increase in agreements for access to genetic resources, and the mixed experience of managing this issue to date, particularly with the extractive industries, policies and institutions in this area should be strengthened.

A strong legal basis has been established for financing ecosystem services, particularly watersheds. The arrangement between Chingaza National Park and the Bogotá water utility is a good example of effective implementation. This arrangement helps secure most of the supply of good quality drinking water to Bogotá (pop. 8 million) as well as some of the water supply for the country's hydropower generation. Colombia has also gained valuable experience with payments for ecosystem services in the area of forestry. The lessons learned from these experiences would provide a good basis for extending this approach.

The main challenge Colombia faces in efforts to reduce pressures on biodiversity is to better integrate this objective into sectoral policies, and to give appropriate recognition to the role that natural capital plays in underpinning economic development. Provisions exist for EIA of projects and SEA of policies, plans and programmes. However, it is not clear how effectively they are implemented. Similarly, the environmental licensing law has provisions that can require projects to include environmental measures, but it is not clear how well they are enforced. A recent positive development was the preparation of a manual on biodiversity offsets by the Nature Conservancy and MADS. The manual is being used to establish offsets in terrestrial ecosystems and is being updated to cover freshwater and coastal and marine environments. Reinforcing the existing legal basis would help to strengthen and widen its use, including in key sectors like mining.

Agriculture and mining are the two key sectors where significantly strengthened efforts to reduce pressures on biodiversity are urgently needed. A major impediment in this regard is illegal activities; for example, about half of all timber is harvested illegally. Nevertheless, steps should be taken to reduce and remove incentives for increasing extensive cattle rearing, which is the major cause of deforestation. Equally, more decisive action is needed to stop the authorisation of mining in protected areas. In this regard, the recent agreement between MADS and the Ministry of Mines and Energy is a step in the right direction as is the co-operation with the Ministry of Agriculture.

Recommendations

- Reinforce efforts to strengthen the Colombian Environmental Information System (SIAC); prioritise information needed to support decision making at different levels of government, particularly information on the main drivers of biodiversity loss; conduct a comprehensive assessment of the economic value of ecosystem services; gradually integrate biodiversity-related economic information into SIAC.
- Build political and public support by developing a communication strategy that demonstrates the benefits generated, nationally and globally, by policies that promote the conservation and sustainable use of biodiversity.
- Develop an action plan to implement the 2012 National Biodiversity Policy that aims to reduce key pressures on biodiversity and ecosystems and provide the means needed to achieve the strategy's objectives.
- Assess experience with policy instruments currently used to achieve biodiversity policy objectives, with a view to enhancing their efficiency and effectiveness.
- Specify the steps needed to achieve the objectives for terrestrial and marine protected areas; prioritise the inclusion of under-represented ecosystems and the protection of endemic species and threatened biodiversity; reinforce institutional and management arrangements, particularly for marine protected areas; strengthen the financing of protected areas, including by expanding the use of economic instruments.
- Adopt the measures needed to implement the 2011 strategy on biotechnology and the sustainable use of biodiversity; strengthen the mechanisms for access to genetic resources; establish a clear and transparent framework for benefit sharing from the use of genetic resources.
- Ensure that biodiversity is effectively integrated into EIA, SEA and environmental licensing.
- Reinforce the legal basis for implementing biodiversity offsets, particularly in key sectors like mining; promote the use of the biodiversity offset manual and support its implementation, e.g. through demonstration projects.
- Develop a co-ordinated plan to reduce deforestation from cattle rearing; promote more intensive but sustainable livestock rearing, with appropriate environmental safeguards, along with silvo-pastural practices.
- Adopt and fully implement the measures necessary to prevent mining in protected areas.

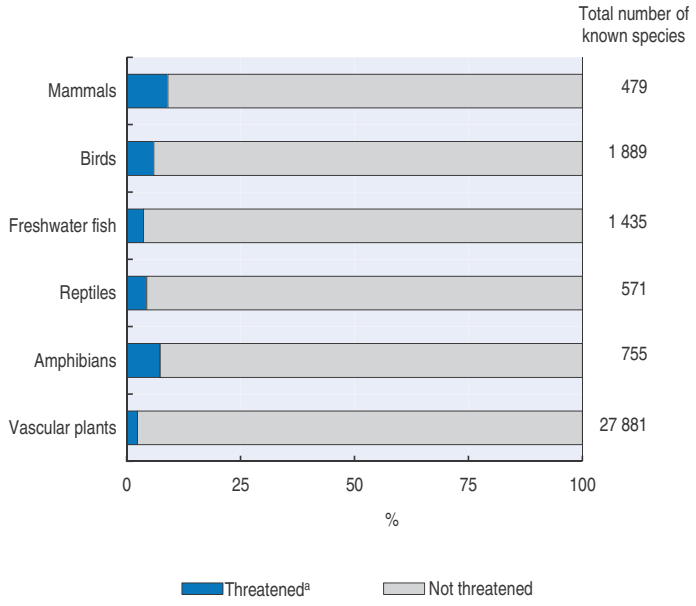
1. Current status and trends in Colombia's biodiversity

1.1. Status of biodiversity

Colombia is considered the world's second most biodiverse country. It sits at the confluence of the tropical Andes and Chocó biodiversity hotspots, with the tropical Andes considered perhaps the "hottest hot spot" in the world (Myers et al., 2000). Although estimates vary, Colombia has been ranked in the top four countries globally for species diversity within various major taxonomic groups (IaVH, 2012). It has a greater variety of ecosystems represented within its borders than any other country (IaVH, 2012).

A major threat to Colombia's biodiversity is loss of habitat. Change in ecosystems' area is a key indicator of the threat to biodiversity. The total area of natural ecosystem that has

Figure 7.1. **Threatened species**
late 2000s



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species. Data refer to the number of species known to be threatened within those species that have been assessed to date.
Source: MADS, 2013.

StatLink http://dx.doi.org/10.1787/888932998120

been transformed in Colombia is 31% (IDEAM et al., 2007), although some earlier estimates were as high as 52% (MADS, 2012a). At the regional level, the highest levels of transformation were recorded in the Andes (≥60%) and Caribbean (72%) (MADS, 2012a). Although monitoring systems have developed, available data are insufficient to assess changes in wetlands, the high Andean moors called páramos, savannas or marine environments. Although they are all estimated by various sources to be in decline, the magnitudes are not known.

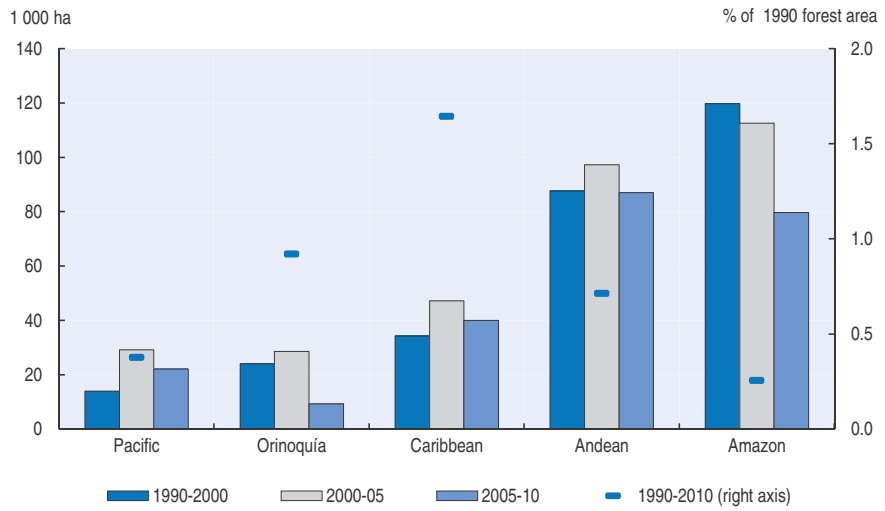
Forest loss varies among regions and over time (Figure 7.2). From 1990 to 2010 the greatest absolute forest loss occurred in the Amazon, and the greatest relative forest loss in the Caribbean. This picture changed slightly in 2005-10, when the highest loss by area was in the Andes. In 2010, forests were estimated to cover 60.5 million ha, the majority in the Amazon region (Cabrera et al., 2011). This represented 55% of Colombia's mainland area, significantly higher than the OECD average of 30% (FAO, 2010). The linear average based on a 2005 baseline was 0.4% annual forest cover loss in 2005-10 (Cabrera et al., 2011), equivalent to the South American average (FAO, 2010) but higher than in Mexico (0.29% annual loss over 2000-10) (OECD, 2013).

A relatively small portion of biodiversity in Colombia is threatened (Annex I.C). This may be in part due to the fact that the number of species is so high and relatively fewer of them have been assessed. The most threatened group is mammals (9% of known species threatened), followed by amphibians (7%) and birds (6%). In other groups, less than 5% of known species are threatened. Other data sources suggest that the level of threat to biodiversity in Colombia varies by region, with the greatest threat in the Andean region (IAvH, 2012; IAvH et al., 2011).

1.2. *Drivers of biodiversity loss*

Land use change is the single most important driver of biodiversity loss. Agricultural expansion accounted for 65% of deforestation in 2005-10 (Cabrera et al., 2011). Over 55% of forest loss in this period was due to conversion to pasture, 41% of which occurred in the Amazon region and 30% in the Andes region (Cabrera et al., 2011). Crop cultivation is also a factor in some regions; for example, oil palm plantations are an important cause of habitat loss on the Caribbean coast. Another significant cause of change in forest cover over this period was conversion to secondary vegetation,[1] a proxy for degradation.

Figure 7.2. **Average deforestation, by region**



Source: Cabrera, E. et al. (2011), *Memoria técnica de la cuantificación de la deforestación histórica nacional - escalas gruesa y fina.*

StatLink http://dx.doi.org/10.1787/888932998139

Some ecosystems are severely fragmented, particularly high-Andes forests and páramos (Armenteras et al, 2003), and there is evidence that many important ecosystems and threatened species survive only on ecological-social mosaics[2] or private property (Mendoza et al, 2007 cited in MADS, 2012a). Other major causes of habitat loss are the development of infrastructure, extractive industries and hydroelectricity (MAVDT, 2010).

Overexploitation of biological resources for subsistence and artisanal use are important drivers of biodiversity loss in various ecosystems, and in and around protected areas. Wood and charcoal account for a major part of the energy mix for rural populations (Barragán, 2011) that live close to forests. Expansion of small-scale farming in rural areas is increasing pressure on protected areas. There is evidence that multiple freshwater and marine species have been overexploited throughout Colombian waters (MADS, 2012a). One reason these problems persist is that property rights are sometimes unclear (e.g. traditional rights in *páramos* and cloud forests), overlapping (e.g. parks and indigenous areas) or poorly enforced.

Beyond subsistence threats, organised illegal activities are a persistent threat to biodiversity. It is estimated that 40-50% of all timber is harvested illegally (MADS, 2012a). In 2008, over 50% of the 33 Autonomous Regional Corporations (CARs) identified illegal tree

felling as the activity most threatening regional protected areas (MADS, 2012a). Extensive illegal mining and illicit crops also occur in protected areas (see Section 4.3).

Biodiversity also faces threats from invasive alien species, pollution and trade in endangered species, but there is no systematic information on the extent of these threats in Colombia (MADS, 2012a). A national assessment identified 298 invasive alien species (introduced and transplanted) out of which 43 species of flora and 255 species of fauna, but there is limited knowledge of their impacts on ecosystems and populations (Baptiste et al., 2010; Gutierrez et al, 2012).

There is limited information available on projected trends for Colombian biodiversity, such as rates of loss of species or ecosystems. Some projections have been made with respect to the impacts of climate change on biodiversity (Box 7.1). The lack of data on

Box 7.1. **Climate change and biodiversity**

Colombia's second national communication under the United Nations Framework Convention on Climate Change in 2010 summarised knowledge at the time of the potential impact of climate change on biodiversity in Colombia. It included information on expected changes in temperature and precipitation across the country.

The greatest large-scale changes, it is predicted, will occur in the Caribbean and Andes. Both regions would shift from a semi-humid to semi-arid climate over the course of this century. Impacts in the Andes are particularly worrying, as the region contains 75% of the Colombian population, and run-off from the mountains is an essential source of water for domestic and industrial consumption, irrigation and hydropower (see Box 7.4).

Beyond such large-scale shifts, there is not yet much evidence available on the direct impact of climate change on biodiversity. The Humboldt Institute communicated results of a modelling study of the impact of climate change on bird species (Salazar-Holguín et al., 2010), indicating that some species are migrating to higher altitudes, have reduced overall ranges and probably face a higher risk of extinction. Some experts warn of the interaction of climate change with other risks that biodiversity faces. In the Colombian Andes, for example, an altitudinal shift in species is particularly worrying because invasive species shift faster than native ones (Spanne, 2012).

Additionally, the loss of biodiversity and ecosystems increases the vulnerability of Colombia to climate change. Certain regions are expected to become more arid and provide fewer ecosystem services, particularly water services (an example is the *páramo*; see Box 7.4). At the same time, the number of extreme precipitation events is expected to increase. The impact of extreme events is exacerbated by loss or alteration of natural habitats. Deforestation and degradation of hillsides and river beds increase river run-off, while artificial diversion of rivers and drainage of wetlands exacerbate flooding.

Colombia is actively improving its institutions and processes for adapting to climate change, including improved information. In the process, efforts should be made to better understand the direct impact of climate change on biodiversity and the effects of natural capital loss and alteration on adaptation and resilience across the country. Early evidence indicates that the synergies between biodiversity and adaptation, including the potential for ecosystem-based adaptation, should be explored. This could support Colombia's dual objective of increased incorporation of biodiversity and adaptation into landscape and sectoral planning.

Source: IDEAM/MAVDT, 2010, *Segunda comunicación nacional ante la Convención Marco de las Naciones Unidas sobre el Cambio Climático.*

drivers of biodiversity loss, and of projections, hinders effective policy making. The Biodiversity Information System (SIB) is being established to address this problem, but currently serves mainly as a repository of information on species identification. Better information is particularly needed on habitat change outside forest ecosystems and how they could affect biodiversity and ecosystem services. More precise information on a finer scale is also needed to facilitate action through Colombia's decentralised environmental management system. In this regard, the recent map of páramos at a scale of 1:100 000 is an important progress. The Humboldt Institute received the 2013 Fundación Alejandro Angel Escobar top science award for this work.

Despite the many gaps in data, the available information on biodiversity and the transformation of ecosystems allows the main threats to be identified and provides a basis for formulating policy. There is no reason to delay action due to lack of information.

