ENVIRONMENT AND BIODIVERSITY:

priorities for protecting natural capital and competitiveness in Latin America and the Caribbean

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Ricardo Quiroga, Maria Claudia Perazza, David Corderi,
Onil Banerjee, Jamie Cotta, Graham Watkins and José Luis López

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Abbreviations

ADB	Asian Development Bank
BIO	Special Program for Biodiversity and Ecosystem Services
CEA	Country Environment Assessments
EIA	Environmental impact assessment
EKC	Environmental Kuznets curve
EPI	Environmental Performance Index
ESMR	Environmental and social management report
ESS	Environmental and Social Strategy
FAO	Food and Agriculture Organization of the United Nations
GCI-9	Ninth General Increase in the Resources of the IDB, or Ninth General Capital Increase
GDP	Gross domestic product
GEF	Global Environmental Facility
GHG	Greenhouse gas emissions
IAIA	International Association for Impact Assessment
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
LAC	Latin America and the Caribbean
OECD	Organization for Economic Cooperation and Development
PES	Payments for ecosystem services
REDD+	Reducing emissions from deforestation and forest degradation
SEA	Strategic environmental assessment
SEEA	System of Environmental-Economic Accounting
SMEs	Small and medium-sized enterprises
TURF	Territorial Use Rights in Fisheries
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization
WQI	Water Quality Index

Contents

A school of small fish underwater

Environment and biodiversity at the heart of sustainable development and competitiveness in Latin America and the Caribbean

Over the last few years, the environment has become an important public policy issue across the world. The impacts and threats of climate change have pushed countries to take steps to mitigate the environmental damage already caused, by addressing greenhouse gas emissions (GHG) and adapting at the global and local levels to the irreversible effects of climate change.

Although climate change mitigation and adaptation measures are necessary for sound environmental management, the environmental challenges that Latin America and the Caribbean (LAC) face – independent of climate change – are pending issues that are critical for sustainable development, improved quality of life, and economic competitiveness, for both countries and businesses. These challenges – addressed in this study – include, among others, air pollution caused by toxic gases (apart from GHGs),

water pollution caused by domestic and industrial wastewater discharge, degradation and overexploitation of natural capital that results in loss of biodiversity, and the persistence of solid and hazardous wastes in the environment.

This work is divided in three parts. The first is an assessment of the present state of performance in the management of the environment and the natural capital of the region. This section will identify the primary threats to sustainability and the challenges that the region faces in order to overcome them. In the second section, we will analyze the policies that are necessary to achieve high environmental performance with a focus on governance, multisector mainstreaming, the participation of the private sector, and social inclusion. The study reviews the debate on trade offs between economic growth and the environment, showing that investing in physical infrastructure and economic development, while conserving the environment and natural capital, is a viable and smart sustainable development strategy. In fact, it is argued that the natural capital is itself a form of "ecological infrastructure" generating valuable goods and services that contribute to economic competitiveness, income generation, and better quality of life, especially for vulnerable groups. The study ends with a short section of conclusions.

Assessment of principal challenges in the region

From abundant to degraded

Latin America and the Caribbean (LAC) region is known for its abundant natural capital and biodiversity as it has the greatest diversity of species and ecosystems on the planet. The region accounts for 40% of the earth's biodiversity (Bovarnick et al. 2010) and is home to 11 of the earth's 14 biomes (Blackman et al. 2014), six of the world's 17 megadiverse countries, and seven of 25 biodiversity hotspots (UNEP 2010a). It is estimated that the region has nearly nine million km^2 of natural forests, including one fourth (37,000 km^2) of the world's mangroves (FAO 2010, Siikamäki et al. 2012). In addition, more than 30% of available freshwater and approximately 40% of water resources are located in LAC (UNEP 2010a). The region contains 700 million hectares of potentially arable land, 570 million hectares of grasslands, and more than 800 million hectares of virgin forests (Bovarnick et al. 2010).

In terms of coastal marine ecosystems, the region has a wide variety of mangrove forests, seagrass beds, and coral reefs. The Caribbean region is particularly rich, with 12,000 recorded marine species, more than any other part of LAC (Miloslavich et al. 2011). It has more than 30 different mangrove ecoregions within 37,000 km^2 of tropical and subtropical coastal areas (Siikamäki et al. 2012). The Caribbean coasts of Mexico, Belize, Guatemala, and Honduras harbor the world's second largest reef system.

In recent decades, the LAC region has made significant strides in terms of advancing the issue of environmental sustainability as a public policy responsibility by creating institutional and legal frameworks and fostering greater citizen awareness. The United Nations Framework Convention on Climate Change (UNFCCC) and growing evidence of the severity of global warming as indicated in the reports of the Intergovernmental Panel on Climate Change (IPCC) have increased momentum and added a new dimension to the need to tackle environmental issues at a global scale.

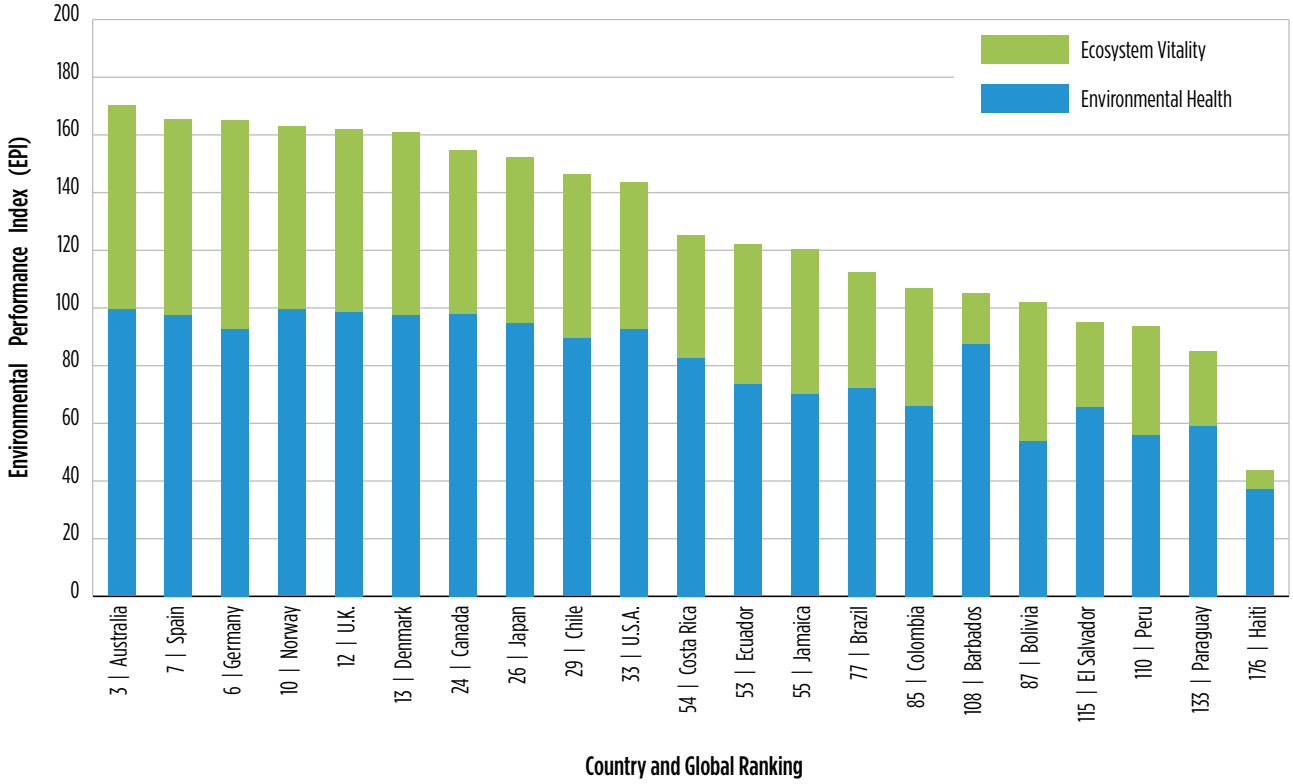
However, the region faces environmental degradation and other growing threats to sustainability, which are driven in part by its demographic and economic growth. Between 1990 and 2013, the population of LAC grew 38.5%, the region's gross domestic product (GDP) rose 106%, and GDP per capita rose 49% (ECLAC 2014). Should this trend continue, demand for energy and water are expected to increase by 50% and 25%, respectively, by 2030. Demand for food, fiber, forest products, farmland, minerals, and other resources is also expected to rise (IDB 2013b). Growing demographic concentration in cities also affects the demand for resources and exacerbates existing pressure on the environment (ECLAC 2014). These trends increase the need for investment in large infrastructure projects of all types, including ports, roads, wastewater treatment, energy, and mining, among others.

Environmental deterioration carries real economic costs for countries, which are often unaccounted for

Environmental deterioration carries real economic costs for countries, which are often unaccounted for. These costs are illustrated, for example, in the country environmental assessments (CEA) performed by the World Bank for Colombia, Mexico, and Peru. These CEAs provide conservative estimates of the costs associated with environmental degradation that can be locally prevented, including damage to public health, loss of productivity due to soil erosion, and the cost of remediation of certain specific environmental liabilities. These studies estimate the economic cost of environmental degradation at around 3% of GDP (World Bank 2006, 2007). These real costs incurred by society are not reflected in the national accounts, which makes it difficult for governments to prioritize public environmental investments.

The Environmental Performance Index (EPI) (Yale University 2014)[1] is a comparative measurement tool, which has systematically monitored the relative performance of countries since 2002. The 2014 EPI shows that while countries in LAC benefit from having relatively abundant natural capital, increasing demand for resources and low environmental governance levels result in relatively low scores for countries that are thought of as high performers. Figure 1 compares certain countries in terms of environmental health and ecosystem vitality, clearly highlighting a significant gap between countries of the region and other countries which serve as benchmark.

