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**Working Party on Climate, Investment and Development**

**Integrating Climate Resilience into Development Planning**

**Draft country case study - Colombia**

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*This draft report will be discussed as item 7 at the meeting of WPCID on 9 December 2013. It accompanies a case study of Ethiopia [ENV/EPOC/WPCID(2013)15]. These two case studies form the basis of the synthesis report [ENV/EPOC/WPCID(2013)17]*

*It contributes to PWB 2.3.2.3 - Development and Environment Linkages*

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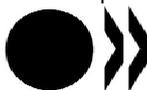
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## NOTE FROM THE SECRETARIAT

This case study is part of the OECD project on *Integrating Climate Resilience into Development Planning*. The project aims to provide an overview of the current state of knowledge on climate-resilient development, summarising emerging lessons and remaining gaps.

The study has been conducted in parallel to a case study on climate-resilient development in Ethiopia, and it has provided input to the synthesis report *Integrating Climate Resilience into Development Planning*. The work has been informed by expert interviews with Colombian government officials, academics, private sector representatives and civil society actors held between December 2012 and October 2013, as well as by consultations of experts from other developing countries, OECD member states, donor agencies, academia and the private sector. This includes a workshop held at the OECD headquarters in April 2013.

It is intended that this paper, along with the case study of Colombia and synthesis paper, will be published in Q1 2014.

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## EXECUTIVE SUMMARY

Most countries make choices about their development policies on the implicit assumption that their climate is static. But this risks that the chosen development pathway is unsustainable under future climate change. As a central element of the move towards green growth, “climate-resilient” development requires reducing the vulnerability of economic growth and livelihoods to future climate change. For this, it will be necessary to reassess development objectives and to integrate climate projections into development and other planning procedures.

This paper analyses Colombia’s experience in integrating climate projections into its development planning to date. It summarises lessons learned and suggests ways for Colombia to further improve its climate-resilient development trajectory, drawing on lessons learned from other countries and academic research. This paper also informed a broader study conducted by the OECD (forthcoming, a) on climate-resilient development, together with a case study on climate-resilient development in Ethiopia that was conducted in parallel (OECD, forthcoming, b). Thus this analysis is intended to inform the policy choices of countries that would like to follow a climate-resilient development trajectory.

Colombia started to integrate the effects of climate change into long-term policy planning after experiencing devastating floods in 2010-2011. The event prompted changes in the institutional structure to better address climate change, and led to the inclusion of climate change in the National Development Plan for 2010-2014, the main strategic policy document in Colombia. This foresees, inter alia, that the government formulates a National Adaptation Plan and integrates the effects of climate change into at least five sectoral strategies by the end of 2014. Work in the agricultural, energy, transport infrastructure, housing and health sectors is already underway.

Main lessons learned from the Colombian experience highlight the importance of four related processes:

- *Explicitly integrate climate resilience into development planning:* The integration of climate change into the National Development Plan 2010-2014 provided a legal basis for considering the effects of climate change in sectoral planning. The next national development plan could encourage their inclusion in other planning processes in the future.
- *Develop the evidence base:* Colombia has benefitted from strong domestic research institutions and support from development partners to improve the evidence base on the potential climate change impacts and benefits of adaptation options. On-going research explores links between economic and social development and climate change, thus building an important evidence base for climate-resilient development. This evidence base is proving instrumental for encouraging support from stakeholders who have not traditionally been engaged in climate change adaptation.
- *Create institutional systems that involve stakeholders relevant for development and climate change adaptation:* Colombia has shifted responsibility for co-ordinating adaptation policy-making at the national level from the Environment Ministry to the National Planning Department, a body that is also responsible for co-ordinating the national development plans. It has also designed an institutional system that aims at engaging additional stakeholders that directly shape the development pathway, such as the Finance Ministry. Both measures will allow feeding lessons learned on climate change back into sectoral and national development planning and are likely to support commitment to climate resilience over the longer term.

- *Secure sufficient financing:* Colombia has benefitted from technical and financial support from development co-operation to build the evidence base and to enhance resilience building processes. Over the past year, several projects were made conditional on receiving development co-operation support. This indicates that appropriate financing mechanisms from domestic and international sources will remain paramount in the future.
- *Involving international development co-operation partners:* Development co-operation agencies have played an important role in supporting research and planning for climate-resilient development. This support has been important to build capacities within the Colombian government, and to demonstrate the feasibility of climate-resilient development through pilot projects. It will be important that development co-operation projects remain closely integrated with a nationally owned agenda for climate-resilient development.