Economic valuation of biodiversity and ecosystem services

There has been very little economic analysis of the impact of trends in biodiversity and ecosystem services in Colombia. The weakness of scientific information on biodiversity is a major impediment to economic valuation. Out of the 3 488 studies in the Environmental Valuation Reference Inventory (EVRI, 2013),[3] 81 are from South America and only 3 focus on Colombia. The inventory is not exhaustive, but it gives an indication of the relative lack of economic analysis of the natural environment, including biodiversity, in Colombia.

Some pilot valuation exercises have been carried out, but they have not generally been used to inform policy. A recent exception is valuation work on the Seaflower Marine Protected Area in the Caribbean (Castaño-Isaza, undated) using stated preference techniques. This study underpins the introduction of entrance fees at the Seaflower site (see Section 3.1).

Colombia's 2012 National Biodiversity Policy recognises that the economic value of biodiversity and ecosystem services is not sufficiently considered in policy making. Strengthening scientific analysis in these areas and developing economic analytical capacity are prerequisites for addressing this issue. A useful step in this direction is Colombia's participation in the World Bank's programme of Wealth Accounting and Valuation of Ecosystem Services. Building on work in the National Statistics Department on monitoring stocks of non-renewable resources, work recently began on valuing ecosystem services. In addition to addressing data gaps and developing capacity, good co-operation will need to be established among the participating ministries, including on the choice of methodology.

2. The policy and institutional frameworks

2.1. *The policy framework*

The Colombian Constitution, adopted in 1991 and updated several times, addresses biodiversity in Article 79: "It is the duty of the state to protect the diversity and integrity of the environment, conserve areas of special ecological importance and foster education for achieving these ends." Article 80 continues, "The state will plan the management and exploitation of natural resources so as to guarantee their sustainable development, conservation, restoration or substitution" (República de Colombia, 2005).

Colombia's first National Biodiversity Policy (PNB) was adopted in 1996. The PNB aimed to promote the conservation, knowledge and sustainable use of biodiversity. A technical proposal for the formulation of a national biodiversity action plan was prepared in 1998 but never adopted. The main reason appears to be the low political priority given to the environment in Colombia in the following decade (see Chapter 2). The PNB did not have full regulatory status and proved generally ineffective.

In the absence of strong national policies, the country's approach to biodiversity management has been strongly influenced by international developments. Colombia is a signatory to 18 multilateral environmental agreements related to biodiversity (MADS, 2012a), including:

- International: The conventions on biological diversity (CBD), wetlands (Ramsar) and wildlife trade (CITES), and involvement in REDD+ initiative (Reducing Emissions from Deforestation and Forest Degradation). Colombia has a national REDD+ strategy under development, is a member of the REDD+ partnership and participates in the Forest Carbon Partnership Facility and UNREDD Programme (Chapter 4).
- Regional: The Amazon Cooperation Treaty (which balances development and environment), Cartagena (Caribbean) and Lima (South-East Pacific) conventions.

One area in which Colombia might consider promoting co-operation and possible international agreement is protection of the *páramo*, a habitat with high biodiversity value that plays an important role in regulating the hydrological cycle. Initially such an effort could focus on ensuring protection of already identified areas, collating data on status and sharing expertise, e.g. on definition and mapping. This could support the elaboration of effective approaches to management and help achieve climate change adaptation objectives. Colombia is a member of the "Regional Initiative for the Conservation and Wise Use of High Andean Wetlands" of the Ramsar Convention which promotes the conservation and sustainable use of high Andean wetlands through the implementation of a long term process of regional management.

In 2012, Colombia adopted a National Policy for the Integral Management of Biodiversity and Ecosystem Services (PNGIBSE). It updates the previous national biodiversity policy in line with the CBD objectives, aligns national objectives with the 2011-20 Aichi biodiversity targets and sets out targets for 2014. A key example is the targets on protected areas, which are discussed further in Section 3.1. The PNGIBSE establishes objectives within a 20-year time frame (Box 7.2). Achieving the Aichi targets would be a step towards meeting these long-term objectives.

Colombia's current National Development Plan (PND) includes objectives related to biodiversity to be achieved by 2014. The basis on which they were set is not entirely clear, and they reflect a mix of economic and environmental considerations. Table 7.1 presents the goals in the PND and the progress achieved by the end of 2012. Progress is relatively good in terms of extending the system of protected areas and restoring or rehabilitating land for conservation, moderate for the area of managed forest and the number of visitors to national parks, and poor for the area zoned as forest reserves.

The integration of biodiversity into the PND is an important step in terms of mainstreaming biodiversity into economic policy. This and the adoption of the PNGIBSE are important steps forward in establishing an effective framework for the conservation and sustainable use of biodiversity. The prospects for effective policy implementation are better than when the biodiversity policy and action plan were developed in the 1990s,

Box 7.2. **The National Policy for the Integral Management of Biodiversity and Ecosystem Services**

The PNGIBSE recognises that biodiversity is an indicator not only of the variety of life on the planet, but also of ecosystem services that influence the quality of life for humans. It describes several principles to frame and guide other environmental management tools, including the ideas that biodiversity is a foundation of the natural and economic wealth of the country and one of its main comparative advantages vis-a-vis other countries, and that the flexibility and resilience of socio-ecological systems may be maintained and improved at the national, regional, local and transfrontier levels. The purpose of the PNGIBSE is to address anthropogenic environmental change and guarantee the conservation of biodiversity and the fair and equitable distribution of the benefits derived from it in order to help improve the quality of life of the population.

The PNGIBSE describes ways of achieving its objectives through six thematic axes, each of which has strategic lines that can form the basis for an action plan. It takes a long-term approach, setting goals to 2032, but also identifies priority actions to be completed by 2014. The strategy uses the Convention on Biodiversity indicators to evaluate progress towards the 2020 Aichi targets.

Thematic axis	Objective by 2032
1 Biodiversity, conservation and the care of nature.	Undertake conservation in both wild and human-transformed areas so the resilience and the supply of ecosystem services are upheld at all levels.
2 Biodiversity, governance and the creation of public value	Strengthen the bond between people and nature. Biodiversity will be managed through co-responsibility and will be recognised as irreplaceable by the public.
3 Biodiversity, economic development, competitiveness and quality of life	Incorporate biodiversity and ecosystem services into planning processes so that their importance for national competitiveness is recognised and the quality of life at all levels is improved.
4 Biodiversity and the management of knowledge, technology and information	Strengthen the generation and dissemination of knowledge and technological developments.
5 Risk management and the supply of ecosystem services	Undertake actions to improve resilience and reduce vulnerability of ecosystem services so as to confront threats related to environmental change.
6 Biodiversity, co-responsibility and global commitments	Strengthen Colombia's international position as a diverse country which supplies ecosystem services of global importance.

The strategy states that it is to be implemented through a national action plan that will define specific programmes, projects, responsible parties, goals and indicators for the fulfilment of each strategic line under the 6 axes. The plan is to be reviewed and evaluated every four years. The strategy identifies key elements of an effective action plan, including:

- links to regional biodiversity action plans;
- a range of stakeholders (public, private and third parties at various geographic scales) who need to be engaged in implementation;
- some details on funding, including central government resources and international funding, as well as the financial contribution to be provided by direct and indirect users of ecosystem services.

Source: MADS (2012a), *Política Nacional para la Gestión Integral de la Biodiversidad y Sus Servicios Ecosistémicos* (PNGIBSE).

largely due to the establishment of a stronger, more independent environment ministry. The ongoing work to improve Colombia's biodiversity information system will also support efforts to implement the PNGIBSE. A national biodiversity action plan is now required to put the policy into operation. The action plan should identify the instruments needed to

Table 7.1. **Biodiversity-related objectives of the National Development Plan 2010-14**

Indicator	Baseline 2010	At end of 2012	Target 2014	Percent of 2010-14 increase achieved by end of 2012
Area zoned as forest reserves under Law 2 (1 000 ha)	24 279	28 702	51 377	16%
Area of land restored or rehabilitated for conservation (1 000 ha)	310	382	400	80%
Area of managed forest (1 000 ha)	913	7 521	15 000	50%
Area in national system of protected areas (1 000 ha)	12 602	14 963	15 602	79%
Annual visitors to national parks (1 000)	679	825	1 000	45%

Source: National Planning Department, National System of Management and Performance Evaluation.

reduce or avoid the negative impacts of key drivers of biodiversity loss and ensure that a regulatory basis exists for achieving its goals.

2.2. Institutional framework for biodiversity

The institutional framework for biodiversity management in Colombia is organised through the National Environmental System (SINA) by the Ministry of Environment and Sustainable Development (MADS) (see Chapter 2). MADS co-ordinates the roles of CARs, territorial entities, five research institutes affiliated with MADS,[4] the National Parks Authority, the university sector, NGOs, other civil society bodies and trade groups (MADS, 2012a). The research institutes play an important role in compiling information and conducting analyses of biodiversity management challenges. Biodiversity protection occurs mainly through the National Parks Authority (see Section 3.1) and CARs. Weaknesses in the environmental governance system, particularly the capabilities of CARs (see Chapter 2), are important obstacles to achievement of biodiversity goals. For example, only eight regions developed a Regional Biodiversity Action Plan (PARB) to implement the 1996 PNB.

A good basis for managing information on biodiversity has been established at the national level. SIB, the Biodiversity Information System, is part of the broader Colombian System of Environmental Information (Chapter 2). There is good co-operation between MADS and the research institutes in support of the Biodiversity Information System (SIB). The Humboldt Institute (IAvH) is primarily responsible for managing and analysing the information in SIB. It supports the collection of data on biodiversity from many sources, including universities, NGOs and regional authorities. It also collaborates internationally to share and learn lessons about biodiversity information systems. As far as possible, information is standardised and made publicly accessible.

Although many gaps remain, the development of SIB is progressing well in terms of characterising biodiversity and ecological systems. The key challenge is to make the information more influential in the policy process. Among other things this involves strengthening the economic dimension of information and analysis, and developing more effective ways to communicate often complex information to decision makers and to the public. The web-based Tremarctos[5] geographic information system is an interesting tool in this regard. Linking the maps of areas of ecological importance with the manual on

biodiversity offsets, it provides developers with a preliminary assessment of the biodiversity offset requirement from infrastructure development projects.

2.3. Financing biodiversity

A key factor in reaching the PNGIBSE goals is availability of resources, particularly for protected areas (see Section 3.1). No information was available on trends in biodiversity expenditure, but total spending (including protected areas) came to COP 748 billion in 2010, one-quarter of total public environmental expenditure. Of this, 83% was capital investment as opposed to current spending (DANE, 2012), and 48% was administered through SINA. Although information on amounts allocated to different levels of government is not always clear, it seems that around three-quarters of SINA expenditure was channelled through CARs (Rudas, 2009 as cited in Higinio and Lucía, 2010).

Commitments of official development assistance (ODA) to Colombia from members of the OECD Development Assistance Committee in support of biodiversity totalled USD 64 million in 2007. With the economic crisis, such funding fell sharply to USD 16 million in 2008. It recovered to USD 39 million in 2010 (2011 USD), but fell again to USD 11 million in 2011 (Chapter 4). In addition to being a source of finance, ODA involves expertise in biodiversity management; for example, Colombia has received not only considerable financial aid but also support for capacity development from the Netherlands since 2000.

A small amount of revenue is raised through economic instruments such as biodiversity taxes, fees and charges (see Section 3.3). Most overall biodiversity spending comes from public finance.

3. Policy instruments for biodiversity conservation and sustainable use

Colombia has introduced many policy instruments for conservation and sustainable use of biodiversity. They can be divided into regulatory (command-and-control) approaches, economic instruments, and voluntary and information approaches. Table 7.2 gives an overview of the three types. Overall, the policy instrument mix is dominated by regulatory instruments and subsidy programmes. The instruments tend to be applied more to conservation rather than to sustainable use of biodiversity.

Table 7.2. **Overview of policy instruments for biodiversity conservation and sustainable use**

Regulatory approaches	Economic instruments	Voluntary and information-based
Protected areas (terrestrial and marine) • national, regional and forest designations • Access and benefit sharing	Biodiversity offsets (compensation manual of National Environmental Licensing Authority)	Nature-based tourism
CITES regulations	Silvopasture subsidies	Green marketing programmes
Ecotourism concessions	Forestry fees and incentives	
Environmental licensing	Charges and fees for watershed services	
River basin and coastal zone management plans	Park entrance fees	
Permits and quotas (e.g. fishing, logging)	Income tax exemption for certified ecotourism investment	
Ban on shark fishing in the Colombian Caribbean and on shark finning throughout Colombia		
Programmes for species conservation		

3.1. Protected areas

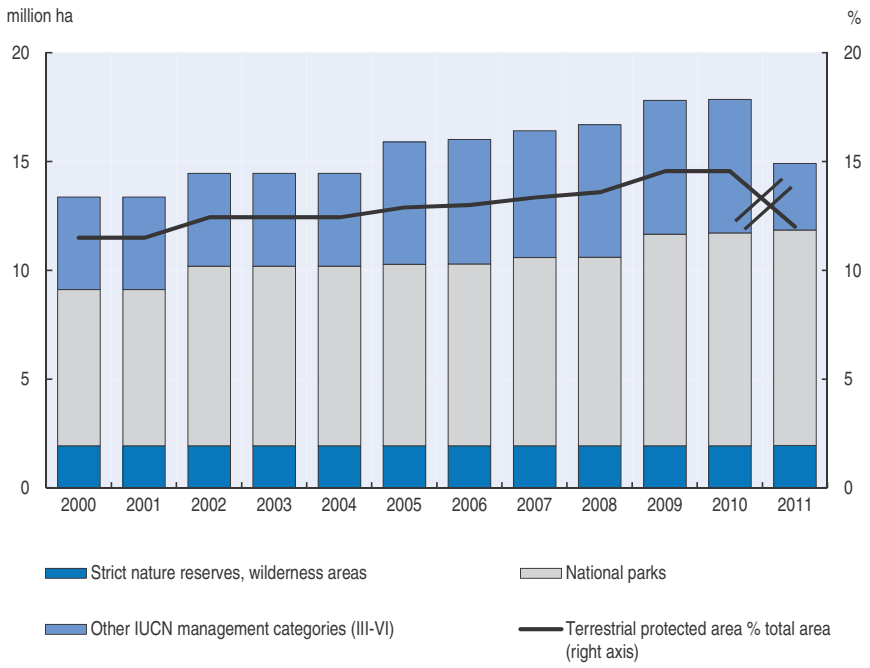
Terrestrial protected areas

Colombia has taken important steps to develop and strengthen its system of protected areas. It is committed to reaching the CBD target[6] of 17% terrestrial area and 10% marine area under protection by 2020. The current PND sets a target of increasing protected areas by 3 million ha, from 12.60 million ha to 15.60 million ha, between 2010 and 2014. By the end of March 2013, 2.4 million ha of the increase had been achieved (Table 7.1).