Figure 1. Environmental Performance Index for 2014

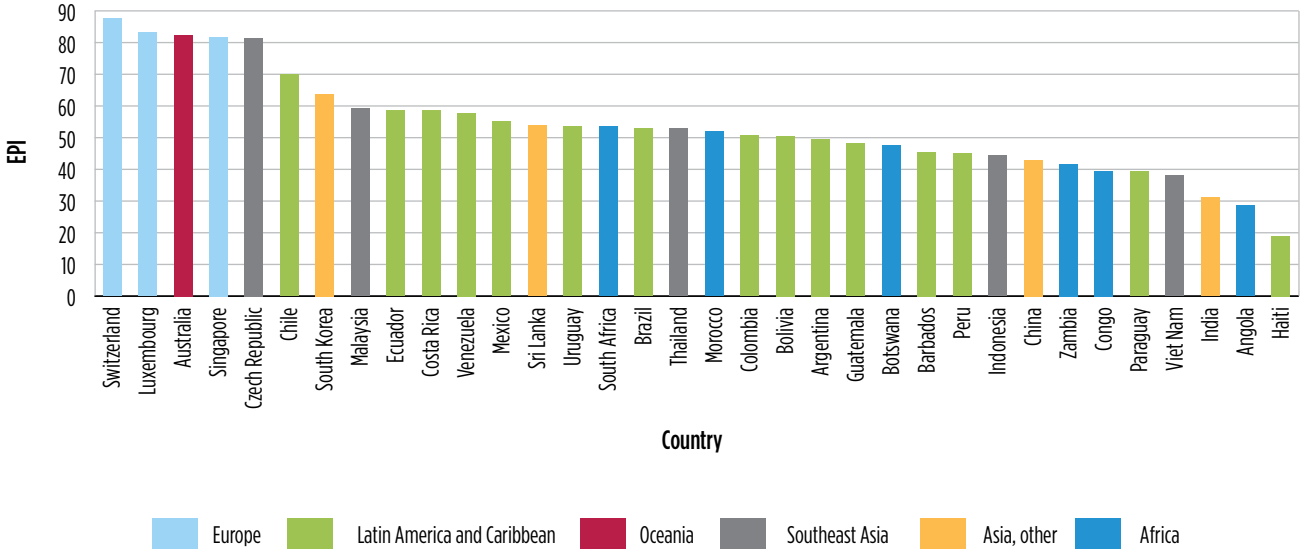


Source: Yale University (2014)

1. See http://epi.yale.edu/ for more information on the index and its components.

Figure 2 compares the 2014 EPI results for the seven countries higher ranked and a set of countries in the rest of the world comparable with countries in LAC in their levels of development. In general, there is great heterogeneity in environmental performance among countries in LAC, similar to the situation in Asia, where countries such as Singapore and South Korea are ranked relatively high, while countries such as China, India, and Vietnam fall into the underperforming group.

Figure 2. Environmental Performance Index (EPI) in 2014



Source: Yale University (2014).

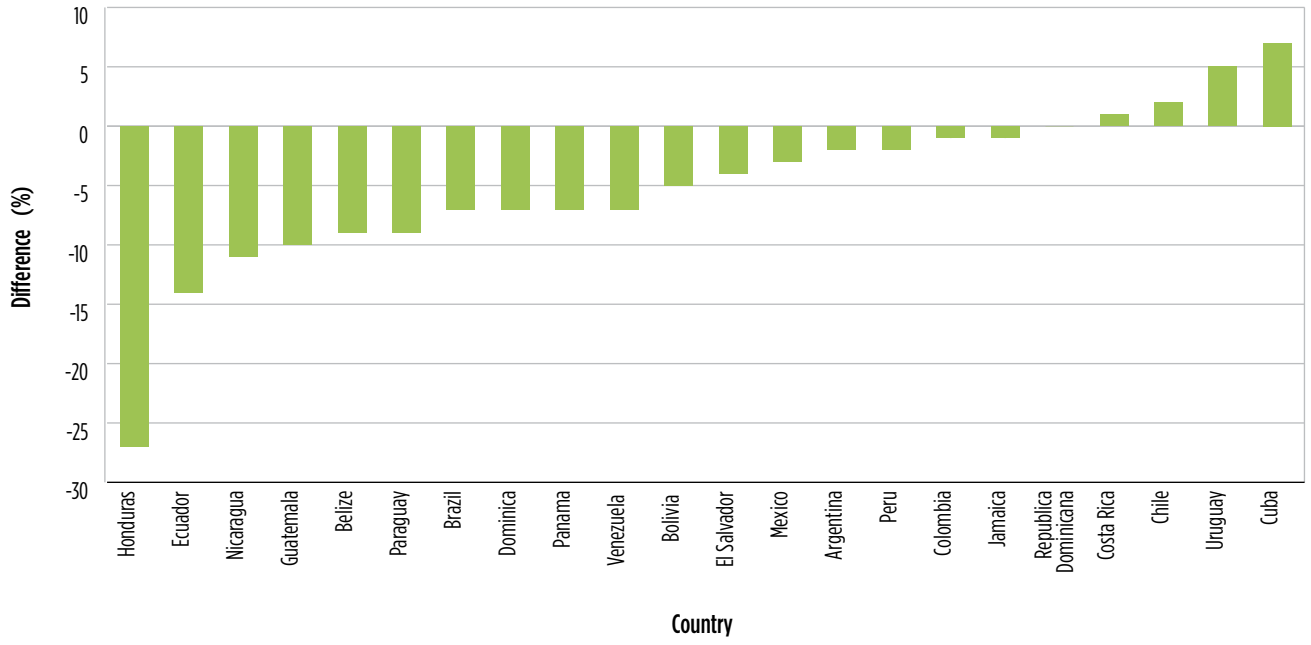
Forest cover: under continuous threat

There are indications that natural capital has increasingly deteriorated in terms of the health of forests, biodiversity, and, terrestrial and coastal-marine ecosystem services. In recent years, most of the region's countries have adopted new forestry policies and/or updated their forestry legislation by introducing environmental and sustainability criteria in forest use. Some examples include the creation of incentives to reduce deforestation through the Reduction in Emissions from Deforestation and Forest Degradation (REDD+) program and the implementation of community forest management systems, which have yielded favorable results (Cronkleton et al. 2011). Nevertheless, land use change is increasing in the region. Between 1990 and 2005, LAC lost an estimated 7% of its forest cover (ECLAC 2015). Since the 1960s, more than 150 million hectares have been converted to

There are indications that natural capital has increasingly deteriorated in terms of the health of forests, biodiversity, and, terrestrial and coastal-marine ecosystem services.

agricultural production (Kaimowitz et al. 2004). Between 2000 and 2010, the annual rate of forest loss in the region was 0.46%, twice the global rate, representing a loss of 4.2 million hectares per year. However, this rate appears to have decreased slightly in recent years (ECLAC-FAO-IICA 2012). Figure 3 shows that, while certain countries, such as Cuba, Uruguay, Chile, and Costa Rica, have increased their forest cover (native forests and timber plantations) between 1990 and 2010, forest losses in most countries have accelerated, even in comparison to prior five-year periods. Honduras, Ecuador, Nicaragua, Guatemala, Belize, and Paraguay experienced the highest rates of forest cover loss.

Figure 3. Change in percentage of forested national territory from 1990 to 2010



Source: http://estadisticas.cepal.org/cepalstat/WEB_CEPALSTAT/estadisticasIndicadores.asp

The loss of forest cover is attributable to a combination of direct and indirect factors. The direct factors include: (i) pressure to expand the area available for industrial and export forest products, especially given the growing demand for biofuels (bioethanol and biodiesel); (ii) expansion of livestock production, a sector that accounts for 45% of the expanded agricultural GDP in LAC and represents 13% of world production with a 4% annual growth rate; and (iii) expansion of road and other infrastructure (UN-ECLAC 2012). The indirect factors are: (i) weak environmental and

institutional governance in forestry management; (ii) uncertain land title and property rights; (iii) policy and economic incentives that encourage land use change for agricultural uses, such as tax credits, subsidies, and allocation of land possession rights; and (iv) failure of government and the private sector to take the value of the ecosystem services of forests into account in economic decision-making (Geist and Lambin 2002, Kaimowitz et al. 2004, UN-ECLAC 2012). The loss of forests is just one of the factors that directly affects biodiversity and ecosystem vitality, as described below.

Biodiversity and ecosystems: high levels of loss and degradation

The region's terrestrial ecosystems, including Mesoamerica, the Amazon, the Chaco, and the Andean Region, among others, contain a wealth of biodiversity and ecosystem services supported in wetlands, forests, aquifers, lakes, rivers, mountains, prairies, and deserts. However, more and more pressure is being put on all these ecosystems. For example, biodiversity in the Pantanal and Cerrado regions in Brazil faces a number of threats: conversion of natural vegetation to accommodate agriculture, pollution from agrochemicals and mining, the introduction of invasive species, and urban waste from neighboring cities (Alho 2011, WWF 2011). In addition, the retreat of Andean glaciers and the drying of wetlands as a result of climate change are substantially altering water flow patterns, posing a threat to water supply and power generation (Parry 2007, Anderson et al. 2011). Similarly, wastewater, agricultural production, and mining are directly affecting freshwater biodiversity in the Orinoco River, which harbors more than 1,000 species of fish (Barletta et al. 2010).