A review of national and sectoral planning processes finds that Colombia is addressing climate change within almost all fast-growing sectors that are prioritised in the National Development Plan 2010-2014. The analysis shows that climate resilience can sometimes compete with other policy priorities in terms of visibility, resource allocation, and ultimately the policy decisions that are taken forward. Such trade-offs have not been explicitly addressed yet in Colombia. Other remaining gaps mainly relate to the potential implications of economic growth on climate resilience, for example in relation to environmental degradation or the resilience of poor populations.

An examination of climate resilience and disaster risk management policies in Colombia highlights the positive effect of building resilience against current climate variability for coping with future climate change. After the floods in 2010-2011, the government strengthened the integration of disaster risk management into land-use and development planning. Also, the government is undertaking efforts to protect the fiscal stability of the state in case of a major disaster. Many disaster risk management activities are likely to build climate resilience, but some may need to be adapted to maintain their protective function despite climate change. There has been a good level of co-ordination and dialogue between disaster risk management and climate change adaptation officials at the national level, but a better integration will be necessary as concrete policies are designed and projects developed and implemented.

This study identifies land-use planning as an important instrument to jointly address climate change, development and resilience. An analysis of current practices indicates that an increased consideration of climate change in land-use and water management might be warranted. Currently, there is no legal obligation to integrate climate projections into existing planning instruments. At sub-national level, several initiatives are piloting such integration, mainly with support of development partners. This will inform whether it is feasible to introduce specific legislation to build climate resilience through land-use management. Any legal obligations will require addressing low levels of administrative capacity in many sub-national administrations.

In the coming years, it will be important that Colombia finds mechanisms that sustain its commitment to climate-resilient development, particularly as it moves towards implementing more measures that are conducive to climate-resilient development. An effective strategy to leverage and allocate domestic and international financial resources will be necessary in this context. Legal requirements to take climate change into account might be warranted in some areas, but the capacity of the private sector and national and sub-national authorities will need to be taken into account when designing such requirements. A remaining gap is the effective engagement of the private sector, even though the government has taken the first steps in this direction. Development partners can assist the Colombian government on its pathway to climate-resilient development, but they need to ensure that they prioritise capacity building and the continued fostering of ownership within the government.

## LIST OF ACRONYMS

Cat DDO	Catastrophe Deferred Drawdown Option – <i>World Bank contingent credit line for disaster response</i>
CDKN	Climate and Development Knowledge Network
ENSO	El Niño Southern Oscillation Phenomenon
FASECOLDA	Federación de Aseguradores Colombianos (Federation of Colombian Insurers)
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IDEAM	Instituto de Hidrología, Meteorología y Estudios Ambientales (Institute of Hydrology, Meteorology and Environmental Studies)
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
POMCA	Plan de Ordenación y Manejo de Cuencas (Watershed Land-use and Management Plan)
POMIUAC	Plan de Ordenación y Manejo Integrado de las Unidades Ambientales Costeras (Coastal Environmental Units Land-use and Integrated Management Plan)
POT	Plan de Ordenamiento Territorial (Territorial Land-use Plan)
SISCLIMA	Sistema Nacional de Cambio Climático (National Climate Change System)
UNFCCC	United Nations Framework Convention on Climate Change
UPME	Unidad de Planeación Minero-Energética (Institution responsible for Mining and Energy Planning)
USD	United States Dollar

## 1. Introduction

1. Climate change creates a new context for policy-making in developing countries. The economic costs of climate change can put their economic growth prospects at risk and endanger the achievement of their development objectives. At the same time, development can inadvertently increase their vulnerability to climate change. Building “climate resilience” into development policies can help to reduce the costs of climate change and sustain economic growth and social wellbeing in the long term. Climate-resilient development does not only aim at climate-proofing existing development objectives, but evaluates development priorities and measures in the context of future climate change, potentially changing policy objectives and priorities.

2. The cross-sectoral nature of climate impacts calls for a co-ordinated approach by the public sector, civil society and development partners across levels of governance. Climate-resilient development goes beyond individual programmes and projects and considers systemic aspects and linkages between economic development, climate change and resilience. A need for such an approach has been acknowledged in international discussions that have recently shifted from project- and programme-based approaches for adaptation to promoting national, strategic responses to the effects of climate change. This includes the call for Least Developed Countries to develop National Adaptation Plans in the framework of the United Nations Framework Convention on Climate Change (UNFCCC). Practical experience with designing and implementing climate-resilient development is, however, still limited.