One obstacle to meeting the target has been the absence of reliable information. Following recommendations in the Council for Economic and Social Policies (CONPES, 2010, a national register of protected areas was established in 2012, the Integrated National Register of Protected Areas (RUNAP). It indicates that the Colombian protected area network, including marine areas, covers about 15 million ha: 12% of the land area and about 1.3% of the marine area[7] (Figure 7.3).

Figure 7.3. **Protected areas**[a]

2000-2011



a) Nationally designated protected areas of the National System of Protected Areas (SINAP). Break in time series in 2011: partial data from the Single Register of Protected Areas.
Source: SIAC (2012), *Sistema de Indicadores Ambientales.*

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The system of protected areas is not fully representative of Colombian ecosystems. In 2009, the National Parks Authority identified 33 of 99 ecosystems as not being represented, or having very little representation, in the system of national parks.[8] The expansion of nationally designated protected areas aims to close this gap. In 2010-12, this involved a focus on improving representation of Andean forests, dry and sub-arid ecosystems, páramos and epi-continental areas (Econometría Consultores, 2012).

The historical development of Colombia's protected area network focused on areas of high biological richness, particularly in the Amazon. It did not take much account of

threatened areas and endemic species. Regional protected areas take more account of threatened areas, but are much smaller than national protected areas. In further expanding the system of protected areas, greater priority should be given to protecting endemic and threatened biodiversity, as well as mitigating the pressures from economic development, population growth and climate change.

Good progress has been made in strengthening the management of protected areas; management plans have been adopted for 93% of them (CONPES, 2011). However, a few national parks that have been designated for more than a decade do not yet have management plans (CGR, 2012). A key part of Colombia's effective management of protected areas is its advanced approach to access and benefit sharing for biological resources (Box 7.3).

Box 7.3. **Access and benefit sharing**

Fair and equitable sharing of the benefits from the use of genetic resources, including by appropriate access, is one of the three main objectives of the Convention on Biological Diversity and the related Nagoya Protocol. Colombia, which was the first signatory of the Nagoya Protocol, is developing an action plan to implement the protocol. Currently 26.9% of the total area under protection is indigenous reservations or collective territories, underlying the significance of the issue of equitable benefit sharing in Colombia. Innovation in biotechnology is identified as an engine of growth in the 2010-14 National Development Plan. Between 2004 and 2011, Colombia signed 45 agreements for access to genetic resources, all for research purposes (MADS, 2012a). The government expects the number of such agreements to have doubled by 2014 (Presidencia República de Colombia, 2012).

In 2011, a national strategy on biotechnology and sustainable use of biodiversity was released (CONPES, 2011). It had four main objectives:

1. Improve the institutional capacity for commercial development of biotechnology from the sustainable use of biodiversity, specifically of biological and genetic resources and their derivatives.
2. Adopt a set of economic instruments to attract public investment and private companies interested in developing products based on sustainable use of biodiversity for commercial purposes, specifically biological and genetic resources and their derivatives and biotechnology.
3. Adapt and revise the regulatory framework related to access to genetic resources, the process of registering biotechnological drugs and the regulation of production and commercialisation of herbal products.
4. Evaluate the creation of a national bio-prospecting company.

Colombia has taken steps to promote fair access to biological diversity. Free, prior and informed consent (FPIC)[a] for indigenous groups is established in law through Colombia's ratification of International Labour Organization Convention 169. This was broadened to cover biodiversity specifically in the designation of national parks and protection of areas of high biodiversity. The provision of information to indigenous groups and the right of ethnic groups to exploit resources by traditional methods are recognised in law. There are examples of land designations protecting this right. For example, the ethno-botanical park of Orito Ingi-Ande was created in 2008. Special management regimes have been developed in some areas, where national parks and indigenous areas overlap, to promote sustainable use of biodiversity. The National Parks Authority is working to develop community-based ecotourism around protected areas (see Section 4.5).

Box 7.3. **Access and benefit sharing** *(cont.)*

Colombia's experience with FPIC in relation to extractive industries is mixed, and underlines the need for stronger policies and institutions to guarantee fair access and benefit sharing. Current development plans envisage more investment, commercialisation and involvement of the private sector in the use of genetic resources. This suggests that the arrangements for enforcement of fair access should be strengthened, to ensure both that companies comply with requirements and that local and ethnic groups retain access to areas and resources they have traditionally used. At the same time, a formal system of benefit sharing needs to be established.

a) Informed consent is agreement to do something or to allow something to happen only after all relevant facts are known. FPIC implies this consent is freely given before the action takes place. *www.un.org/esa/socdev/unpfii/documents/workshop_FPIC_tamang.doc*.

In 2008, a study of Latin America ranked Colombia fourth in terms of the share of the budget for protected areas provided by the government, and first in terms of financial sustainability[9] (Bovarnick, et al., 2010). However, the study found that protected areas were receiving only 80% of the budget needed to meet basic needs, and 47% of what was needed for optimal management. Subsequently, the public budget allocated to the National Parks Authority increased from COP 32 billion in 2008 to an anticipated 54 billion in 2012 (in COP 2011) (Figure 7.4). Other sources of funding (national and international) fell by 50% following the global economic crisis, but returned to 2007 levels in 2012.

In 2008, entrance fees and concessions generated about 8% of funding for protected areas, putting Colombia 14th out of 19 Latin America countries assessed, which suggested there was scope to make greater use of this approach (Bovarnick et al., 2010). Venezuela had a similar total budget for protected areas but received 12% of revenue from tourism-based fees; Costa Rica and Argentina had budgets about 50% larger and received 18% and 27%, respectively, of their revenue from tourism. Fee income may be increased by raising rates, but also by promoting more visits to national parks.

Colombia recently embarked on a large-scale programme to update and consolidate the system of national parks. The goal is for domestic public funding (national or regional) to account for about two-thirds of required funding, with the remainder from international sources.[10] In May 2013, with support from Germany, Colombia launched a long-term sustainable financing strategy, Naturalmente Colombia, a public private partnership involving 12 key institutions to promote the protection of more than 2 million hectares in strategic ecosystems (MADS, 2013)

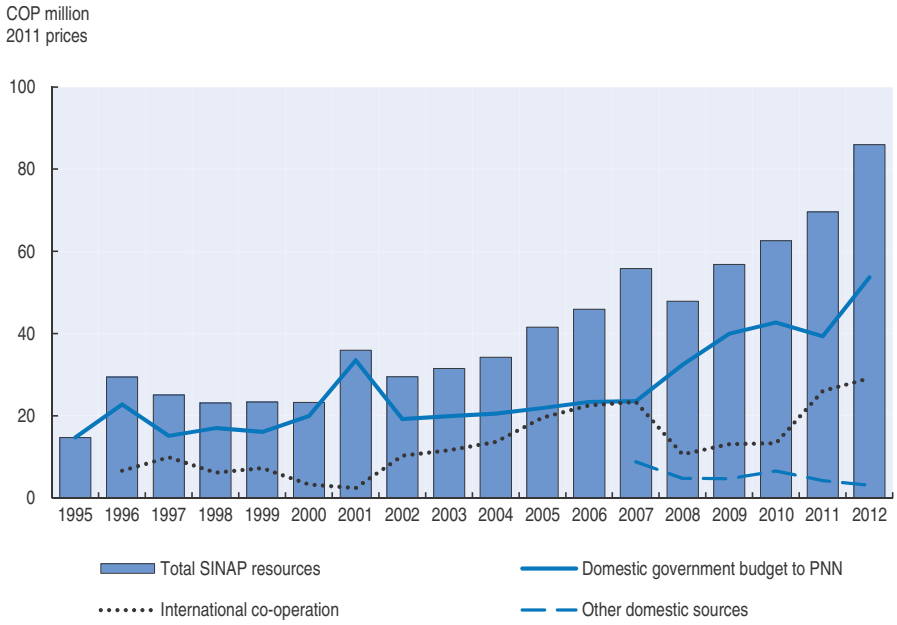
International sources accounted for one-third of expected financing in 2012 (Figure 7.4). The Colombian authorities hope international funding will cover around 40% of the large-scale investment needed to improve the protected areas system.

Marine protected areas

Colombia considers that protected areas cover 9.2% of marine areas. However, this estimate is more than that which is currently assessed using IUCN criteria and includes an area which has been the subject of an international dispute. Efforts to expand these areas in line with the Aichi objectives were set back by the ruling of the International Court of Justice on a jurisdictional dispute with Nicaragua. The court decided that the disputed territory, which included some areas that Colombia had designated as marine protected

Figure 7.4. **Sources of funding for protected areas**

1995-2012



Source: Econometría Consultores (2012), *Evaluación institucional y de resultados de la Política de Consolidación del Sistema Nacional de Áreas Protegidas, SINAP: Informe final.*

StatLink http://dx.doi.org/10.1787/888932998177

areas (MPAs), were Nicaraguan territory. This resulted in the size of the Seaflower protected area (a biosphere reserve of 180 000 km^2, containing an MPA of 65 000 km^2) being reduced by around 55%.[11]

Colombia is developing a Subsystem of MPAs which is expected to be in place in 2015. Until recently there was no coherent management system for these areas. One obstacle was that coastal CARs generally lacked capacity to exercise jurisdiction over marine areas (FAO, 2012). As a result, marine and coastal protected areas required significant oversight from MADS and the National Parks Authority. In 2011 a law provided the Autonomous Regional Corporations with jurisdiction over marine areas, which is an important step to the formal establishment of the subsystem. In addition, closer co-operation is required with other ministries with an interest in the marine environment, such as fisheries. Co-operation also needs to be strengthened with communities whose livelihood depends on fishing. Integrated Coastal Zone Management tools were specified in 2013 (Decree 1120). Progress in implementing coastal zone management plans should help in balancing economic activities with ecosystem conservation.

Mobilising the financial and human resources to develop and manage MPAs is also a challenge. Achieving the MPA targets will entail a very substantial increase in their total area, yet MPA management is seriously under-resourced, with few staff and a lack of information on environmental or social attributes of areas with high marine biodiversity. The current financing method, based on an annual national allocation in response to bids by CARs, is not stable and hence unsuitable for solving the financial gap (Salazar-Bermudez, 2012). The planned increase in public financing for protected areas should provide some support, but it is unlikely to be sufficient.

In view of this funding gap, and in line with international efforts to increase the use of economic instruments in the marine environment,[12] MADS and other organisations are researching alternative financing options. One is an entrance fee to MPAs. Over the next five years, the management plan for the Seaflower Biosphere Reserve in the Caribbean includes a temporary entrance fee. An economic valuation study (Castaño-Isaza, undated; Salazar-Bermudez, 2012; Newball, undated) has helped develop the basis for the fee, which could be increased from about USD 12 now to at least USD 17 and possibly as much as USD 27.

This entrance fee is in addition to a fee collected by the departmental government. The revenue generated by the entrance fee would be allocated to the management body, the Corporation for the Sustainable Development of the Archipelago of San Andres, Old Providence and Santa Catalina, or Coralina. The revenue would be used to create a trust fund over five years that could generate financial flows to fund conservation activities. This proposal has been subject to ex-ante financial, political and technical evaluation. The implementation plan also involves a process of dialogue and advocacy led by Coralina with relevant stakeholders, including those in the tourism sector. An entrance fee pilot project executed in the neighbouring Johnny Cay Regional Park will provide useful lessons about how this approach could be applied in the Seaflower MPA.[13]

Other approaches under consideration include marine user licences for activities such as water sports. A demonstration ecosystem services project is also being developed in which tourism facilities in an MPA can voluntarily participate and contribute funds to support the management of the MPA.

There are also opportunities to levy fees and royalties on extractive industries and projects in marine and coastal areas. However, before such projects are developed, detailed plans for MPAs should be elaborated, and other measures to preserve marine and coastal biodiversity should be resourced and implemented. This is necessary to provide a clear framework for sustainable investment and development by industry while safeguarding the marine environment in line with policy objectives.

3.2. Other regulatory approaches

As in other countries, biodiversity management in Colombia has traditionally involved command and control approaches. Designating protected areas (as discussed above) and restricting trade in endangered species are classic examples. Another approach involves restricting or prohibiting activities in ecologically important areas, e.g. via licensing. Environmental licensing is required in Colombia for a variety of projects, such as those that may have an impact on renewable natural resources.

Colombia is an active participant in CITES discussions, and proposed species classification changes at the 16th Conference of the Parties in Bangkok, 3-14 March 2013.[14] However, CITES implementation presents challenges from local enforcement to border controls (Chapter 4). Licensing for projects and large works include requirements for environmental impact assessment (EIA) and environmental management plans. More recently, MADS has also promoted strategic environmental assessments (SEA) on sectoral policy development (e.g. in transport), but it is not yet required. It is unclear to what degree biodiversity considerations are effectively institutionalised in the licensing and environmental enforcement systems.

The most recent version of the environmental licensing law (Decree 2820 of 2010) requires environmental management plans for projects to include measures to prevent, mitigate, correct and compensate for negative environmental impacts during all phases of a project's life cycle. However, as in many OECD countries, except for biodiversity offsets (see below) biodiversity compensation has not been widely implemented.

3.3. Economic instruments for biodiversity conservation and sustainable use

Watershed services: charges, fees and investment (payment for ecosystem services)

A strong legal basis has been established to finance ecosystem services, particularly watersheds. This approach has been successfully applied in Colombia, notably to assure the supply of water to Bogotá through protection of the Chingaza National Park (Box 7.4).

Four main elements of Colombia's environmental legislation support the financing of watershed management. (The underlying legislation is Law No. 99 of 1993 with relevant modifications in Decree 155 of 2004; Law No. 1151 of 2007; Law No. 1152 of 2007; and Law No. 1450 of 2011, Decree 953 of 2013.)

First, hydroelectric plants must transfer 6% of their revenue to public authorities to carry out watershed conservation and sanitation projects. Of this, half goes to CARs to be spent on environmental and watershed protection, and half to municipal governments for municipal development plans, with a preference for environmental or sanitation improvements. This has raised around USD 84 million annually in recent years (MADS and DIAN, 2012).

Second, any entity carrying out: i) construction and operation of irrigation projects; or ii) undertaking projects subject to environmental licencing and abstracting water must use 1% of the amount invested to pay for watershed protection.