One half of the Caribbean population lives less than 100 kilometers from the coast (Chatwin 2007), which creates direct and indirect pressure on coastal marine ecosystems. The destruction and degradation of mangrove forests, coastal wetlands, and coastal reefs in turn reduces livelihoods for coastal communities (Halpern et al. 2008). The expanse of mangrove forests in LAC has shrunk by 40% between 1980 and 2001, primarily due to coastal development (Valiela et al. 2001), including agricultural, aquaculture and, in some cases, urban-tourism projects (Yáñez and Lara 1999, UNEP 2010b). Furthermore, 66% of the region's coral reefs are damaged, and their worth has been reduced to almost one third of their historic value (Sherman et al. 2009). Approximately 30% of Caribbean coral reefs has been destroyed, and another 20% in LAC is expected to be lost over the next 20 years

(UNEP 2010d), particularly in the west coast of South and Central America, the Gulf of Mexico, and the Caribbean coasts (Burke and Maidens 2005, UNEP and CATHALAC 2010, Jackson et al. 2014). In addition, between 1992 and 2008, overexploitation of fishery resources in the region has risen from 24% to 33% (FAO 2012). According to the United Nations Food and Agriculture Organization (FAO) (2014b), the LAC seas supplied roughly 20% of the global catch in 2012. Annual catch has fallen over the past decade by an average of 8.5% per year, from 20.06 million tons in 2000 to 12.3 million tons in 2010.

A comparison of threatened species in 1996 (IUCN 1996, 1997) and today (IUCN 2015) shows that the situation is critical. The region includes five of the 20 countries with the largest number of threatened or endangered animal species and seven countries with the largest number of threatened plant species (UNEP 2010c). Between 1996 and 2014, the number of extinct animal species has increased from 99 to 128, the number of critically endangered species has increased from 255 to 1,065, and the number of endangered species has risen from 500 to 1,624. In total, the number of endangered species has tripled in less than two decades, with the greatest loss occurring in Central America. In addition, as tends to be the case worldwide, information on the state of continental aquatic species in LAC is limited. As a result of biodiversity losses, the region's genetic reserve is quickly declining. Approximately 40% of medicinal plant species in South

▼ Underwater landscape of coral reefs showing signs of coral bleaching

▲ Deforestation: Scarred earth where tropical rain forest has been destroyed

America are endangered and close to 75% of the genetic diversity of the region's agricultural crops has been lost in the past century (UNEP 2010c, CBD 2014).

To differing degrees, the region's countries have established various types of legal instruments aimed at protecting biodiversity, particularly through protected areas and national parks (Dourojeanni and Quiroga 2006). Protected areas in LAC have grown to exceed 20% of the territory, from 1,966,400 km^2 in 1990 to 4,634,067 km^2 in 2014 (UNEP-WCMC 2014). However, the increase in the creation of protected areas, including a number of laws and regulations associated with biodiversity, does so far not appear to have resulted in better biodiversity indicators, as described below.

Protected areas: few notable successes

According to the International Union for Conservation of Nature (IUCN) and the Biodiversity Indicators Partnership (2010), the LAC region obtained a score of 0.51 (on a scale of 0 to 1) in management effectiveness of protected areas, surpassing only Africa (0.49). It is estimated that 46% of the protected areas in the region are subject to clearly inadequate or seriously deficient management, and only 16% are under management that has been rated as acceptable. Several studies show that protected areas are in large part fragmented, poorly managed (Brandon et al. 1998, Dudley and Stolton 1999, DeFries et al. 2005, Leverington et al. 2010), or insufficiently financed

(Bruner et al. 2004, Bovarnick et al. 2010). Less than half of the countries in the region have completed a review of their national biodiversity strategies. Flores (2010) estimates that countries in LAC allocate 1% of their GDP to environmental protection and less than 0.01% is allocated to protected natural areas. This is equivalent to US$1.18 per protected hectare per year. These budget allocations and funds from international sources cover less than 54% of the minimum financial needs of existing protected land areas, or 34% of what would be needed for optimal management.

In terms of financial needs for managing already existing protected areas in LAC, it is estimated that approximately US$317 million in additional investments would be required per year to address the minimum operating needs of these areas and US$700 million per year to ensure they are properly managed (Bovarnick et al. 2010). In addition, close to US$22 million would be required per year to expand the protected area network to cover gaps in the representativeness of ecosystem types found in many countries of the region (TNC 2007).

Interventions like public-private co-management arrangements for protected natural areas, co-management by indigenous peoples, payment for ecosystem services (PES) mechanisms, development of non-timber resources, and nature tourism have high potential for contributing to the sustainability of biodiversity and ecosystems, but are not sufficient if countries fail to comprehensively address the need for public policies and long-term investment programs (Blackman et al. 2014). Current public policies generally fail to prioritize or internalize the importance of biodiversity and ecosystems. As a result, countries are still unable to halt or mitigate the main threats: (i) economic pressures leading to the overexploitation of resources, accompanied by infrastructure and settlements lacking proper controls and environmental regulations; (ii) unrestricted access to natural areas and habitats, due in part to an absence of property rights, insecure tenure, and weaknesses of protected area systems; (iii) environmental pollution, particularly affecting main water bodies; and (iv) climate change, among others (UNEP 2010d, Müller et al. 2014).

Long-term water availability: a first order challenge

Two thirds of the region is classified as arid or semiarid, including central and northern Mexico, northeast Brazil, and several Andean regions in Argentina, Chile, Bolivia, and Peru. According to the FAO, water is primarily used for agriculture (73%), domestic consumption (18%), and industry (9%) (FAO 2014a). Growing demand for irrigated land, large hydroelectric projects, and an increase in urban population point to increasing conflicts among the various sectors and greater environmental pressures in general (Mahlknecht and Pastén Zapata 2013). By 2050, according to the estimates of the Organization for Economic Cooperation and Development (OECD) (2012), demand for water will rise by 55% and 40% of the population will live in river basins experiencing severe water stress. For example, in 2010, four of Mexico's 13 hydrologic regions (CONAGUA 2015) were subject to water stress, which affected 59.8 million inhabitants.[2] In the case of Chile, according to the National Water Resources Strategy 2012-2025 (MOP 2012), five of the country's 13 regions experienced high levels of water stress.

With these challenges in mind, in recent years, countries including Mexico (2014), Peru (2009), Uruguay (2009), and Paraguay (2007) have initiated significant legal and institutional reforms to improve water resource management. Nevertheless, legislation and policies that govern water resources are still insufficiently developed and inadequate in many countries (Dourojeanni 2010). One of the main difficulties for sustainable water management is the lack of sufficient information. In most countries, if data exist at all, they are incomplete, heterogeneous, isolated, and in many cases collected by sector entities with narrow objectives that are of little use to other users or managers (Mahlknecht and Pastén Zapata 2013, UN-ECLAC 2012). Moreover, an institutional mapping of water management shows great disparity in the various ministries and levels of government, with overlapping functions and contradictory applications of sector policies. A long-term resolution will require functional systems of integrated management built with special attention to three core pillars: (i) strengthening of governance; (ii) use of economic and financial instruments; and (iii) improved information on the quality and quantity of water resources (UN-Water 2008, UNEP 2010d).

2. Baja California (1,250 m^3/inhabitants/year), Río Bravo (1,144 m^3/inhabitants/year), Lerma-Santiago-Pacífico (1,527 m^3/inhabitants/year), and Valle de Mexico (160 m3/inhabitants/year).

Environmental contamination: far from international standards

Water contamination

Water pollution from untreated wastewater discharge has significant impacts on human health, ecosystem quality, and economic development. This situation in LAC is critical, as reflected by the level of degradation of important aquatic ecosystems, whether land-based (rivers, wetlands, lakes) or coastal marine. While wastewater treatment coverage indices in the region have improved, it is estimated that more than 70% of wastewater is still discharged untreated into rivers, lakes, or the sea (Jouravlev 2014). Chile is treating nearly 100% of its urban waste water, but in the other countries, the level of water treatment is low: Mexico (48%); Brazil and Uruguay (35%); Belize and the Caribbean (20%); Colombia, Peru, and Bolivia (20%); Ecuador, Argentina, and Venezuela (10%); and Central America (5%) (Mahlknecht and Pastén Zapata 2013).

Water pollution from untreated wastewater discharge has significant impacts on human health, ecosystems quality, and economic development.