3. This paper examines Colombia’s experience in moving towards climate-resilient development. After severe flooding in 2010-2011, the government started to integrate climate change adaptation into institutions, policies and planning processes to further economic and social development. This included the integration of climate change adaptation into Colombia’s National Development Plan 2010-2014. Most of the economic activities that the government has prioritised as key sectors for economic growth, including energy, transport infrastructure and agriculture, will be affected by climate change. The current policy processes therefore provide a timely opportunity for Colombia to make its development more resilient to the effects of climate change. While planning and policies for climate-resilient development are at an early stage in Colombia, this case study outlines a number of lessons learned that may be useful for other countries that wish to review their current policy or institutional approach to climate resilience. It can also serve as a reference for development partners who aim to assist developing countries in making their development climate-resilient.

4. The paper is structured as follows. Section 2 provides an overview of the links between climate, resilience and development, exploring the particular context of Colombia. Section 3 analyses key enabling factors and activities that pave the road for climate-resilient development. This includes sub-sections on the current policy framework, institutional design, the evidence base, financing, and on the role of development partners. Section 4 looks at specific policy areas for building resilience into development processes. Sub-sections analyse climate resilience in relation to the key growth sectors identified in the National Development Plan 2010-2014, and with respect to disaster risk management, and land-use and water management, highlighting the importance of these areas for Colombia and outlining actions Colombia has taken to improve its climate resilience. Sections 3 and 4 provide overviews of lessons learned from the analysis at the end each section or sub-section. Section 5 concludes with an outlook of priorities in the coming years.

**Box 1. Definition of key terms**

This report uses **climate resilience** to refer to the capacity of a social, economic or ecological system to cope with losses or disturbances caused by climate change. While **resilience** refers more generally to the capacity to cope with any hazardous event or disturbance (UNISDR, 2013), climate resilience highlights the need to consider future climate change as it poses new risks and may require changes to traditional risk management. Therefore, resilience is not only the outcome of deliberate adaptation activities, but also of other, often unrelated, policies and socio-economic trends. **Climate-resilient development** describes a sustainable improvement in economic growth, poverty reduction and other development objectives both under current and projected future climate conditions. Climate-resilient development thus implies a continuous and integrated process of climate change adaptation and other policies (Sperling et al., 2008).

**Adaptation** is defined as “the process of adjustment to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities” (IPCC, 2012: 556). Thus, adaptation is understood as a process or specific activity, while climate resilience describes the outcome of adaptation and other, often unrelated, activities.

**Vulnerability** is defined in this paper as the “propensity or predisposition to be adversely affected” (IPCC, 2012). Vulnerability describes the opposite of “resilience”. Climate vulnerability can be understood in terms of exposure, sensitivity, and adaptive capacity.

In line with the IPCC (2012), this report defines **climate extremes** as either an extreme weather or extreme climate event, i.e. an event that is rare at a particular place and time of the year.

### Box 2. Colombia – Country context

Colombia is an *upper middle income country* with an average annual growth rate of 4.3% between 2000 and 2012 (DANE, 2013a). Since an economic depression in the late 1990s, Colombia's average growth rates have exceeded those of the OECD member states (World Bank, 2013). In 2011, Colombia's 47 million inhabitants had reached a GDP per capita of USD 7 104 (USD 10 033 in purchasing power parity). Growth has mainly been stimulated by three factors: significant policy reforms since the early 1990s, improvements in the security situation linked to a decade-long internal armed conflict, and increasing mining activities in times of high commodity prices (OECD, 2013b; IMF, 2013). Accession discussions between Colombia and the OECD started in 2013.

Since the early 2000s, economic growth has helped to bring *poverty* back to levels in the early 1990s before the economic depression. Despite this progress, in 2011, 7% of Colombians lived on less than USD 1.25 a day in purchasing power parity, and 34% of the population lived below the national poverty line (World Bank, 2013). *Inequality* is among the highest in the world both in terms of income and land property distribution, with Gini coefficients of 0.56 for income and 0.9 for land tenure (UNDP, 2011; OECD, 2013b). A long-standing *internal armed conflict* has marked Colombia, particularly in its rural areas. Although the overall security situation has improved, parts of the country are still controlled by rebel or paramilitary groups. Between 1999 and 2011, the conflict displaced around 3.9 million people, equivalent to more than 8% of Colombia's total population (OECD, 2013b). Nearly all of them live below the national poverty line; 74% in extreme poverty (Ibáñez and Moya, 2009; Garay, 2008).