Third, all water users must pay a fee. This raises around USD 11 million annually (MADS and DIAN, 2012). In addition to raising water fees and earmarking the revenue, the law requires departmental and municipal governments to spend a minimum of 1% of their current income to purchase and/or manage lands that protect municipal water sources or for payment for ecosystem services (PES).

Fourth, while earlier versions of the legislation implied that spending had to occur within the relevant district, more recent legislation allows authorities to work together to finance watershed conservation across departmental or municipal jurisdictions (Article 213, Law No. 1450, 2011).

The system of water fees could potentially finance both water service provision to users and watershed protection. However, the fees have been set too low to achieve these objectives (Garcia and Calderon, 2013). The fee collection rate has also been a problem, though it improved from 40% in 2007 to 67.5% in 2010. It could be increased further in line with improvements in local environmental management (Chapter 2). Although collection of fees was low, 90% of what was collected in 2007 was reported as being spent on reforestation and ecological restoration, erosion control, land acquisition and management, and development of management and planning (MAVDT, 2010). It is unclear how this relates to the requirement that municipalities spend 1% of their income to purchase and/or manage lands that protect municipal water sources.

Another measure to enhance efficient use of water fees has been their consolidation in water funds. Three water funds had been established in Colombia by 2011 (Bennett,

Box 7.4. **Value of hydrological services from the *páramo*: Chingaza National Park**

The páramo (high Andean moorland) is a habitat with high biodiversity value. It is also the source of valuable ecosystem services, particularly in regulating the hydrological cycle (quantity and quality of water). It is estimated that 70% of the Colombian population's water supply originates from upland areas. Chingaza, which protects a large area of *páramo* habitat, is the source of the majority of Bogotá's water supply (for 8 million inhabitants) and supplies water for hydropower generation. Good conservation of the habitat and its isolation from logging and mining activities not only secures the quantity of water flows, but also improves the quality of the water. It reduces the sediment load, the need to treat sediment, and related costs. For the same level of water production, the conservation measures in the Chingaza National Park decrease the generation of sediment in the water ten times as much as those in a nearby area outside the park (Calvache et al., 2012).

The Bogotá water utility contributes to the management and conservation of the park through two economic mechanisms. First, the utility makes a voluntary annual payment to Chingaza National Park to support monitoring and GIS in the park. Second, as the main user of the water resource, it is charged a water use fee, approved in 2004, in exchange for the services provided by the ecosystem. The fee consists of a minimum charge plus a variable part based on coefficients that aim to capture the investment needs for conservation, and reflect the socio-economic circumstances of stakeholders and scarcity of water resources. The fee calculation is feasible thanks to the capacity of the national park to gather the required technical data. However, full deployment of this approach has been blocked for political reasons. Opponents believe its full application would raise costs and could damage some economic activities in the region and create problems of affordability for poorer households and other consumers. The goal is to fully apply the fee by 2017. It is acknowledged that the revenue does not reflect the full cost or value of the ecosystem service, which could threaten the ability to maintain the current level of the service in the future.

Overall the Chingaza National Park is relatively well funded and has a relatively high staffing level (more than three times the national average of 1 staff member per 10 000 ha). It provides an example of the successful use of a "payment for ecosystem services" approach. Key factors in its success are an easily identifiable beneficiary (the utility) and service provider (the park), and the capacity to gather technical data to support the transaction. This case also highlights the challenge that such programmes may face in terms of political acceptability and social concerns.

Source: Chingaza National Park and MADS personal communication, December 2012; Castaño-Uribe, 2008.

Carroll and Hamilton, 2013). These funds consolidate the revenue generated by the mechanisms provided for in Colombian legislation, as well as other sources such as donors and international financial institutions. The financial resources are often managed as a trust fund by a committee of stakeholders. The committee decides how best to invest the resources for watershed conservation, e.g. on land restoration, community conservation projects or payment for ecosystem services. This model has also been adopted in other Latin American countries. The Latin American Water Funds Partnership is working to scale up the use of water funds in the region.[15]

Efficient use of this funding could be further enhanced by focusing it on maintaining habitats that play a key role in the water cycle, particularly in regulating catchment run-off.

Such services are hard to measure directly but can be monitored through indicators such as habitat types and slope steepness of areas managed.

Payment for ecosystem services

In addition to watershed payments, many other PES programmes have been implemented in Colombia (MAVDT, UASPNN, WWF, Conservación Internacional, and The Nature Conservancy, 2008), ranging from local initiatives to national incentive programmes. The legal basis for PES was extended in 2007 (Law No. 1151, 2007), giving MADS responsibility for developing economic and financial tools to achieve Colombia's biodiversity objectives, including a PES system. Colombia has gained notable experience with PES and PES-like programs at national and local level (Blanco, Wunder and Navarrete, 2005; Southgate and Wunder, 2007). At national level, these include Forestry Incentive Certification (CIF) and the Forest Ranger Families Programme (PFGB). A national PES strategy was developed in 2008 (MAVDT, 2008), but there is no evidence of its implementation.

CIF for commercial reforestation was established in 1994 and is discussed below (see Section 4.2). The other long-standing national program is PFGB, which not only is focused on maintaining forest, but also has a broad sustainable development objective. The PFGB targets families living in environmentally strategic ecosystems who are involved, or at risk of becoming involved, in growing illicit crops. With an agreement over a defined time, the programme provides an annual cash payment and technical support in exchange for the families helping to protect forest through conservation or restoration, as well as switching to legal and sustainable production systems (Blanco et al., 2005). The Social Prosperity Department stated that as of mid-2012 the PFGB had supported more than 122 000 families in transforming more than 2.3 million ha of illicit crops into legal and more sustainable production systems (DPS, 2012).

In addition to such national programmes, there are many at subnational level, largely focusing on watershed conservation and restoration. The water funds directly fund conservation activities, such as paying park guards. Among successful subnational PES programmes are those promoted by the CAR of Boyacá department, where both irrigators and urban users pay rural communities for the conservation and restoration of the basin they live in (MADS and Ecofondo, 2012). Many also include some form of in-kind or indirect compensation to participating communities and households (Goldman et al., 2010).

Biodiversity offsets

Colombia's environmental regulation system requires, in theory, compensation for environmental damage to biodiversity. However, residual damage to biodiversity from development is rarely offset. To address this, in 2012 the Nature Conservancy and MADS developed a manual (MADS, 2012b) that provides guidance on how the impact on terrestrial ecosystems from development projects can be offset by the developer providing an equivalent form of ecological compensation. The compensation is area-based, with multipliers to account for five characteristics of the area affected: 1) representation in the system of protected areas; 2) rarity; 3) fragmentation; 4) annual loss; and 5) whether it is primary or secondary vegetation. The manual describes where such compensation could be carried out relative to where the impact occurs, and how it could be implemented (e.g. conservation or restoration). The manual is being updated to cover freshwater and coastal and marine environments.

The development of this manual is a positive step but requires effective implementation. There is a need for demonstration projects to show how such compensation would work to advance its uptake. Furthermore, the process needs to be supported by legal enforcement, co-ordinated by the National Environmental Licensing Authority, to ensure a level playing field for developers through consistent application of the requirements in different sectors and regions. There also need to be measures to counteract the risk of developers not reporting biodiversity damage to avoid paying compensation. Experience from other countries suggests that serious efforts are needed to ensure that the offsets provide real additionality, that decision making should be fully transparent to avoid any possibility of corruption and that enforcement is essential for effective implementation (eftec et al., 2010).

Forestry fees

Since 1982, a forestry fee has been in place. It was initially established as a 10% charge on the value of wood extracted. Under the 1993 environment law, CARs are authorised to set the fees, leading to a wide range of levels and enforcement. The effectiveness of this instrument is limited by illegal logging, which accounts for of a large percentage of timber produced.

3.4. Information instruments and voluntary agreements

There are initiatives in Colombia to provide information to consumers to allow them to choose more environment-friendly products. Sello Ambiental Colombiano is a national green labelling system. It supports a target of increasing goods and services with environmental certification to > 10% by 2014 and > 30% by 2019. Colombia is also broadening support for sustainable use of biological components through its sustainable bio-trade initiative administered by the IAvH (Chapter 4). The programme that aims to support sustainable trade in ecologically derived products, which currently have a small market share in Colombia, and includes financial support via a new fund (Bessudo, 2011).

These initiatives are linked closely to biodiversity management on issues such as nature-based tourism (one of the first products/services to be certified was accommodations and lodging) and CITES. Such exploitation of biodiversity aligns with the country's broader goal of promoting trade and competitiveness. However, the scale of current activity remains very limited. As with other policy instruments, a lack of monitoring and enforcement restricts assessment of effectiveness.

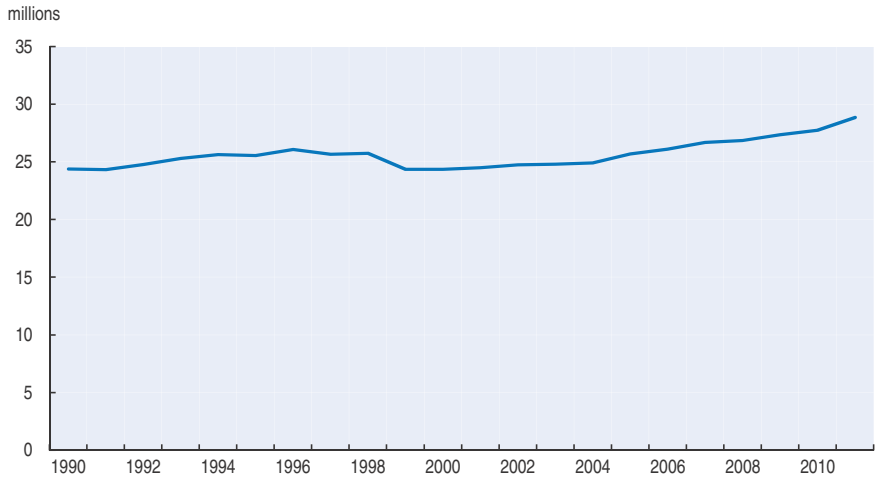
4. Integrating biodiversity into economic and sectoral policies

4.1. Agriculture and biodiversity

Expansion of agricultural land is the major type of land use change in Colombia, and an acute threat to biodiversity. Conversion of forest to pasture for livestock grazing is the primary driver of deforestation. Figure 7.5 shows the steady increase in head of cattle over the decade to 2011.

According to Colombia's livestock strategy 2019 (FEDEGAN, 2006), livestock occupied 38.3 million ha of land.[16] The strategy suggests, however, that only 19.3 million ha is suitable for livestock, with the other 19 million ha considered more suitable for forest (10 million ha) and crop cultivation (9 million ha). The strategy suggested that 10 million ha of pasture should be returned to a more natural state (e.g. through

Figure 7.5. **Head of cattle**
1990-2011



Source: FAO (2013), *FAOSTAT* (database).

StatLink http://dx.doi.org/10.1787/888932998196

reforestation or conversion silvopasture), and that production of livestock on the rest of the land be intensified. However, the strategy does not appear to have influenced the rate of forest lost to pasture: in 2000-05, 626 000 ha were lost, and in 2005-10, the period just before and after the adoption of the strategy, 664 000 ha were lost (Cabrera et al., 2011). By way of comparison, in 2000-07, 130 688 ha of forest were planted for productive functions and 41 223 ha for conservation purpose (IAvH, IDEAM, IIAP, INVEMAR, and SINCHI, 2011).

The increase in pasture area between 2000 and 2010 coincided with an increase in head of cattle (Figure 7.5), indicating continued extensive cattle rearing. The livestock strategy set a goal of 48 million head of cattle on 28 million ha of pasture, in line with reducing the 38.3 million ha of pasture land in 2005 by 10 million ha). Achieving the strategy's goal implies intensifying cattle rearing across the whole country, from 0.6-0.7 head/ha in 2010 (range from FAO STAT and national industry data) to 1.7 head/ha in 2019. However, intensification of livestock production would exacerbate other environmental problems, such as run-off from increased manure production. Measures would need to be put in place to avoid or minimise these effects.

Pilot programmes have been initiated to promote silvopasture, notably through the Sustainable Colombian Cattle Ranching initiative. However, while welcome, this initiative is unlikely to significantly alleviate pressures from ranching on biodiversity. Farm-level implementation had occurred to a limited extent with pilot projects funded by the GEF, and the initiative targets only 50 000 ha rather than the 10 million ha required to achieve the objectives of the strategy. The UK International Climate Fund is providing GBP 15 million in grants over 2012 to 2016 to convert around 28 000 hectares of open pasture to silvopastoral systems.

At the heart of the problem is a set of incentives that promote the expansion of grazing land: property tax exemptions that encourage agriculture do not consider underuse of land, while agricultural credits and other incentives do not include environmental criteria (MADS, 2012c). Decoupling growth in livestock from habitat loss and degradation requires

a co-ordinated effort to reduce direct and indirect incentives for extensive farming while actively supporting intensification of cattle rearing and greater use of silvopasture practices.

The second key impact on biodiversity from agriculture is loss of natural habitats to crop cultivation. This is most significant on the Caribbean coast, where the climate is suited to oil palm and other plantation crops. For example, the area of oil palm cultivation increased by 1 08 000 ha between 2008 and 2012 to 4 52 000 ha (Fedepalma, 2013). Henson et al. (2012) suggest that the majority of oil palm plantation takes place on previously cultivated or grazed land. However, this can still put pressure on natural habitats and biodiversity, as the displaced cultivation or grazing will increase demand for land converted from natural habitats.

A third major threat to biodiversity from agriculture is the overuse of chemical inputs that pollute waterways. The PNGIBSE highlights contamination of water bodies as one of five major threats to biodiversity in Colombia (see Box 7.2). In 2001, the water quality index regarding the function of preserving flora and fauna showed that 27% of 51 monitored stations had a poor or inadequate rating. The index declined between 2001 and 2008, with a clear seasonal pattern linked to rainfall (MADS 2012a), indicating surface run-off (likely from agriculture) as a major source of pollution. Colombia uses a relatively high amount of fertiliser: by amount applied per hectare of arable land it was ranked 10th out of 157 countries examined (World Bank, 2012). It is estimated that 70% of nitrogen application and 75% of phosphorus application is wasted (CONPES, 2009). The high rates of fertiliser and pesticide usage are encouraged by incentives that reduce their costs (MADS, 2012c).