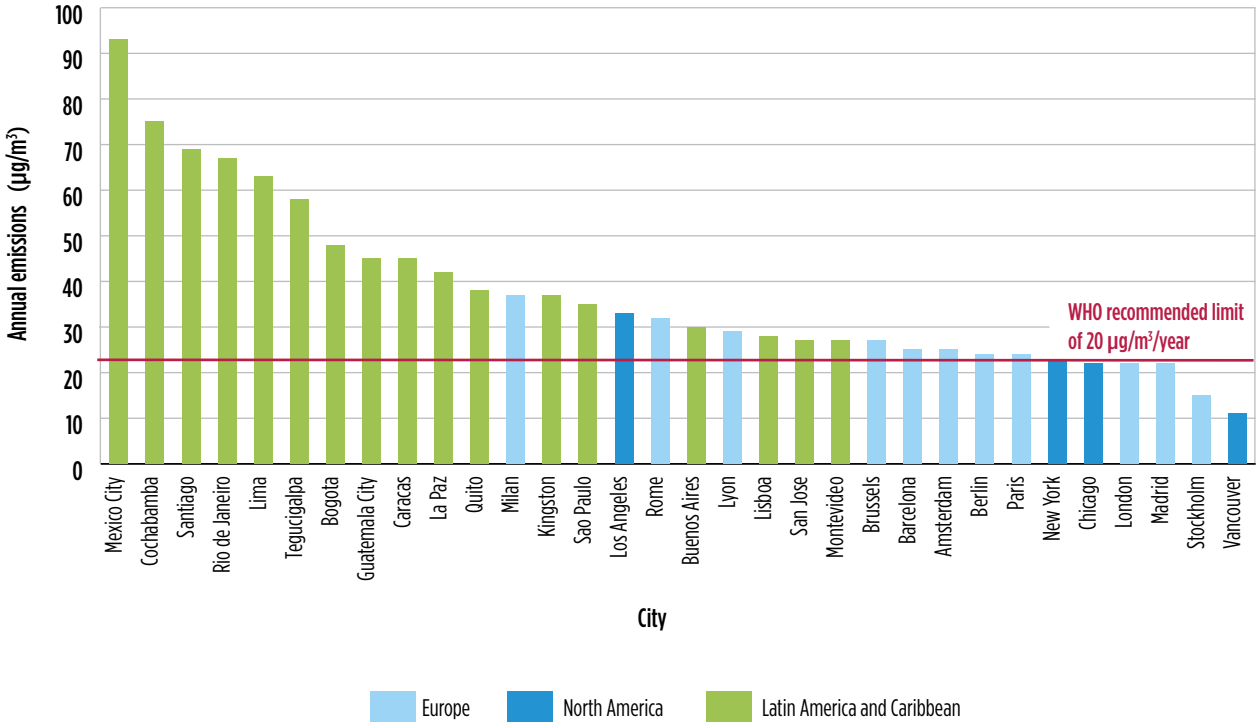
Pollution caused by agriculture-related substances (chemicals and pesticides) and mining effluents, particularly from dispersed and informal mining and other industries is another challenge for water management. For example, while Chile has high domestic wastewater treatment levels, the official water quality index (WQI) reports that water quality is in poor condition in eight sections of 33 watersheds, highlighting the high levels of chemical pollution from metals in certain areas of Region VI (Mahlknecht and Pastén Zapata 2013). In a different geographical setting, in El Salvador, 20% of riverbeds are catalogued as being in poor environmental condition and indicators of pollution from the discharge of organic materials and pathogens (coliform bacteria) are well in excess of internationally accepted levels. This is associated with an infant mortality rate from gastrointestinal diseases of 16 per 1,000 live births (MARN 2014).

Air pollution in urban centers

Despite the strides made in recent years in many LAC cities, such as Mexico City, Bogotá, São Paulo, and Santiago, at least 100 million people in the region are exposed to air pollution levels exceeding the World Health Organization (WHO) guidelines (Green and Sánchez 2013).

In 2012, there were 3.7 million deaths worldwide due to causes directly associated with air pollution, and 4% of these deaths occurred on the American continent (WHO 2014). The presence of particulate matter (PM_{10})[3] is of particular concern, since cities in LAC far exceed the WHO annual average standard of 20 µg/m³, as shown in Figure 4 below.

Figure 4. Annual PM_{10} (µg/m³) emissions in LAC, European, and North American cities



Source: (ECLAC 2015)

Since 1990, greenhouse gas emissions in LAC have grown steadily at an average annual rate of about 1.2%, which is similar to the world average (UN 2010). Emissions of carbon dioxide (CO_2) have gone from 1.006 billion tons in 1990 (2.3 tons/inhabitant) to 1.701 billion tons in 2010 (2.9 tons/inhabitant). Studies point to motorized transport and the sustained increase in the vehicle fleet as the main causes of atmospheric pollution in cities (CAF 2011). In response, the countries of the region have increased investments in infrastructure and transportation and mobility systems in order to reduce their carbon footprint (Li and Colombier 2009). Examples include the implementation of mass public transport systems in Brazil, Mexico, and

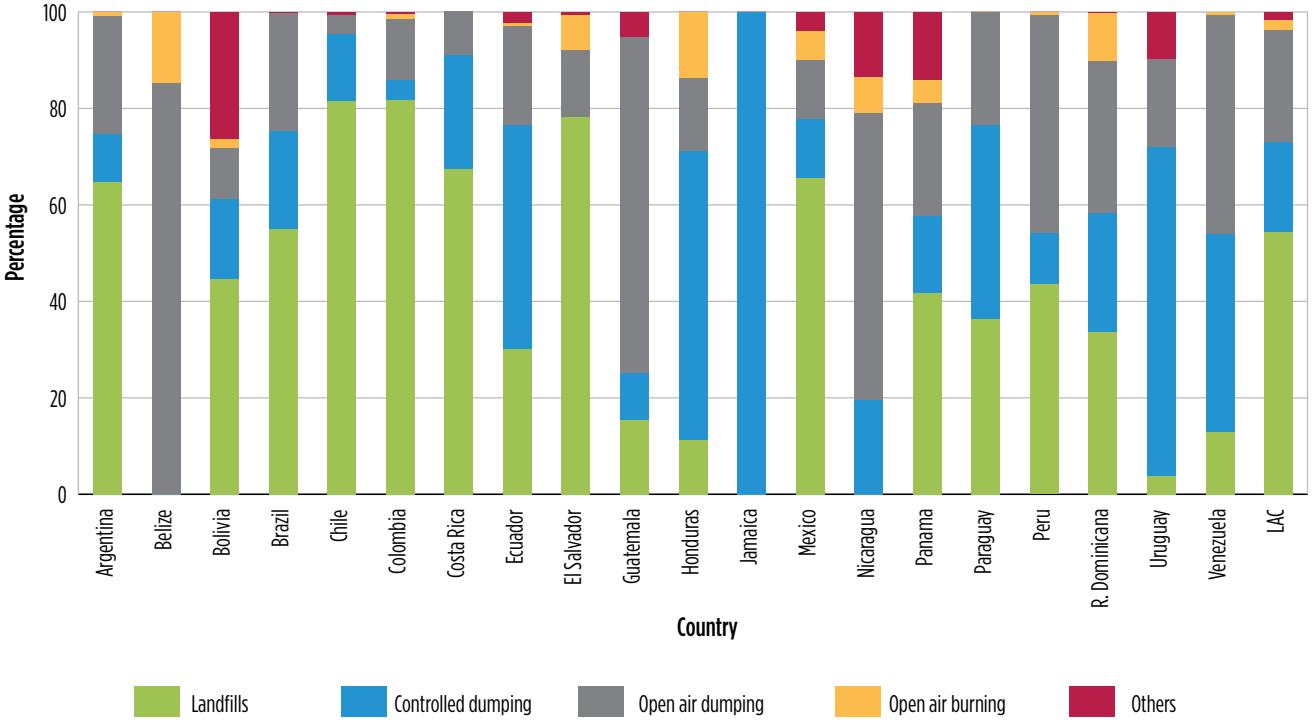
3. Particulate matter pollution has a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

Colombia. In addition, the region has developed a cleaner supply of energy by tapping its potential for renewable energy sources (Galindo 2009). All these efforts are necessary and will help considerably in reducing the current pollution levels. However, significant changes in policy and economic behavior will still be required in the energy and transportation areas, along with greater public and private investment (UNEP-ECLAC 2010).

The challenge of waste disposal

Solid waste disposal continues to be one of the greatest environmental challenges in LAC due to significant shortcomings in both urban and rural municipalities, which results in direct impacts on public health and ecosystem pollution. Despite the progress made in garbage collection coverage, which now averages 93.4% of households (IDB 2010), the central environmental problem is in the treatment and final disposal of solid waste. As shown in Figure 5, solid waste is disposed of in controlled dumpsites, open-air dumps or through open-air burning.

Figure 5. Percentage of the population with access to solid waste disposal systems



Source: Regional Evaluation on Urban Solid Waste Management in Latin America and the Caribbean – 2010 Report. IDB-AIDIS.

An estimated 55% of the population in the region has access to urban solid waste disposal in sanitary landfills (IDB 2010). However, this figure is probably overstated, since some municipalities tend to report controlled dumpsites as if they were sanitary landfills. Dumpsites (whether controlled or uncontrolled) are not always located in appropriate areas and are often found in sensitive areas like hillsides, ravines, and riverbanks. Furthermore, they are not always properly operated, creating problems such as improperly controlled gas emissions, leachate, and generating propitious conditions for the development and proliferation of disease-bearing vectors (Díaz, 2009). The absence of planning instruments and capacities at the municipal level is one of the main obstacles encountered in addressing the problem of waste. Only 19.8% of municipalities in LAC have solid waste management plans. Uruguay (73.9%), Argentina (74%), Peru (57.2%), and Chile (53.4%) are the only countries where more than 50% of municipalities have such plans. It is estimated that only 2.2% of waste is recovered and recycled in the region, although some countries and cities have started to prioritize these practices (IDB 2010, UN-ECLAC 2012).

Improvements in legal frameworks and governance institutions have not resulted in better environmental performance

In terms of legal frameworks, all countries of the region have some type of general (not sector-specific) framework law for environmental management, and many have sector-specific laws and regulations, including environmental impact assessment (EIA) regulations, as shown below.

Table 1. Proportion of LAC countries with specific legislation on priority environmental issues

Legislation	Framework law on environmental management	Urban waste	Water	Public information	Forestry	Protected areas
Proportion of countries	25/25	13/25	15/25	7/25	23/25	20/25

Legislation	Air	Biodiversity	Soil	Environmental impact	Fishery resources	Land-use planning
Proportion of countries	11/25	19/25	6/25	20/25	12/25	13/25

Source: Authors' elaboration

Despite the existence of this legal framework, several diagnostic assessments and studies on the issue of environmental performance highlight the following challenges and weaknesses (Gómez et al. 2006, INECE 2009, Bovarnick et al. 2010, Acerbi et al. 2014, Blackman et al. 2014):

Weak environmental institutions. Within the hierarchical and budgetary structures, environmental institutions are generally weak because they lack adequate budget and technical capacities and have limited ability to attract first-rate, qualified, technical staff. These weaknesses, which are evident at the national and central government levels, become accentuated at the local levels (provinces and municipalities).