4.2. Forestry and biodiversity

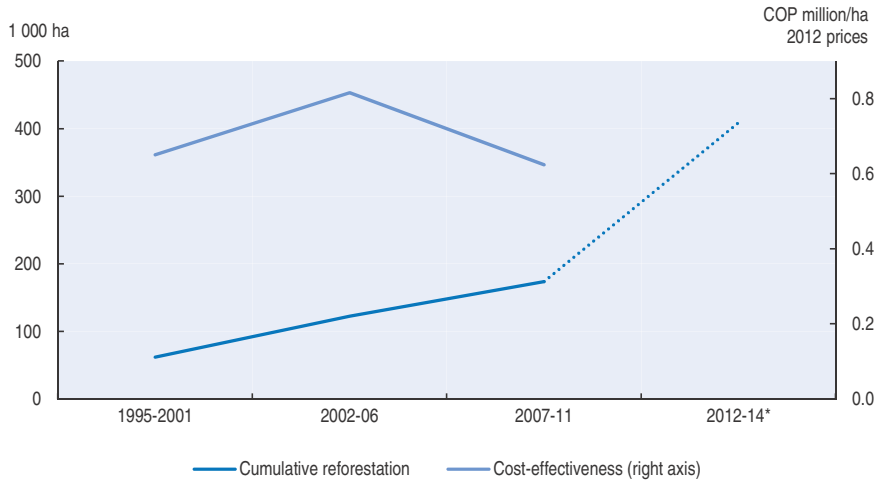
Forestry exploitation is based on selective extraction of up to 470 native tree species, a clear example of Colombia's biodiversity being an economic asset. Although clearance for cattle grazing is the primary cause of forest biodiversity loss, forestry activities to extract timber and fuel also exert pressure. In 2000-08, some 15 million m^3 of timber was extracted (MADS, 2012a). The evidence suggests that policy instruments such as forest fees have had little influence on reducing logging or controlling the biodiversity impact of forestry. Fuelwood production and consumption volumes were stable over the past decade. About 15% of the population in the cloud forests continue to depend on solid biofuels (firewood and charcoal) for heating and cooking (MADS, 2012).

Colombia's Forestry Incentive Certification (CIF), established in 1994 (Law No. 139, 1994), was originally designed to promote reforestation. It subsidises 50% of the up-front planting costs for introduced species and 75% for native species. It also subsidises 50% of the running costs in the second through fifth years. Primary forest is not supposed to have been present on the site within five years of reforestation. Over 1995-2011, CIF supported reforestation of 173 950 ha (CONPES 3724, 2012). However, it has not been effective for commercial reforestation, nor has it been taken up for conservation of natural forests. As with similar programmes in other countries, there are problems with monitoring, reporting and verification.

The PND 2010-14 includes an objective to reach 1 million ha reforested, 60% of which should be commercial plantation. The reforestation CIF is the key instrument to achieve this goal. However, it only helped reforest 17 415 ha in 2010-11 (CONPES 3724, 2012). The budget was increased roughly sixfold from 2011 to 2012, to COP 93 000 million, only COP 7 000 million short of the target for 2012. Nevertheless, the programme still has a long

way to achieve about 250 000 hectares of reforestation over 2010-14. Figure 7.6 displays data from the intermittent CIF reports, including a cost-effectiveness measure of the programme's budget in relation to the number of hectares reforested with CIF support in a given period. The cost-effectiveness appears fairly steady over the life of CIF to date, and implies a required total budget of COP 714 billion to COP 933 billion (2012 values) to achieve the commercial plantation portion of the reforestation goal in 2012-14. There is a second CIF for conservation of natural forest, but as of 2010 it had not been implemented.

Figure 7.6. **Cost-effectiveness of the CIF programme**



* Projections based on current policy objectives.
Source: Conpes (2003, 2008 and 2012), Distributión de Recursos para el Certificado de Incentivo Forestal con Fines Comerciales (CIF de reforestación).

StatLink http://dx.doi.org/10.1787/888932998215

4.3. Extractive industries and biodiversity

The oil and mining sectors have rapidly expanded over the last decade. By 2011, they represented 12% of total value added and more than half of exports (Chapter 1). As discussed elsewhere, rapid expansion of the extraction of exhaustible natural resources (oil, coal, gold) is a main cause of pollution of soil and water, degradation of sensitive ecosystems (e.g. *páramos*) and severe impacts on human health (e.g. from the use of mercury in gold mining).

There are important overlaps between mining areas and those areas that are important for biodiversity. Most mineral titles, requested and granted, are in the Andes, the region with the highest level of threatened and endemic species (CGR, 2011). There are also significant mining interests in Amazonia, which led to a two-year moratorium on new mining in the region being announced in 2012 while a management plan was developed. The moratorium was an important initiative to stem growing pressures from mining on biodiversity

There is evidence of tens of thousands of mining titles of various designations being sought in protected areas. Of particular concern is a significant increase in titles solicited in *páramos* in 2005-09 (CGR, 2011), with over 400 titles granted in 2010 and, according to the IAvH (the national biodiversity research institute), over 800 titles sought (Table 7.3). The IAvH also recorded over 1 000 mining titles granted (and over 3 000 sought) in wetland habitats, and 2 000 granted (nearly 9 000 sought) in forest reserves in 2010.

Table 7.3. **Total mining titles granted in areas of ecological importance in 2010**

Ecological areas	Source	Titles granted	
		Number	Area (ha)
National protected areas	IAvH	35	36 475
	Ingeominas	36	36 456
Regional protected areas	IAvH	24	15 002
	Ingeominas	7	2 541
Protected forest reserves	IAvH	66	12 882
	Ingeominas	89	18 258
Law 2 forest reserves	IAvH	2 083	2 224 902
	Ingeominas	984	1 136 256
Páramo	IAvH	451	106 596
	Ingeominas	410	106 356
Wetlands	IAvH	1 122	311 994
	Ingeominas	43	8 353
Total	**IAvH**	**3 781**	**2 707 851**
	Ingeominas	**1 569**	**1 308 220**

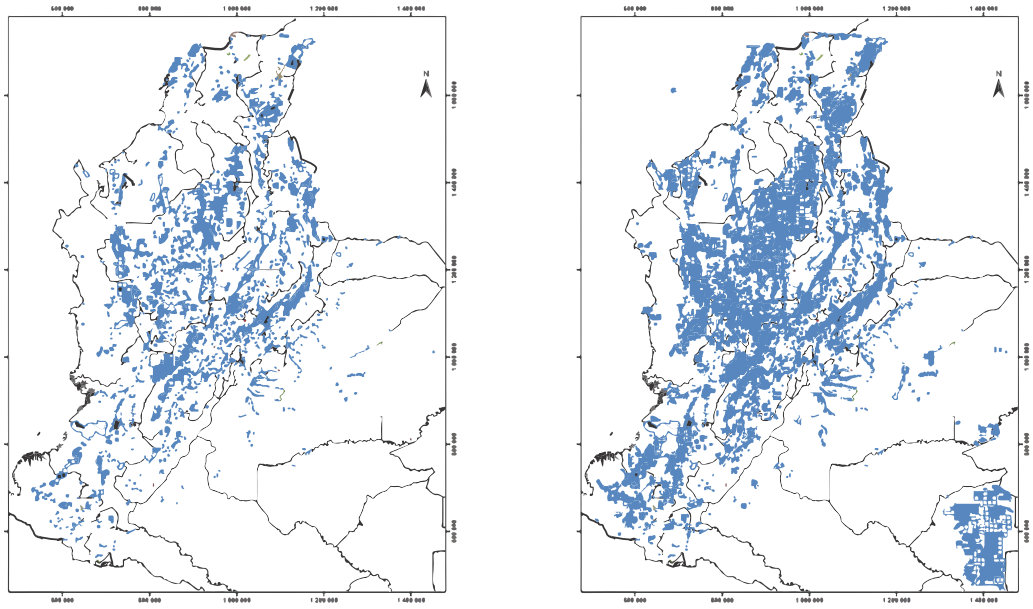
Note: Ingeominas: National Institute of Geology and Mining (renamed as Colombian Geological Service in 2011).
Source: CGR (2011), *Estado de los Recursos Naturales y del Ambiente 2010-2011*.

Environmental policies relating to the mining sector have not been enforced effectively, if at all. Depending on the data source, 16% or 32% of the land titled for mining is in areas of environmental importance. The data recorded by the IAvH show a higher number of titles affecting protected areas (with one exception) than the mining agency's data (Table 7.3). The IAvH and the mining agency also have different data regarding the number of titles in different ecological categories. These differences help illustrate some of the basic challenges to effective dialogue and co-operation between the two sectors including a clear demarcation of areas of ecological importance and a complete mining registry. In early 2011, the number of title requests had increased so fast that mining authorities had to suspend[17] the applications to manage the backlog of nearly 20 000 requests (Figure 7.7; CGR, 2013).

Nevertheless, these data should be interpreted with caution: not all areas with mining titles are necessarily mined (the area varies depending on the mineral involved,) which mean the data in Table 7.3 may overstate the scale of pressure from mining on biodiversity. On the other hand, water and air pollution are generated by mining operations, which suggests that pressures on biodiversity from mining may be greater than Table 7.3 shows. For example, mining is a source of heavy metals, which have been detected in fish (CRG, 2013). In addition, pressures from other human activities associated with greater access to areas, which that may follow mining developments, can also contribute to biodiversity loss.

The government response to the significant increase in mining activity in recent years has been largely reactive. A recent update to the mining code restated the prohibition of mining in protected areas, including in the *páramo* (Law No. 1382, 2010). This was considered necessary because of the continued issuance of mining titles in areas of environmental importance. The environmental authorities were not able to prevent the Ministry of Mines and Energy from granting titles in such areas (CGR, 2011). Moreover, there was no provision in the mining strategy regarding respect of biodiversity or ecosystems (UPME, 2006). In 2011, the 2010 law was declared unconstitutional because of a failure to consult ethnic groups. To avoid adverse effects on the environment, the Constitutional Court suspended the entry into force of its decision for two years (until May 2013) to

Figure 7.7. **Mining titles**



Mining titles 2012

Mining titles and applications 2012

Source: CGR (2013), Minería en Colombia Funbdamentos para superar el modelo extractivista.

provide time to develop new legislation that conformed with constitutional requirements. By mid-2013, as new legislation had not been adopted, the 2001 mining code was in force without its 2010 amendments. In 2013, the Ministry of Mines and Energy and MADS signed an agreement in which the mining ministry stated that it would respect protected areas and pursue sustainable development within its sector. The mining ministry also established an office to deal with social and environmental issues, and the two ministries are conducting research on the impact of mining on natural resources.

4.4. Fisheries

Fishery resources are managed through various measures including catch quotas established by the Ministry of Agriculture with scientific support from the National Aquaculture and Fisheries Authority (AUNAP) and the executive committee on Fisheries including MADS and research institutes. However, fisheries management needs a more coherent and co-ordinated approach within the Colombian government (see also Chapter 4). For example, lack of data on commercial fish species is a key gap in information for both biodiversity and socio-economic policy. Governance and management of information could be improved by greater involvement by MADS in fish management, which currently is the responsibility of the Ministry of Agriculture. At the same time, other sectors should be involved in the development of MPAs and the specification of management objectives.

The national legislation on protected areas requires zones of sustainable use to be defined so as to permit artisanal fishing but exclude more damaging industrial fishing. Due to the mobile nature of marine species, however, the necessary buffer zones around MPAs, across which sustainable fisheries management is measured, are large. An approach similar to terrestrial forest zones, requiring consideration of locals' needs across a large

geographical range, appears to be a gap in marine designations with the exception of the Seaflower MPA. Co-operative management initiatives where local fishery communities are involved in the development and implementation of sustainable fishery policy are implemented in the North of Chocó Department. Such initiatives could be replicated in other coastal areas of the country.

4.5. *Nature-based tourism*

Nature-based tourism is a growing economic sector in Colombia. The 2010-14 PND aims to increase visitor numbers to national parks from 679 000 to 1 million. Various instruments have been applied to support nature-based tourism. Ecotourism investment receives a 20-year income tax exemption if certified by MADS (Decree 2755, 2003). A voluntary environmental certification system for tourism providers has been established (see Section 3.1). The Ministry of Trade, Industry and Tourism is also engaged with nature-based tourism, and a nature-based tourism strategy is under development.

Increased nature-based tourism represents both opportunities and threats to biodiversity. In 2011-12, there were 1.5 million visitors to all types of protected areas. There appears to be scope for Colombia to increase revenue from tourism in protected areas. This would help finance the management and infrastructure needed to ensure that increased tourism did not adversely affect the biodiversity and ecosystems in and around protected areas. The National Parks Authority has implemented Community Ecotourism Programmes in some national protected areas. By the end of 2012, six partnerships had been established. Their aim is to improve the livelihoods of communities in the parks' zones of influence while reducing pressures on natural resources by fostering environmentally sustainable economic activities. These programmes support the goal of promoting fair access and benefit sharing of biological resources (see Box 7.3), and contribute to growth in the wider tourism sector, which is forecast a 3.6% annually over 2012-22 (WTTC, 2012).

Notes

1. Secondary vegetation comprises plant communities that have regrown after a significant disturbance to primary vegetation (e.g. where grass and scrub land develops after burning or felling of primary forest). Pressures (such as grazing by domestic livestock) that prevent primary vegetation returning maintain secondary vegetation.
2. Ecological-social mosaics are areas containing a mix of agricultural and other transformed land and natural habitats.
3. *www.evri.ca/Global/HomeAnonymous.aspx* (accessed, 22/2/2013).
4. The Institute of Hydrology, Meteorology and Environmental Studies, the José Benito Vives de Andréi Institute of Marine and Coastal Research, the Amazonian Institute of Scientific Research, the Pacific Institute of Scientific Research and the Alexander von Humboldt Institute for Research on Biological Resources.
5. *www.tremarctoscolombia.org*.
6. Aichi Target 11: "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes".
7. Between 1.2% and 1.4%, depending on the figure used for Colombia's maritime territory (several maritime boundary disputes persist). This figure excludes some areas of the Subsystem of Marine

Protected Areas which have less strict management requirements than those of the National Parks Authority.

8. Julia Miranda, Director of National Parks of Colombia, personal communication.
9. Financial sustainability is defined as a protected areas system having secured sufficient and stable resources over the long term to meet its total management cost. This is a necessary, but not sufficient, condition for management of such a system (Bovarnick et al., 2010).
10. *www.cbd.int/lifeweb/project.shtml?did=4683* accessed 22/2/2013.
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13. Elizabeth Taylor, Director Marine, Coastal and Aquatic Affairs, MADS, personal communication, 18/6/2013.
14. *www.cites.org/common/cop/16/inf/E-CoP16i-14.pdf* accessed 15/06/13.
15. For more information, see *www.nature.org/ourinitiatives/regions/latinamerica/latin-american-water-funds-partnership.xml*.
16. No date is noted for this data, but other data presented are for 2005, so it is presumed that this figure is for around that time.
17. Applications were suspended until July 2013.

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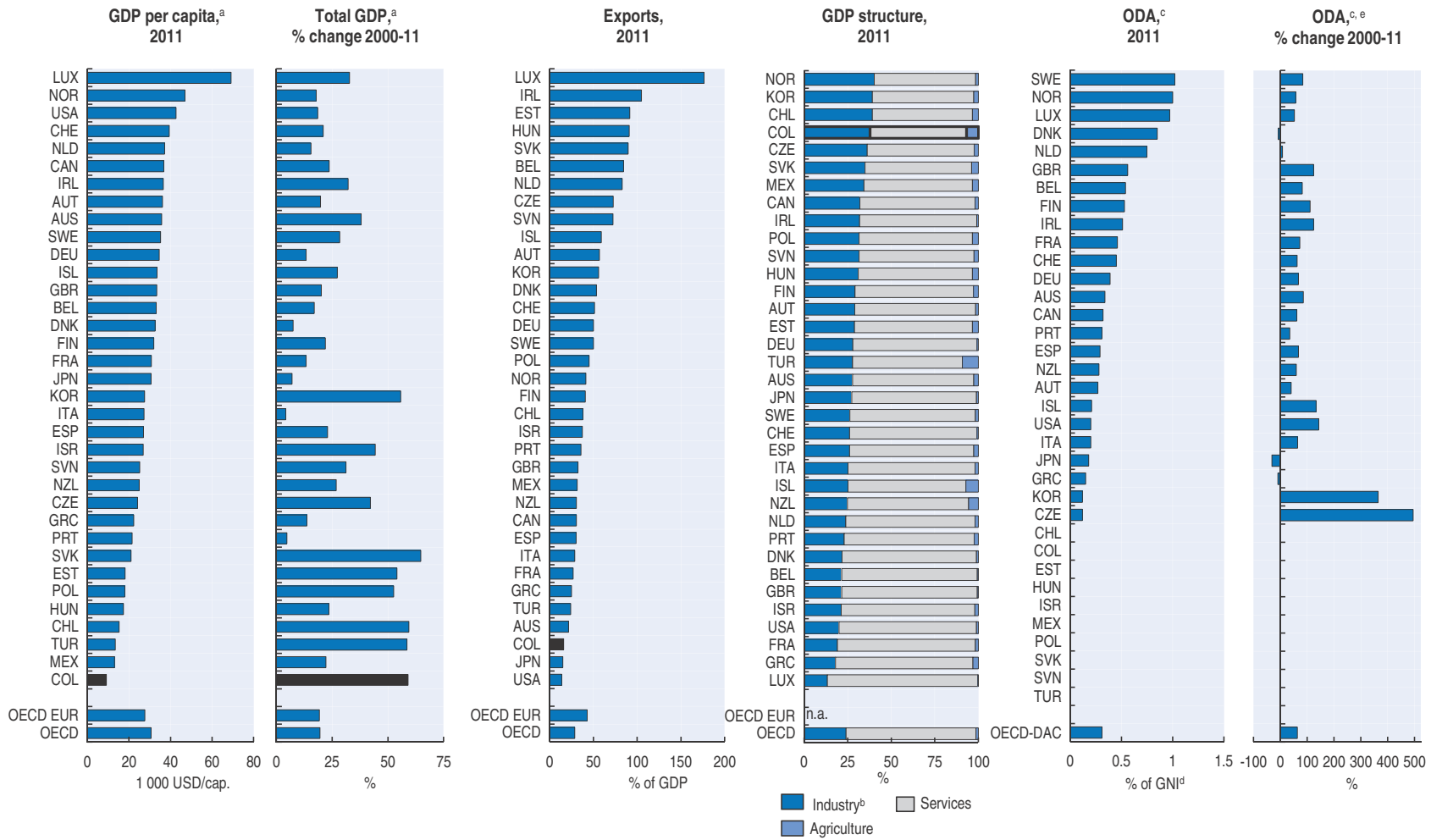
ANNEX I

*Selected data**

I.A. Selected economic data 220
I.B. Selected social data 223
I.C. Selected environmental data 224

* The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Annex I.A. **Selected Economic Data*– Economic context**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Partial totals are indicated by dotted borders.

a) GDP at 2005 prices and purchasing power parities.

b) Includes mining and quarrying, manufacturing, gas, electricity and water, and construction.

c) Total net disbursement of official development assistance by member countries of the OECD Development Assistance Committee.

d) Gross National Income.

e) Based on data expressed in constant 2010 USD; (CZE, ISL and KOR became DAC members after 2000).

Source: OECD (2013), *OECD Environment Statistics* (database).

Annex I.A. **Selected Economic Data* – Energy**

*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Partial totals are indicated by dotted borders.

a) Excluding international marine and aviation bunkers. The breakdown by fuel exclude electricity trade and heat.

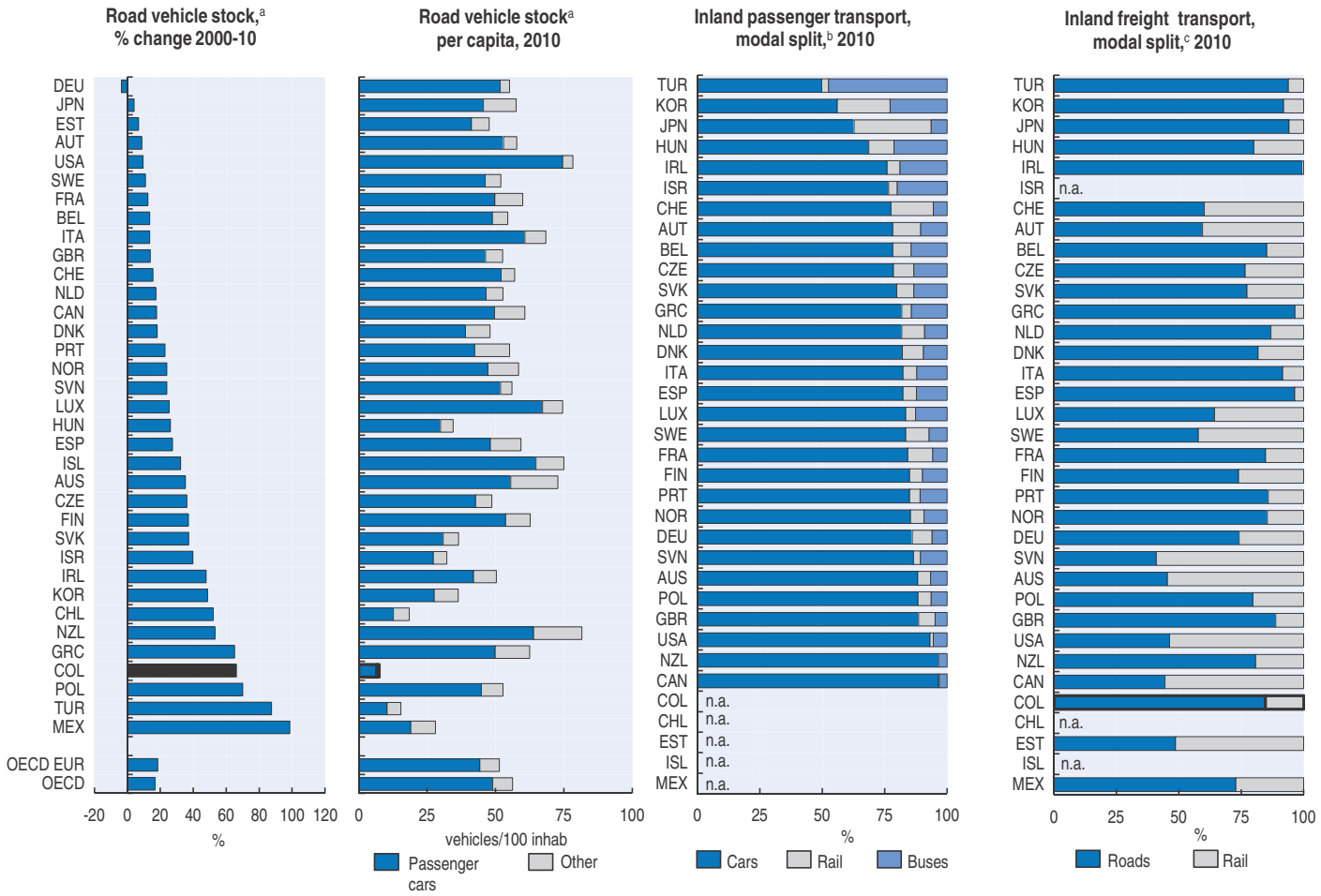
b) Total primary energy supply per unit of GDP expressed at 2005 prices and purchasing power parities.

c) Excludes trade of electricity and heat.

d) Diesel fuel: automotive diesel for commercial use, current USD; Unleaded petrol: Unleaded premium (RON 95), except NZL (RON 96), COL and JPN (regular unleaded); USD at current prices and PPP (COL : 2011 PPP); ISR: 2011 data.

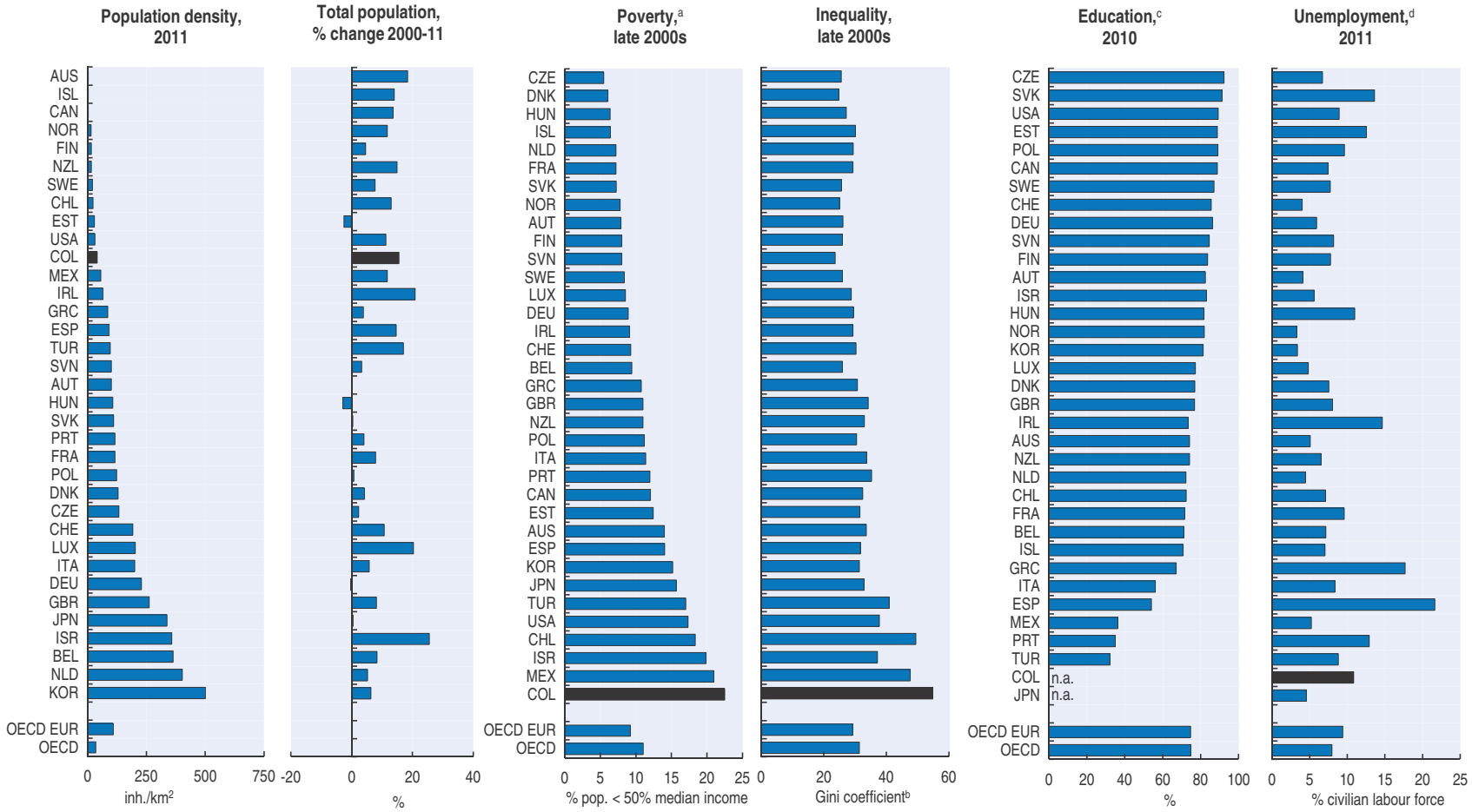
Source: OECD (2013), *OECD Environment Statistics* (database).