Limited development of environmental capacities at sector institutions. While environmental initiatives have emerged in recent years in productive and infrastructure sectors such as transportation, energy, agriculture, tourism, housing, and others, the coordination between sectors is inadequate. In addition, many sector policies are inconsistent in their approach to a specific resource (e.g. water) or territory.

Low levels of investment and public expenditure[4] in the environment. Several studies have attempted to determine the appropriate levels of public spending for protecting the environment and the natural capital (Eurostat 2005, OECD 2007b, etc.), using methodologies such as the United Nations System of Environmental-Economic Accounting (European Commission et al. 2012, Oleas-Montalvo 2013). These studies show that the region's investment and public expenditure in environment are less than 1% of GDP. Only Brazil, Mexico, and Costa Rica exceed 0.6% of GDP, far from the OECD average, which is approximately 1% of GDP (IDB 2012, European Commission et al. 2012, UN-ECLAC 2012, IDB 2013a). This situation demonstrates how restricted access is to the resources needed to address the environmental problems and threats affecting the region.

4. Environmental public expenditure is defined as spending by public institutions on activities directly aimed at preventing, reducing, and eliminating environmental, pollution or any other degradation of the environment resulting from human activity, as well as on natural resource management activities not aimed at the exploitation or production of such resources.

Shortcomings in the use of EIA and environmental permitting systems. While the use of EIA procedures is now well established in most countries in LAC, and authorities have sufficient experience, there are clear shortcomings and limitations (Triana and Enriquez 2007, Acerbi et al. 2014). There is a lack of institutional capacity for project monitoring that often is not performed after the relevant license or permit is issued (Astorga 2006), which has affected the credibility of the EIA process. The inclusion of environmental aspects at the strategic level in the design of policies, plans, and programs continues to be subject to significant limitations and gaps and is in most cases insufficiently developed in the legislative framework (ECLAC and MINAMBIENTE-Colombia 2009, OECD 2007a, IUCN-ORMA 2007, VBRFMA 2007, CAF 2010, Utrilla 2011).

Noncompliance with laws. All of these weaknesses create a situation in which the regulatory and legal provisions are not fully complied with and/or compliance is not verified. In many cases, companies prefer to pay fines rather than comply with environmental requirements (Russell and Vaughan 2003, Akella and Cannon 2004). Permitting systems become transaction costs with little added value for the companies or for environmental conservation.

Insufficient use of economic instruments. There has been some use of economic and market instruments in the region as part of the environmental management toolkit, such as the introduction of tradable property rights to fisheries or the implementation of disposal fees. However, emphasis continues to be primarily on administrative and command-control systems that levy permits and fines. These are generally inefficient and poorly managed.

Lack of information and environmental accounts. There is an absence of systematized environmental information at the sector level, which prevents natural capital from being properly valued in national accounts or when setting economic policy. The greatest information deficit concerns the terms of supply and demand for ecosystem goods and services and the function of their ecological production in relation to their economic contribution, particularly in the case of aquatic, coastal, and marine systems (Ferraro and Pattanayak 2006, Pullin and Knight 2009, Arroyo et al. 2010, UN-ECLAC 2012, Blackman et al. 2014).

Limited private-sector participation in environmental initiatives. While companies in LAC are increasingly adopting environmentally friendly practices, especially by reducing their carbon footprint and through clean production initiatives, major challenges and gaps remain when compared with companies in Europe, Canada, and United States. For example, although ISO 14001 certifications in the region have grown from 711 in 2000 to 10,996 in 2013 (ISO 2015), they account for only 3.6% of total certifications worldwide.

Vulnerability to disaster risks. The severity of natural disasters (e.g., hurricanes, droughts, floods, earthquakes) in LAC has been exacerbated by inadequate environmental conditions. This is especially true regarding land occupancy and use, where the impact is greatest on the poorest and most unprotected groups, including indigenous peoples, Afro-descendants, and women (World Bank 2006, 2007, UNEP 2010d, UN-ECLAC 2012).

Need to strengthen local communities, and indigenous and Afro-descendant groups. Although some progress has been made in strengthening the role of local communities in managing the environment, current arrangements are incipient and fragmented **(Pacheco et al. 2008, Bowler et al. 2011).**

In summary, the region's environmental challenges, which are linked to governance and institutional shortcomings, clearly show that, in the realm of public and economic policies, investments in the conservation of natural capital are not a priority. This is due in part to the perception that environmental issues, except those relating to climate change, are an additional cost that inhibit economic growth and job creation. This is especially relevant in the context of public spending, where the priorities of short political cycles do not align with the long-term strategic vision needed for environmental investments. The following section provides empirical evidence that, irrespective of income level, countries can and should develop appropriate management and governance instruments for both the public and private sectors. Such tools should aim to increase the contribution of natural capital and a healthy environment to better economic growth.

Misty jungle / rainforest scene

Evidence on the effectiveness of policies and programs for the environment and biodiversity

Economic growth and environmental protection are not mutually exclusive

There is no reason why environmental protection and conservation of natural capital should limit business competitiveness or the countries' economic development. Some policy-makers and segments of society in Latin America and the Caribbean continue to adhere to the conventional wisdom that environmental regulations impose significant costs and hinder productivity growth and thus undermine the ability of businesses to compete in international markets. This position is reinforced by a literal interpretation of the Environmental Kuznets Curve (EKC or the Curve), which was popularized in the 1990s by various economists who argued that the relationship between environmental degradation and a country's per-capita income follows an inverted U-shaped curve. According to this theory, environmental degradation initially increases with economic development, but then, starting at a certain level of income per capita, the rise in income

There is no reason why environmental protection and conservation of natural capital should limit business competitiveness or the countries' economic development.

brings about an improvement in environmental quality (Grossman and Krueger 1995). The common interpretation is that countries in the initial stage of the Curve are more interested in generating jobs and income than in a clean environment, leading some policy-makers to take the position that first, the country needs to grow and only later address environmental degradation.

Copeland and Taylor (2004), among others, in their research on trade, growth, and the environment, have used a simplified general equilibrium model to find ample evidence confirming that a country's income growth has a positive effect on environmental quality and performance. However, their theoretical and empirical review of the Curve makes them skeptical of a simple and predictable relationship between environmental degradation and income per capita. Similar conclusions are reached by Dasgupta et al. (2002) and Stern, Common, and Barbier (1996), who point to fundamental problems with the Kuznets curve hypothesis, particularly that it assumes that there is no feedback between environmental quality and productive potential and that international trade has a neutral effect on the environment. In fact, Stern (2004) finds that the Curve is built on a weak statistical foundation and that some developing countries have been successful in adopting the environmental standards of developed countries while achieving strong economic performance. Panayotou (1997) argues that there are smart ways of achieving economic growth while flattening the curve and lowering the cost of environmental degradation. Specifically, this requires effective institutions and policies. Similarly, Lin and Liscow (2012) conclude that political institutions have a significant effect on environmental degradation and consequently on the shape of the Curve. Consistent with this empirical evidence, the study "Better Growth, Better Climate," prepared by The New Climate Economy (2014), concludes that countries of all income levels now have the opportunity to build long-term economic growth models while reducing the risks of climate change and environmental degradation.

From the standpoint of business competitiveness, Margolis and Walsh (2003), in an exhaustive review of the literature, examine 109 quantitative studies published between 1972 and 2002. They find that 54 of these studies point to a significant, positive relationship between environmental responsibility and competitiveness, seven of them show a negative relationship, and the others are inconclusive. Similarly, Jaffe et al. (1995), in a study on the impact of environmental regulations on the competitiveness

of the United States manufacturing industry, conducted an exhaustive review of the empirical evidence to find that environmental regulations can not only be beneficial in terms of their environmental impact, but also have a positive effect on the competitive position of industries. The study finds no evidence that environmental regulations and the costs associated with pollution abatement have had an adverse effect on competitiveness. The study indicates that achieving this outcome requires implementing flexible and cost-effective economic and political instruments. Managi and Kaneco (2009) reach similar conclusions in the context of China.

A similar study by Albrizio et al. (2014) on the empirical evidence of the effects of environmental regulation on European productivity growth also concludes that the enforcement of strict environmental policies has had no adverse effect on factor productivity growth. The authors highlight the fact that corporate economic activity can benefit from environmental improvements that result from regulation. For example, industries that use water benefit from clean production processes that reduce the resources required to purify it. Similarly, employees become more productive once air pollution and its impact on health are reduced. At the macroeconomic level, the study observes that although an increase in environmental regulations initially leads to a drop in productivity, there is positive productivity momentum in later years. In terms of labor productivity, findings show that air quality standards have a significant effect on productivity in the United States. Environmental protection, rather than being perceived as a tax on producers, can be viewed as an investment in human capital and as a tool for promoting economic growth (Berman and Bui 2001, Graff Zivin and Neidell 2012).

Porter and Linde (1995), in a study that changes the paradigm of the trade-off between environment and competitiveness, examine hundreds of case studies to show that competitive international companies do not use cheap inputs or produce at large scales, but have the ability to continually innovate and improve. According to the authors, well-designed environmental standards can lead to innovation. They argue that visionary and innovative entrepreneurs have come to appreciate the fact that regulations based on effectiveness and efficiency criteria make them more competitive in the global marketplace. Examining the European Union, Testa, Iraldo, and Frey (2011) confirm that environmental regulations favor investments in advanced technologies and bolster corporate economic performance.

The importance of assigning value to environmental assets

It is important to recognize that, aside from market mechanisms and the way in which prices of goods and services are revealed in production and consumption decisions, the actual economic value of the environment and biodiversity has several dimensions. According to Pearce (1993), total economic value is usually divided into use value and passive-use (or nonuse) value.

Use value is associated with private or quasi-private goods, for which market prices normally exist. Use value tends to be divided into: (i) direct use value, which is associated with direct benefits (e.g., timber or food harvest); (ii) indirect use value, which may be approximated by public services that are not reflected in the market (e.g., the regulation of soil erosion or the protection of water sources that a forest can provide); and (iii) option value, which may be approximated by the willingness to pay for a potential future use (e.g., the value that the genetic material of a species may have for pharmaceutical use).

Passive value reflects satisfaction from (willingness to pay for) a good simply by knowing that it exists. Passive value is difficult to quantify, since it stems from moral, religious, or ethical considerations. Typically, passive value components include existence value (keeping a good in existence), altruistic value (the good in question should be available to all members of the same generation), and bequest value (the good in question should be available for future generations). Effective environmental performance requires societies, policy-makers, and businesses to recognize and internalize these values. The following sections provide examples of conditions or contexts that incorporate or internalize these values as part of environmental management.

Good environmental governance is a requirement for sustainability

The quality of environmental governance, grounded in the use of effective management instruments and regulations, are required to improve environmental performance and achieve sustainability goals.

According to the United Nations Environment Programme (UNEP 2012), environmental governance requires the smooth functioning and coordination of the following components: (i) institutional framework at various levels; (ii) regulatory framework in its normative and policy aspects; (iii) management instruments used to implement institutional actions and enforce the policy and legal framework; (iv) financing and sufficient resources to provide the means for management; (v) information systems and their accessibility; (vi) oversight and accountability; and (vii) participation and collaboration mechanisms that include civil society engagement, as well as mechanisms for collective action.

By examining the environmental performance of more than 50 countries, Esty and Porter (2005) conclude that environmental performance is directly related to the development of the regulatory system, institutional capacity, and the social and economic context in which they operate. Similarly, several studies conclude that effective environmental management requires a harmonious and balanced institutional structure and coordination with sufficient sector and local presence, as well as solid regulatory and planning capabilities (Larson et al. 2006, Mahon et al. 2011, Mazur 2011, Wever et al. 2012, Castro et al. 2015).

On the other hand, Margulis and Vetleseter (1999) and Burtraw (2013) identify the transfer of capacity and technology to subnational levels as essential elements for success. Nevertheless, in an analysis of 90 developing countries, Fredriksson et al. (2006) find that decentralized institutional structures appear to lead to less rigorous and weaker enforcement of environmental policy that is more susceptible to external pressures. Whether governance structure is centralized or decentralized, strengthening of skills and capabilities is in all cases found to be a basic necessity.

Addressing market failures and creating better incentives

Degradation of the environment and natural capital is rooted in market failures related to the allocation and use of resources. It is essential for environmental and sector policies to develop the right signals and incentives to correct these failures.

Sterner (2003) highlights several reasons why economic development models can lead to a decline in environmental quality and a loss of social welfare: (i) the existence of negative externalities, such as damage to public

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health resulting from pollution generated by productive activities; (ii) the nature of environmental assets, such as ecosystem services, as a public good; and (iii) the absence of clearly established property rights to common resources, such as fishery resources or water. Public policies are required to correct these market failures and internalize cost and benefit considerations in production and consumption decisions.

There is a vast economic literature in this area, and countries have used a number of instruments to correct market failures, including command and control measures, market-based economic instruments, and voluntary and flexible instruments (Blackman and Rivera 2011, Coria and Sterner 2011). In general, the literature is conclusive in showing that the application of command and control mechanisms imposes unnecessary costs and can lead to inefficient solutions from a social and economic standpoint. Within an effective governance framework, economic and market instruments as well as incentives, if used correctly, make it possible to achieve quality goals more flexibly and at a lower cost (Tietenberg 1990, Russell and Vaughan 2003).

In this context, Goulder and Parry (2008) review the various economic instruments for environmental management and arrive at the following conclusions: (i) no single environmental management instrument is superior to others when all relevant dimensions and circumstances are taken into account; (ii) there are significant trade-offs when considering various instruments, with equitable distribution and political feasibility implications; (iii) depending on the context, it is advisable to design hybrid instruments that combine features of several different instruments; (iv) more than one market failure may be at the source of many environmental problems, justifying the use of more than one instrument; and (v) it is important to consider the potential for counterproductive interactions and effects between different environmental management instruments when they are implemented without proper interagency coordination. In addition, it should be acknowledged that these economic instruments are not necessarily a panacea and that their effective use depends on the specific context in which they are being applied and their relationship with the governance mechanisms in effect, particularly in terms of monitoring and oversight capacity (Tietenberg 1990, Stavins 2001, Goulder 2013).

Examples of the successful use of economic instruments include the use of: (i) emissions taxes and fees in the Netherlands, Spain, Portugal, United Kingdom, and Finland, where the introduction of vehicle registration taxes based on emissions capacity has spurred the purchase of less polluting vehicles (Potter and Parkhurst 2005); (ii) taxes on wastewater discharge

in Colombia, which show that authorities can be incentivized to improve their oversight and companies can be incentivized to manage their waste (Blackman 2009, INECE 2009); (iii) credit incentives in Finland, Japan, and France that encourage the adoption of clean technologies (OECD 2009), or targeted subsidies that promote the adoption of conservation practices in the agricultural sector of the European Union (Laukkanen and Nauges 2014); and (iv) tradable rights and negotiable permits used successfully to reduce air pollution, such as by the Regional Clean Air Incentives Market (RECLAIM) program in the United States, which is a market program that allows companies to comply with air quality and emission standards (Goulder 2013). In the case of LAC, the use of public information campaigns on air pollution has proven helpful in supplementing public vehicle restriction measures and reducing human exposure during environmentally critical periods (Mullins and Bharadwaj 2014).

In countries in the region , the use of market instruments to control pollution and manage natural resources is still limited. However, the concept of payments for ecosystem services (PES) has become popular as a mechanism aimed at reinforcing biodiversity conservation policies,

▼ Juvenile sloth in tropical rainforest, Costa Rica

particularly with regard to water (to protect sources in hydrologically important ecosystems) and conservation of forests and biodiversity (Balvanera et al. 2012). In general, the results from implementing PES mechanisms have been mixed (Pattanayak et al. 2010). There are reports of successful applications of PES mechanisms in: (i) United Kingdom and Australia, to halt mining activities in favor of the creation of protected areas (TEEB 2010); (ii) Vietnam, China, and Japan, to prevent the destruction of forests by promoting the maintenance of watersheds and the traditional landscape (Hayashi and Nishimiya 2010, Adhikari and Boag 2013, Zheng et al. 2013); and (iii) Nicaragua, Mexico, and Peru, to protect groundwater recharge in forest areas (Pagiola et al. 2007, Muñoz-Piña et al. 2008). In addition, several studies indicate that some PES mechanisms have helped to empower local communities and organizations and contributed to institutional strengthening. These include the Forest Partner Conservation Incentive Program in Ecuador, the CONAFOR Program in Mexico, and the FONAFIFO Program in Costa Rica (Larson et al. 2006, Corbera et al. 2007, Asquith et al. 2008, de Koning et al. 2011, Constantino et al. 2012, Kothari et al. 2013, Bremer et al. 2014).

According to a study of nine countries (Tacconi et al. 2013), the primary reasons why PES mechanisms have not been successful include financial management shortcomings and conflicts in the allocation and sharing of benefits. There is a generalized view that insufficient governance, particularly a lack of regulatory and legal frameworks, weak institutional development, and lack of information on the value of ecosystem services jeopardize the success of PES mechanisms. There are many reported problems, including: rent-seeking, unequal bargaining power of buyers and sellers, intermediation costs, payment volatility, opportunity costs or verification and monitoring problems, allocation of property rights, and absence of credible audits (Clements et al. 2010, Kronenberg and Hubacek 2013, Mahanty et al. 2013).

Strengthening property rights and security

Clearly defined property rights and legal certainty of land tenure can contribute to better management of natural resources and biodiversity and to private and public investment as long as they are accompanied by the right incentives and additional management actions.

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Several studies on the problems of deforestation and overexploitation of fishery resources in LAC have emphasized the absence of property rights and tenure security as primary causes of this situation (Castilla and Defeo 2001, Larson et al. 2006, Pacheco et al. 2008, Blackman et al. 2014, Locatelli et al. 2014). These studies highlight the premise that property rights and tenure security promote a more productive and sustainable use of resources and foster long-term investments to improve the state and value of the territory and its resources (Kaimowitz 1996, Triana et al. 2007, Barbier et al. 2011). In addition, there is evidence that legal recognition of land tenure generates opportunities for increased access to financing mechanisms, such as REDD+, PES, and conservation incentive programs (Bruce et al. 2010). The empirical evidence shows cases that appear to confirm this assertion, such as the land titling program in Peru (Aldana and Fort 2001, Antle et al. 2003, Torero and Field 2005) In artisanal fishing, regulating resource access rights or implementing territorial use rights in fisheries (TURFs) has made it possible to recover fisheries and control illegal activities by setting quotas and bans, among other measures (Castilla and Defeo 2001, Pomeroy et al. 2001, Grafton et al. 2006, Wilen et al. 2012, Orensanz and Seijo 2013).