Annex I.A. **Selected Economic Data* – Transport**



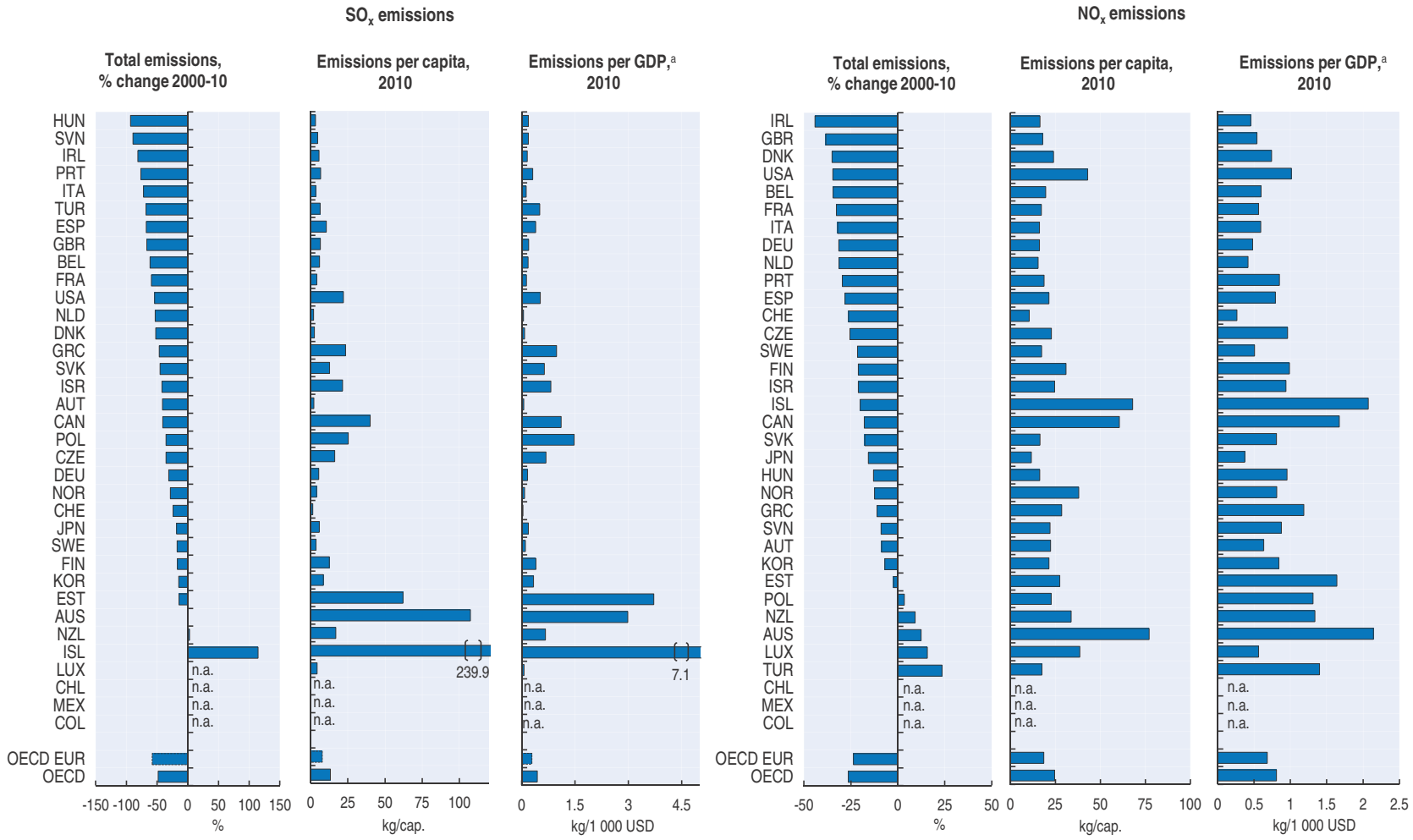
*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Partial totals are indicated by dotted borders.
a) Motor vehicles with four or more wheels.
b) Based on values expressed in passenger/km.
c) Based on values expressed in tonne/km.
Source: OECD (2013), *OECD Environment Statistics* (database); OECD (2013), "Goods Transport" and "Passenger Transports", OECD.Stat (database).

Annex I.B. **Selected Social Data* – Social context**



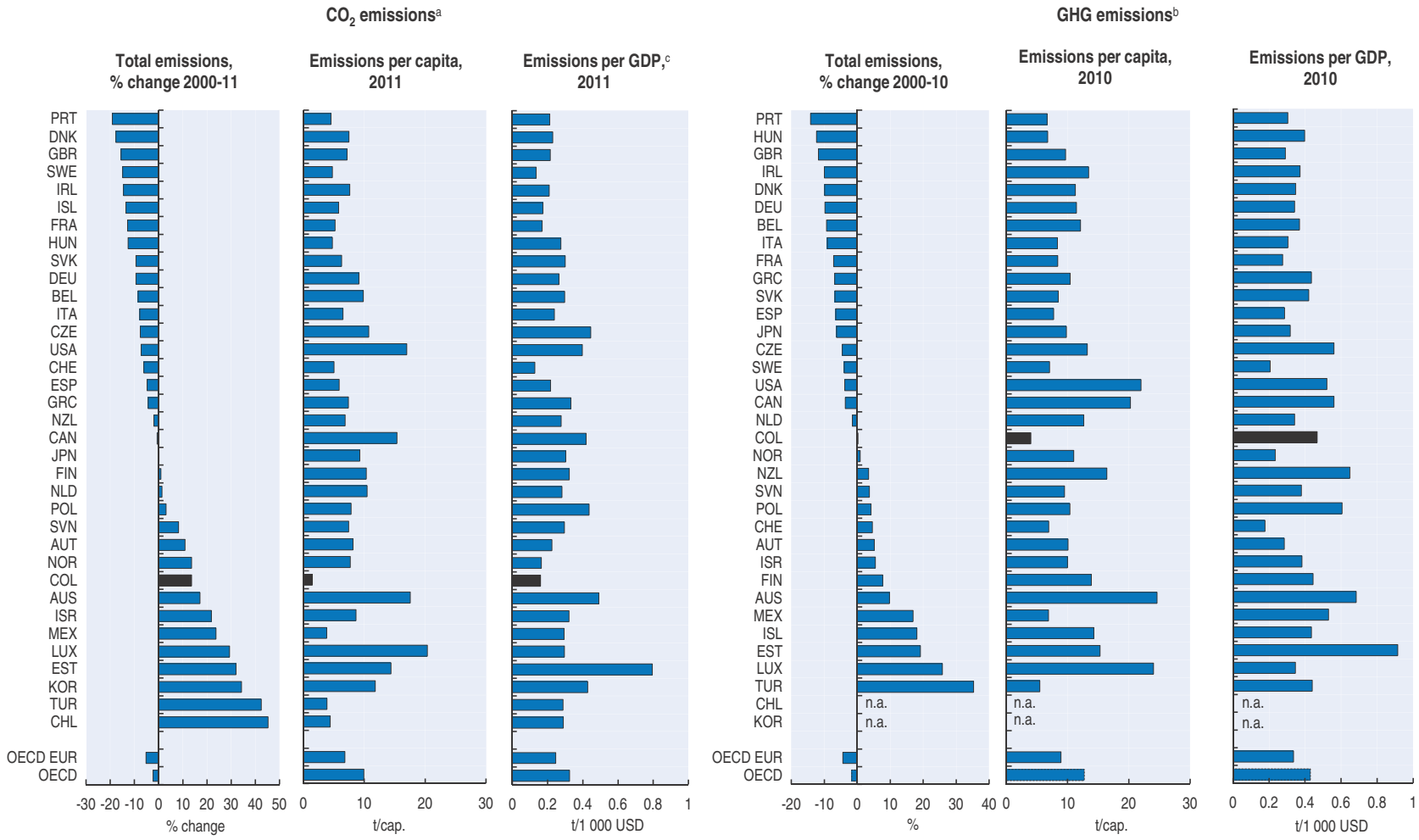
*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Partial totals are indicated by dotted borders.
a) Share of population with an income under 50% of the median income.
b) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (incl. all incomes, taxes and benefits) for the entire population.
c) Share of population aged 25-64 years with at least upper secondary education. OECD: average of rates.
d) Harmonised unemployment rates.
Source: OECD (2013), *OECD Environment Statistics* (database); OECD (2013), "OECD Social Expenditure Statistics", "OECD Education Statistics", OECD Main Economic Indicators", *OECD.Stat* (database).

Annex I.C. **Selected Environmental data* – Air**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries. Partial totals are indicated by dotted borders.
a) GDP at 2005 prices and purchasing power parities.
ISL: SO_x emissions include emissions from geothermal energy (182 kg per capita in 2010). KOR: data refer to 2006. LUX: NOx emissions exclude "fuel tourism" emissions and refer to 2009.
Source: OECD (2013), *OECD Environment Statistics* (database).

Annex I.C. **Selected Environmental data* – Climate**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries. Partial totals are indicated by dotted borders.

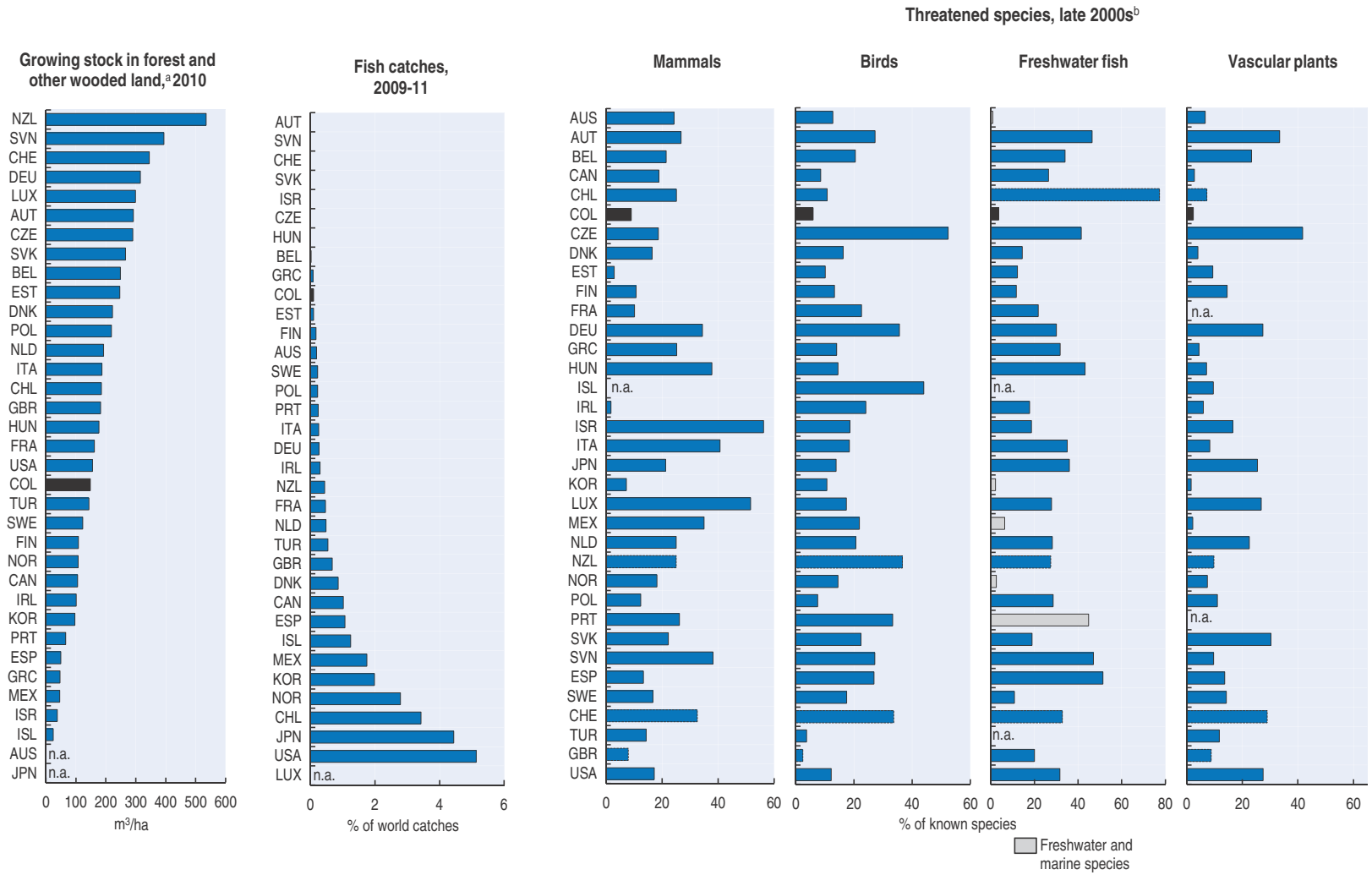
a) Emissions from energy use only; excluding international marine and aviation bunkers; sectoral approach.

b) Exluding emissions/removals of the land use, land-use change and forestry (LULUCF) sector. COL: excludes emissions/removals from LUCF other than forest and other vegetation fires and from solvents use. ISR: 2000 data exclude F-gases.

c) GDP at 2005 prices and purchasing power parities.

Source: OECD (2013), *OECD Environment Statistics* (database).

Annex I.C. **Selected Environmental data* – Biodiversity conservation and sustainable use**



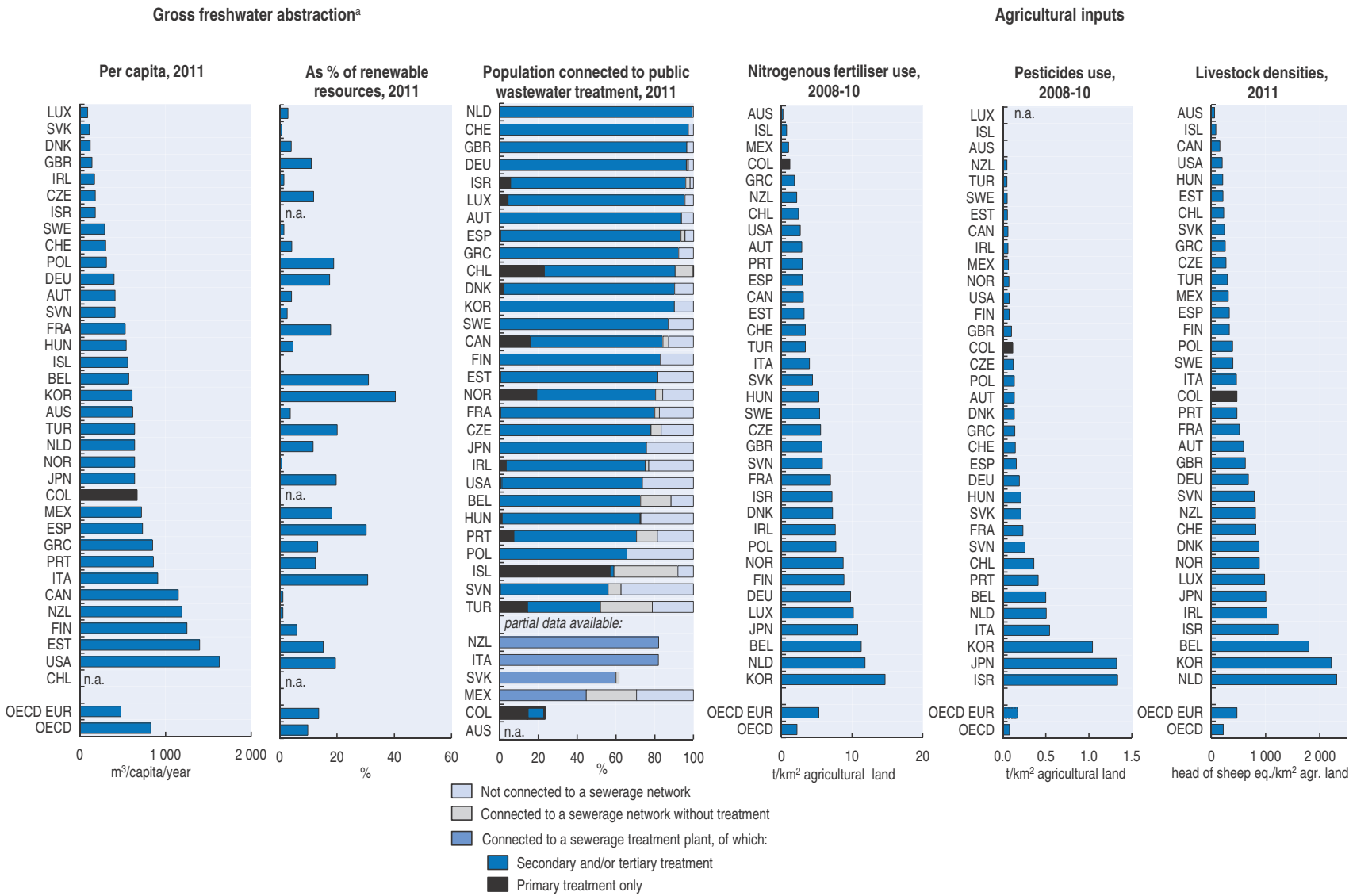
*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries.

a) Growing stock refers to volume over bark of all living trees.

b) Data refering to indigenous species are indicated by dotted borders; NOR fish species: marine fish only.