Nevertheless, property rights alone do not guarantee the conservation of natural resources and natural capital. For instance, Liscow (2013), in a quasi-experimental study that uses an instrumental variables approach to examine the relationship between property rights and deforestation in Nicaragua, finds that property rights have led to higher deforestation rates by increasing productivity and agricultural returns. Similarly, in a review of 131 cases (56 of them in Central and South American countries) on forest management results under various land tenure conditions, Robinson et al. (2011) find that, while important for achieving better forest management, land tenure security does not ensure forest conservation. Therefore, as with any other management instrument, secure tenure and land title cannot by themselves be considered a panacea. Instead, they must be combined with effective complementary mechanisms, solid institutions, and economic instruments that eliminate open access to resources and reconcile individual interests with the public interest. On the other hand, in cases with indigenous peoples, recognition of the various forms of ancestral land tenure would seem to contrast with land privatization schemes, which not only fracture the social structures and collective rights of these peoples, but fosters habitat fragmentation and land use change (Plant and Hvalkof 2001, Appendini and Torres 2008, OVE 2014b).

The management instrument most commonly used in LAC for biodiversity conservation has been the creation of protected areas. Various studies demonstrate that the establishment of protected areas throughout the world can contribute to the reduction of deforestation in areas affected both directly and indirectly (Joppa and Pfaff 2010, Andam et al. 2008, Nelson and Chomitz 2011, Blackman 2013). While the protected areas established prior to 1990 appear to have yielded relatively effective results in terms of mitigating deforestation processes, some studies suggest that offering to turn management over to the indigenous communities could be a more effective means of combating deforestation than creating protected areas (Miranda et al. 2014). Similarly, Nelson and Chomitz (2011) find that the incidence of fires in the region (used as an indicator of deforestation) has been reduced between 3% and 4% in the comprehensive protection areas where all extractive activities have been prohibited, between 5% and 6% in multi-use protection areas, and between 16% and 17% in protected areas within indigenous territories. Despite these positive trends, protected areas are generally not properly managed and the biodiversity and ecosystem quality indicators are sharply deteriorating, which suggests the need for a more comprehensive approach to biodiversity management (DeFries et al. 2005, Dourojeanni and Quiroga 2006, Bovarnick et al. 2010, Leverington et al. 2010, IUCN and Biodiversity Indicators Partnership 2010).

In conclusion, success in using specific economic instruments and policies on property rights, land tenure, and access to resources depends on: (i) strong local and national institutions capable of enforcing compliance with regulations and territorial limits, as well as respect for established rights; (ii) transparent legal frameworks; and (iii) policies that foster and strengthen community-based management (Larson et al. 2008, Bruce et al. 2010, Cronkleton et al. 2011, Robinson et al. 2011, Pacheco 2012).

Environmental Impact Assessments: a key decision-making and management tool

Environmental Impact Assessment (EIA) systems are key management instruments essential to ensuring the transparency of investment decision-making processes. However, using them effectively requires avoiding practices that can turn them into a costly licensing instrument.

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After examining the EIA procedures adopted by 22 countries in LAC, Acerbi et al. (2014) find that the use of this instrument is generally deficient and that EIAs have become a de facto substitute for regulations on biodiversity conservation, pollution control, and land use planning. EIA application currently emphasizes the management of negative impacts, relegating the strengthening of decision-making processes to secondary status. Similar conclusions are reached in a study by Triana and Enríquez (2007), who find that EIAs in the region are not yet as effective as in developed countries, and they fail to comply with the principles established by the International Association for Impact Assessment (IAIA). This is partially attributable to the fact that public participation and interagency coordination processes are given little importance and are generally implemented when key decisions have already been made. Also, there is a lack of a real evaluation of alternatives that could better respond to environmental concerns (Ahmed 2012).

In contrast, a European Commission review (2009a) of the use of this instrument in European Union countries over the course of almost three decades highlights several essential factors for its success: (i) capacity to set thresholds for its application; (ii) implementation of simplified procedures and development of classification criteria; (iii) regulations against project fragmentation; (iv) improvement of technical institutional support for implementation of procedures and publication of practical case studies and guidelines; (v) use of this instrument as a basis for open dialogue and common concern; and (vi) strengthened monitoring and surveillance of the proposed measures, which will help improve future assessments.

Availability of reliable information: another essential tool for good management

The availability of appropriate and sufficient information is a primary determining factor for effective environmental management, including the use and allocation of natural capital. This is a necessary condition to enable policy-makers, businesses, and society as a whole to take the appropriate management actions.

Unlike economic and social areas, information on the environment and natural capital in LAC is dispersed. This prevents any systematic monitoring of quality and quantity or effective use of regulatory and economic instruments that require this information (Awe et al. 2015). Some studies identify the absence of environmental information as one of the factors that leads to the overexploitation of resources, particularly fisheries and forest resources, and biodiversity in general (Swan and Gréboval 2004, Arroyo et al. 2010, Miloslavich et al. 2011, FAO 2012, UN-ECLAC 2012); and also to shortcomings in land use planning (Chomitz et al. 2006). Furthermore, the Organization for Economic Cooperation and Development (OECD 2006) reports that investment in monitoring networks and information systems has been essential to strengthening environmental management in developing countries.

The credibility and success of a national environmental management system require effective implementation of monitoring and enforcement mechanisms.

Effective monitoring and enforcement mechanisms

The credibility and success of a national environmental management system require effective implementation of monitoring and enforcement mechanisms. The empirical evidence shows that countries that have good environmental performance also exercise their ability to monitor and penalize violations proportionate to the environmental damage (INECE 2009, OECD 2009). For example, a study by Shimshack and Ward (2008) indicates that the imposition of fines is not only an effective means of reducing violations by the sanctioned companies, it can also indirectly improve environmental performance of firms that have not been fined. The study also shows that the use of random inspections has positive results in terms of environmental conduct and concludes that an optimal inspection and sanctions system markedly improves the environmental performance of companies at low cost. Similar conclusions are reached by Escobar and Chávez (2013), Dasgupta and Wheeler (1998), and Dasgupta et al. (2000), who point out that inspected facilities exhibit better environmental standards than non-inspected facilities.

Countries are increasingly adding environmental offenses to their criminal legislation in an effort to improve environmental compliance in serious cases. In the United States, this has become common practice, but some question the excessive cost of legal proceedings. In light of this, it is important to balance policies that require a certain degree of command and control with economic instruments and appropriate incentives (Almer and Goeschl 2010, Oposa Jr. 1998).

Why public consultations and social participation matter

The requirement that all stakeholders and affected parties be well-informed and duly consulted is a proven good practice. In general, participatory processes in communities allow projects to be accepted and supported, which in turn leads to better execution outcomes (Seymour, Maurer and Quiroga 2005). Social involvement based on a suitable information system generally yields good environmental management results, as in the case of seeking citizen collaboration to reduce air emissions. One example is the policy applied in Santiago, Chile, where the population is provided with short-term forecasts of critical environmental pollution episodes. This practice has led to a 20% reduction in the concentration levels of particulate matter on the days when critical conditions occur (Mullins and Bharadwaj 2014).

Comanagement systems[5] for protected areas in Central America are also examples of active participation by the local population. These arrangements can be successful under certain conditions, especially if they have suitable institutional and economic backing, as in the case of the Maya Biosphere Reserve (Guatemala) or El Imposible National Park (El Salvador). However, studies by Blackman et al. (2014) and Bowler et al. (2011) indicate that comanagement has not been shown to offer clear advantages over other management models. In general, comanagement models are required to operate under an integrated governance and institutional coordination system with clear rules regarding financial and operational management (PROARCA et al. 1999, Constantino et al. 2012).

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5. In a comanagement system, two or more social actors (public and/or private) negotiate and mutually agree on a fair distribution of management functions, rights, and responsibilities in terms of the administration of a natural territory or resource.

This type of participatory model is frequently used in Spain in national parks and generally in protected areas of potential conflict, where advisory and accountability bodies are established under the names of *Patronatos* (Boards of Trustees) or *Juntas Rectoras* (Governing Boards) (EUROPARC-Spain 2010). In addition, various studies have confirmed the effectiveness of including the civil society in the processes of monitoring compliance with environmental requirements (INECE 2009). Examples include training and using volunteers to monitor forestry, hunting, and fishing activities in Estonia (Casey-Lefkowitz et al. 1996), or training and using volunteers from fishing communities to perform monitoring tasks in the Philippines (GTZ 2003).

The evidence also shows that women can perform an active role in environmental management due to the unique nature of their interaction with the environment and their access to the natural capital on which their communities depend. However, women are still largely absent from decision-making and political processes (Shanley et al. 2011, Matthews et al. 2012, FMAM 2013, Harper et al. 2013). Another illustration is the case of a fisheries management project in Senegal, which succeeded in consolidating a trained group of 200 women fish processors who require that fish harvesters abide by size regulations and fish closures, among other standards. In other words, fishermen must improve their fishing practices in order to be able to sell their catch (Coastal Resources Center 2014).

The evidence shows that women in LAC perform a critical role in the provision, management, and protection of the water supply as they ensure its availability and their families' well-being, in addition to caring for forests and managing the natural capital in their communities (UN-ECLAC 2012).

Mainstreaming, multisector approaches, and the participation of the private sector

Investment in infrastructure and productive development, while necessary for economic growth, can better serve and have a greater impact on society if the benefits and added value of the environment and natural capital are harnessed.

The notion of mainstreaming and the multisector approach associated with environmental sustainability are recognized and reflected in the strategic and operational vision of international cooperation and finance organizations such as the IDB, the World Bank, the Organization for Economic Cooperation and Development (OECD), the Asian Development Bank (ADB), and the Global Environmental Facility (GEF).