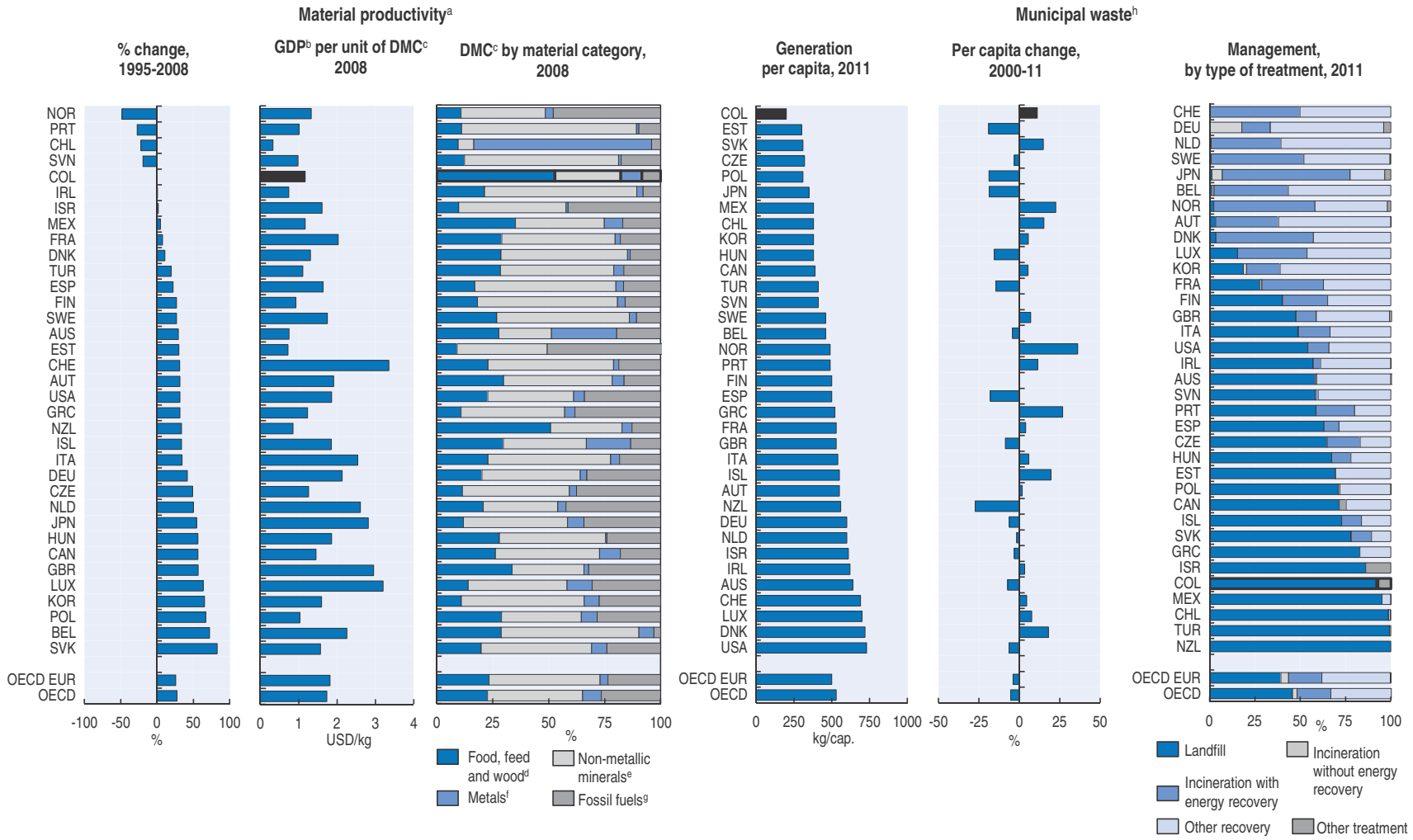
Source: FAO (2013), *FAO Fisheries and Aquaculture Information and Statistics Service*; FAO (2013), *Global Forest Resources Assessment 2010*; OECD (2013), *OECD Environment Statistics* (database).

Annex I.C. **Selected Environmental data* – Water and land**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries.
a) For some countries, data refer to water permits and not to actual abstractions.
GBR: Water abstraction and public wastewater treatment: England and Wales only; pesticides use: Great Britain only.
Source: FAO (2013), *FAOSTAT* (database); OECD (2013), "Agri-Environmental Indicators: Environmental Performance of Agriculture 2013", *OECD Agriculture Statistics* (database); OECD (2013), *OECD Environment Statistics* (database).

Annex I.C. **Selected Environmental data* – Material productivity and waste**



*) Data refer to the indicated year or to the latest available year. They may include provisional figures and estimates. Varying definitions can limit comparability across countries. Partial totals are indicated by dotted borders.

a) Amount of GDP generated per unit of materials used, ratio of GDP to domestic material consumption (DMC).

b) GDP at 2005 prices and purchasing power parities.

c) DMC equals the sum of domestic (raw material) extraction used by an economy and its physical trade balance (imports minus exports of raw materials and manufactured products).

d) Domestic production from agriculture, forestry and fisheries, plus trade of raw and processed products from these sectors.

e) Domestic extraction and trade of minerals used in industry and construction, plus trade of derived processed products.

f) Domestic extraction of metal ores, plus trade of metal ores, metal concentrates, refined metals, products mainly made of metals, and scrap.

g) Coal, crude oil, natural gas, peat and traded derived products.

h) Waste collected by or for municipalities and includes household, bulky and commercial waste, and similar waste handled at the same facilities. CAN: household waste only and total incineration; COL: excludes separate collection for waste recycling; other treatment includes waste disposal in sea and inland waters, non controlled dumping sites and open areas burning; NZL: landfilled waste only.

Source: OECD (2013), *OECD Environment Statistics* (database).

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ANNEX II

Abbreviations

ACP	Asociación Colombiana del Petróleo (Colombian Oil Association)
ACTO	Amazon Cooperation Treaty Organization
AILAC	Alianza Independiente de Latinoamerica y el Caribe (Independent Alliance of Latin America and the Caribbean)
ANDI	Asociación Nacional de Empresarios (National Business Association)
ANH	Agencia Nacional de Hidrocarburos (National Hydrocarbon Agency)
ANLA	Autoridad Nacional de Licencias Ambientales (National Environmental Licensing Authority)
ARB	Asociación de Recicladores de Bogotá (Association of Waste Pickers of Bogotá)
ARL	Entidad Administradora de Riesgos Laborales (Occupational Risk Management Body)
ASGM	Artisanal and small-scale gold mining
BACEX	Banco de Datos de Comercio Exterior (Foreign Trade Database)
BRT	Bus rapid transit
CAN	Comunidad Andina (Andean Community)
CAR	Corporación Autónoma Regional (Autonomous Regional Corporation)
CBD	Convention on Biological Diversity
CCO	Comisión Colombiana del Océano (Colombian Ocean Commission)
CCS	Consejo Colombiano de Seguridad (Colombian Safety Council)
CDM	Clean development mechanism of the Kyoto Protocol
CFCs	Chlorofluorocarbons
CGR	Contraloría General de la República (Comptroller General's Office)
CI	Conservation International
CIF	Certificado de Incentivo Forestal (Forestry Incentive Certification)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO_2	Carbon dioxide
COMICC	Comisión Intersectorial de Cambio Climático (Inter-sectoral Commission on Climate Change)
CONPES	Consejo Nacional de Política Económica y Social (National Council for Economic and Social Policies)
COP	Colombian peso
CRA	Comisión de Regulación de Agua Potable y Saneamiento Básico (Commission for the Regulation of Drinking Water and Basic Sanitation)
CTF	Clean Technology Fund
DAC	Development Assistance Committee, OECD

DANE	Departamento Administrativo Nacional de Estadística (National Administrative Department of Statistics)
DIAN	Direccion de Impuestas y Aduanas Nacionales (National Tax and Customs Agency)
DIMAR	Dirección General Marítima (General Maritime Directorate)
DMC	Domestic material consumption
DNP	Departamento Nacional de Planeación (National Planning Department)
ECDBC	Estrategia Colombiana de Desarrollo Bajo en Carbono (Low Carbon Development Strategy)
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
EIA	Environmental impact assessment
ELN	Ejército de Liberación Nacional (National Liberation Army)
EPR	Extended producer responsibility
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FARC	Fuerzas Armadas Revolucionarias de Colombia (Revolutionary Armed Forces of *Colombia)*
FCA	Fondo de Compensación Ambiental (Environmental Compensation Fund)
FDI	Foreign direct investment
FONAM	Fondo Nacional Ambiental (National Environmental Fund)
FTA	Free trade agreement
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GLP	Good laboratory practice
HCFCs	Hydrochlorofluorocarbons
IATTC	Inter-American Tropical Tuna Commission
IAvH	Instituto de Investigación de Recursos Biológicos "Alexander von Humboldt" (Alexander von Humboldt Institute of Biological Resources Research)
ICCA	International Council of Chemicals Associations
IDB	Inter-American Development Bank
IDEAM	Instituto de Hidrología, Meteorología y Estudios Ambientales (Hydrology, Meteorology and Environmental Research Institute)
IEA	International Energy Agency
IIAP	Instituto de Investigaciones Ambientales del Pacífico John Von Neuman (John Von Newman Institute of Environmental Research of the Pacific)
ILO	International Labour Organization
IMF	International Monetary Fund
IMO	International Maritime Organization
INS	Instituto Nacional de Salud (National Institute of Health)
INVEMAR	Instituto de Investigaciones Marinas y Costeras José Benito Vives de Andréis (Institute of Marine and Coastal Research)
IUCN	International Union for Conservation of Nature
IUU	Illegal, unreported and unregulated (fishing)
IWRM	Integrated Water Resource Management
LUCF	Land-use change and forestry

MAD	Mutual Acceptance of Data
MADR	Ministerio de Agricultura y Desarrollo Rural (Ministry of Agriculture and Rural Development)
MADS	Ministerio de Ambiente y Desarrollo Sostenible (Ministry of Environment and Sustainable Development)
MARPOL	International Convention for the Prevention of Pollution From Ships
MAVDT	Ministerio de Ambiente, Vivienda y Desarrollo Territorial (Ministry of Environment, Housing and Territorial Development)
MDG	Millennium Development Goal
MEA	Multilateral environmental agreement
MHCP	Ministerio de Hacienda y Crédito Público (Ministry of Finance)
MME	Ministerio de Minas y Energía (Ministry of Mines and Energy)
MINCIT	Ministerio de Comercio, Industria y Turismo (Ministry of Commerce, Industry and Tourism)
MPA	Marine protected area
MVCT	Ministerio de Vivienda, Ciudad y Territorio (Ministry of Housing, Urban Issues and Territorial Development)
NAMAs	Nationally Appropriate Mitigation Actions
NCP	National contact point
NCRE	Non-conventional energy sources
NGO	Non-government organisation
NO_x	Nitrogen oxides
N_2O	Nitrous oxide
OAS	Organization of American States
ODA	Official development assistance
ODS	Ozone-depleting substances
PCBs	Polychlorinated biphenyls
PES	Payment for ecosystem services
PGIRS	Plan de Gestion integral de residuos solidos (Integrated Solid Waste Management Plan)
PNB	Política Nacional de Biodiversidad (National Biodiversity Policy)
PND	Plan Nacional de Desarrollo (National Development Plan)
PNGIBSE	Política Nacional para la Gestión de la Biodiversidad y sus servicios ecosistémicos (National Policy for the Integral Management of Biodiversity and Ecosystem Services)
POMCA	Plan de manejo y ordenamiento de una cuenca (Watershed management plan)
POPs	Persistent organic pollutants
PRAE	Programa de educacion ambiental (Environmental education project)
PROURE	National Plan for Rational and Efficient Energy Use and Non-conventional Energy Sources
PRTR	Pollutant release and transfer register
QSP	Quick Start Programme Trust Fund
R&D	Research and development
REDD	Reducing Emissions from Deforestation and Forest Degradation
SAICM	Strategic Approach to International Chemicals Management
SCP	Sustainable consumption and production

SDGs	Sustainable Development Goals
SDS	Safety data sheet
SEA	Strategic environmental assessment
SIAC	System of Environmental Information
SIB	(Sistema de Información sobre Biodiversidad) Biodiversity Information System
SINA	National Environmental System
SINCHI	Instituto Amazónico de Investigaciones Científicas (Amazon Institute of Scientific Research)
SMEs	Small and medium-sized enterprises
SSPD	Superintendencia de Servicios Públicos Domiciliarios (Superintendence of Domestic Public Services)
TNC	The Nature Conservancy
TPES	Total primary energy supply
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
USAID	United States Agency for International Development
USD	United States Dollar
VAT	Value-added tax
VITAL	Ventanilla Integral de Trámites Ambientales en Línea (Integrated Window for Environmental Procedures)
WEEE	Waste electrical and electronic equipment
WHO	World Health Organization
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation
WWF	World Wildlife Fund

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OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
(97 2014 01 1 P) ISBN 978-92-64-20828-5 – 2014

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Contents

Part I. Progress towards sustainable development

Chapter 1. Key environmental trends

Chapter 2. Policy-making environment

Chapter 3. Towards green growth

Chapter 4. International co-operation

Part II. Progress towards selected environmental objectives

Chapter 5. Waste

Chapter 6. Chemicals management

Chapter 7. Biodiversity

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2014

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ISBN 978-92-64-20828-5

97 2014 01 1 P

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