Seymour, Maurer and Quiroga (2005), Dalal-Clayton (2009), the European Commission (2009b), and Research and Resources for Sustainable Development (2008), among others, examine cases and propose guidelines for effectively integrating environmental sustainability and human capital within development goals and activities carried out in various productive and industrial sectors. This integration generally requires the use of strategic environmental assessments (SEA) at the earliest stages of investment and public policy planning. The concept of environmental mainstreaming acknowledges that: (i) the environment is not a sector and that sustainability goes beyond implementing safeguards, mitigating damage, and applying controls; and (ii) investments in infrastructure and productive development in various sectors have the potential to create and maximize environmental benefits, reduce costs, and prevent reputational risks if these investments are conceptualized, designed, and carried out with a strategic and multisector vision. The European Commission report concludes that the SEA has contributed to a systematic and structured consideration of environmental concerns in the planning processes and has imbued planning procedures with greater formality and structure. This has helped to bring about a more transparent, participatory, and effective decision-making process.

Various examples of infrastructure projects provide evidence of a successful integration of natural capital. By way of illustration, a modeling study of the Reventazón river basin in Costa Rica concluded that the strategic decision of the hydroelectric power company to finance and implement specific soil conservation practices at upstream basins reduced erosion by 97%, generating an annual cost savings of US$1 million for the company by eliminating the need to remove sediments (Bovarnick et al. 2010). In addition, through a partnership with the Smithsonian Institute, the Camisea project succeeded in using a pioneering approach to implement the project without building new roads in order to minimize the impact on biodiversity in the Peruvian Amazon (Mata 2012).

Creating a business climate for strong environmental performance

Corporate competitiveness is becoming increasingly tied to a business climate that rewards environmental performance. The private sector can play a vital role in investing and innovating to conserve the environment and natural capital.

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In a study based on a meta-analysis of 52 empirical studies published between 1972 and 1997, Orlitzky et al. (2003) conclude that, in most cases, companies that take responsible environmental steps obtain positive economic benefits. They further conclude with a reasonable degree of confidence that, for the companies under review, the relationship between social and environmental performance and economic performance is positive. In this regard, there are a growing number of studies that conclude that the relationship between companies and the environment and biodiversity can create opportunities to create value and make these companies more competitive (Porter and Linde 1995, Esty and Winston 2009).

Studies report a number of benefits from improved environmental management, including: lower operating costs from savings in water and energy uses (Berchicci and King 2007); improved corporate prestige and access to markets (TEEB 2012); and access to better financing terms (Hanson et al. 2008, TEEB 2010, Houdet et al. 2012). A growing number of companies are voluntarily integrating environmental management systems into their productive procedures and processes. These systems represent a commitment to continuous improvement of environmental performance and contribute multiple financial and economic benefits. Implementation of these systems and alignment with standards, such as ISO 14001, can open the door to new markets while reducing risks, potentially leading to lower costs associated with insurance and threatened litigation (Berchicci and King 2007, Ahmed 2012). There is also growing consumer concern and environmental awareness worldwide, which has created incentives and opportunities for innovative businesses that differentiate their investments and products based on their sustainability attributes (Mulder and Koellner 2011, TEEB 2012).

Nonetheless, there is also evidence pointing to the need for caution in regards to the potential effects of voluntary agreements on environmental management in the industrial sector. After examining 64 voluntary agreements in Colombia, Blackman et al. (2009) found that limited environmental results have been

achieved, particularly in terms of helping to improve the environmental management capacity of companies. These voluntary agreements are complementary instruments and under no circumstances replace the need for a comprehensive system for managing public policy.

In addition, there is growing recognition that businesses directly and indirectly depend on ecosystem services to produce the goods and services they provide to the economy. According to a recent report on TEEB[6] in Brazil (Conservation International 2014), the global market for certified or "green" products is growing. Organic farm products are increasing their market share and have grown at an annual rate of 20%, although they still account for less than 2% of the market. However, information on ecosystem services and technical or management expertise remains limited. A failure to recognize the effects of businesses on biodiversity and ecosystem services could result in missed opportunities for obtaining a steady flow of income (TEEB 2010).

Throughout the world, companies are beginning to pay attention and understand that the loss of biodiversity is not simply an ecological concern. The challenge consists of integrating the value of biodiversity and ecosystem services into business models so that these hidden values can be taken into account. For example, biodiversity can have significant economic potential for biogenetic studies and the manufacture of medicinal products, helping to

▼ Cacao beans drying by the roadside, Andes, Ecuador

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attract large investments in biotechnology research and development. This is the case with herbal medicines, which now have a global market estimated at more than US$60 billion (UN-ECLAC 2012).

The creation of the Equator Principles,[7] which have been voluntarily adopted by 65 of the largest private financial institutions in the world, including in LAC, also aims to strengthen the business community's commitment to the environment. In addition to voluntary mechanisms, several financial institutions in the region, including national development banks, have established mandates and procedures that promote financial risk management mechanisms associated with carbon footprint reduction and environmental sustainability (de Olloqui et al. 2013, Smallridge et al. 2013, Nolet et al. 2014). For example, the Central Bank of Brazil has integrated social and environmental risk management into its bank regulatory requirements, which indicates that the quality of the bank's environmental risk management systems will increasingly be taken into account when assessing risk exposure and financial portfolio quality. Initiatives promoting good environmental practices in capital markets have also been recognized at local securities exchanges in Chile, Brazil, Mexico, and Colombia (Sustainalytics and BVC 2014, BM&FBovespa 2015, Bolsa Comercio Santiago 2015, BMV Group 2015).

The environment, social inclusion, and empowerment

There is interdependence between many local communities, particularly indigenous communities, and ecosystems and biodiversity, which provide their source of livelihood and form the basis of their identity. These groups are key managers and administrators of ecosystems and the services they provide.

The empirical evidence for this assertion is documented in several specialized studies of international scope (Vedeld et al. 2004, Grafton et al. 2006, Stoll-Kleemann and Welp 2006, Lemenih and Bekele 2008, Boelee et al. 2011, Andrade and Rhodes 2012, Kothari et al. 2013, FAO 2014c). These studies show that inclusion and empowerment of resource users provides a variety of social benefits that reinforce their commitment to conservation and the success of their efforts. A study commissioned by 30 leading international

7. See www.equator-principles.com.

environmental and development organizations in communities that are dependent on natural resources confirms that communities have succeeded in increasing their income and improving their quality of life by linking their productive activities more closely to local and national markets (Pearce 2005).

In general, the likelihood of success for similar interventions increases when the following are considered: (i) inclusion of marginalized communities and groups from the start of the decision-making process (Reed 2008, Armstrong 2012); (ii) institutional strengthening (Bray and Velazquez 2009, McGrath et al. 2004); (iii) strong leadership and community cohesion (Berkes 2010, Gutiérrez et al. 2011, Armstrong 2012); (iv) proper dissemination of information and training of local stakeholders (Galvin and Haller 2008, Arévalo and Ros-Tonen 2009); (v) trust between the resource users and management authorities (Grafton et al. 2006, Chhatre et al. 2012); (vi) reduction of transaction costs that can limit community participation (Pagiola et al. 2007); and (vii) respect for the relevant social and cultural context, customs, and rights at all stages of the intervention (Stonich 2005, Larson et al. 2006).

The most marginalized populations in urban, coastal, and rural areas are also the most exposed and vulnerable to environmental degradation and natural disasters. Consequently, socially inclusive environmental management and local empowerment help to reduce these risks and vulnerabilities.

In many cases, disaster risk identification and reduction has relied on implementing environmental measures and good practices in specific territorial contexts (Benson et al. 2007). Environmental degradation intensifies disaster conditions when a natural phenomenon strikes, as in the cases of the earthquake in Haiti and Hurricane Mitch in Honduras. These disasters hit poor and vulnerable groups such as indigenous peoples particularly hard and negatively affected their food security, livelihoods, way of life, and sources of income (Dalberg Global Development Advisors 2010). Examining the effects of clear land use planning policies, institutional strengthening, and empowerment of local management capacities, a series of studies report cases of success in reducing vulnerability and risk through active community participation in the risk identification and reduction processes (Becker and Ghimire 2003, Arévalo and Ros-Tonen 2009, Radel 2012, Wever et al. 2012).

Two young girls form huaorani tribe in the amazon rainforest, Yasuni National Park, Ecuador

Conclusions

The environmental performance of Latin American and Caribbean countries is still below international best standards. The countries in the region will reach high performance levels once their environmental indicators reflect the sustained maintenance and functionality of terrestrial and marine ecosystems, and long-term sustainability of natural capital that provides goods and services to the economy. High performance also entails improved health conditions and quality of life of the people as a result of reduced environmental pollution.

The empirical evidence indicates that environmental performance is determined by the quality of institutions, governance structures, public policies, and the allocation of public money to protect natural capital. Therefore, it is imperative that countries strengthen and improve the performance of their environmental governance systems at the national and subnational levels, by employing efficiency and effectiveness criteria in the application of environmental norms and standards, and in strategic management, monitoring, financing, and law enforcement. Additionally, a large increase in public and private environmental investment is needed, specifically to reduce pressure on the environment and the ecosystems that generate the region's natural capital.

The available evidence and this assessment demonstrate that since the advent of environmental mainstreaming, the actions that have had the greatest impact on the use of natural capital and the quality of the environment are sector-specific, economic interventions; environmental mainstreaming is a necessary condition for sustainability. As such, it is imperative to promote the systematic incorporation of the economic value of environmental goods and services in infrastructure and productive sectors. This includes the opportunity for public and private investment in innovative sector initiatives that aim to reduce the carbon footprint, protect the environment, and conserve and place value to natural capital.

Finally, there is evidence that vulnerable urban and rural populations in LAC are the groups most affected by disasters and are most exposed to poor environmental conditions. Given this, it is necessary to implement land use and human settlement planning activities that enhance local environmental conditions and the safety of the population. Furthermore, it is important to take into account that the quality and availability of natural capital is a fundamental aspect of the way of life of traditional and indigenous communities. Therefore, providing for the conservation and management of natural capital is a priority, so that these communities can enhance their quality of life and income generation, according to their needs and cultural values.

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