The short and medium-term *outlook for economic growth* is positive (OECD, 2013b; IMF, 2013). The economy has a relatively high degree of *diversification*. In 2011, the services sector contributed almost 60% to GDP, the manufacturing sector generated 13%, and the construction and agricultural sectors each constituted 6% of GDP. The *commodity sector* has grown rapidly in recent years, contributing 8% to Colombia's GDP in 2011. It attracted Foreign Direct Investment (FDI) equivalent to 1.6% of Colombia's GDP, corresponding to 40% of total FDI (IMF, 2013). The Colombian peso has gained value due to the commodity boom, putting other exporting sectors at a competitive disadvantage in international trade. To sustain future growth, economic reviews of Colombia have recommended measures to better manage the commodity boom, reduce income inequality, enhance economic productivity, and further consolidate fiscal stability and financial deepening (OECD, 2013b; IMF, 2013).

The *political system* is a unitary presidential democracy. Presidents are directly elected by popular vote and can serve up to two four-year terms. At the regional level, Colombia's 32 departments and the Capital District of Bogotá have some degree of autonomy. Executive power at that level is exercised by department governors, and by mayors and local administrators for municipalities and smaller settlements. Environmental policies at the sub-national level are refined and implemented by 33 Autonomous Regional Corporations whose administrative borders partially correspond to watersheds, and partially to those of the departments. Legislative power is vested in a bicameral Congress with a nationally elected Senate and a Chamber of Representatives elected by region and minority groups. Department assemblies and municipal councils hold the legislative power at sub-national level.

Colombia's *climate* is characterised by its mountainous topography and geographic location close to the equator. Temperatures differ depending on elevation, but are stable throughout the year. The hot zone under 900 m accounts for about 86% of the land area. The majority of the population lives in the temperate zone (900 m – 1 980 m) that is most suitable for agriculture. The cold zone (1 980 m – 3 500 m) constitutes 6% of Colombia's mainland and sustains a quarter of its population, including the capital Bogotá. Beyond that lie the cloud forest zone and the treeless "páramos". The permanent snow line starts at around 4 500 m. Precipitation varies by year, season, and geographical location. The position of the Inter-tropical Convergence Zone causes one to two rainy seasons each year, depending on the region. Inter-annual variation is driven by the two phases of the El Niño-Southern Oscillation (ENSO) climate pattern: El Niño causes low levels of precipitation and higher temperatures, sometimes leading to droughts. La Niña, on the other hand, brings high levels of rainfall and colder temperatures, and can cause flooding and landslides.

Temperature and precipitation jointly define Colombia's *natural regions*: The Pacific coastal region and the Amazon rainforest region have a wet climate all year around. Large parts of the land are covered by rainforest. The Llanos plains east of the Andes are savannahs known for the intensity of their rainy season that inundates large parts of the land. The Caribbean coastal region and the Andean mountain range have drier climates and dry broadleaf forest. Colombia has very high rates of biodiversity and natural resource endowments. More than half of its territory is covered with forest, and freshwater resources by far exceed the averages of OECD and Latin American countries (OECD, forthcoming, c).

## 2. Links between climate, resilience and development

5. There is a strong link between socio-economic development and resilience to the negative effects of climate change. This section first presents the rationale for taking a climate resilience approach to development planning and policies. It then considers the links between climate resilience and development in Colombia, outlining how climate change could affect economic development, and how development could alter the country's resilience to the effects of climate change.

### 2.1 Understanding the links

6. Climate extremes can reduce economic growth (McDermott et al., 2013; UNISDR, 2013). This slowdown, which can affect a country for several years, is in marked contrast with developed countries, where disasters have the potential to act as an economic stimulus (Cavallo and Noy, 2010; Loayza et al., 2009). Developing countries also bear the heaviest human burden. Between 1970 and 2008, 95% of deaths due to natural disasters occurred in developing countries (IPCC, 2012). This vulnerability is due to a combination of factors, including a lack of coping capacity, low levels of disaster preparedness and high dependence on the agricultural sector for development and livelihoods.

7. Development itself is one of the most effective means to increase the capacity to cope with disasters. Higher disposable income, better education and healthcare, and improved transport infrastructure are some of the characteristics of development progress that also strengthen resilience. But this is not automatic. Development choices can lead to a concentration of economic activities and assets along rivers and coastlines; places which are vulnerable to flooding, storm surges and sea-level rise. There is also evidence that certain characteristics of middle-income countries, such as a high reliance on physical infrastructure for GDP creation and a high interconnectedness between economic sectors, can increase their vulnerability to climate extremes (Benson and Clay, 2004; Ghesquiere and Mahul, 2010; Okuyama, 2009; Cummins and Mahul, 2009).

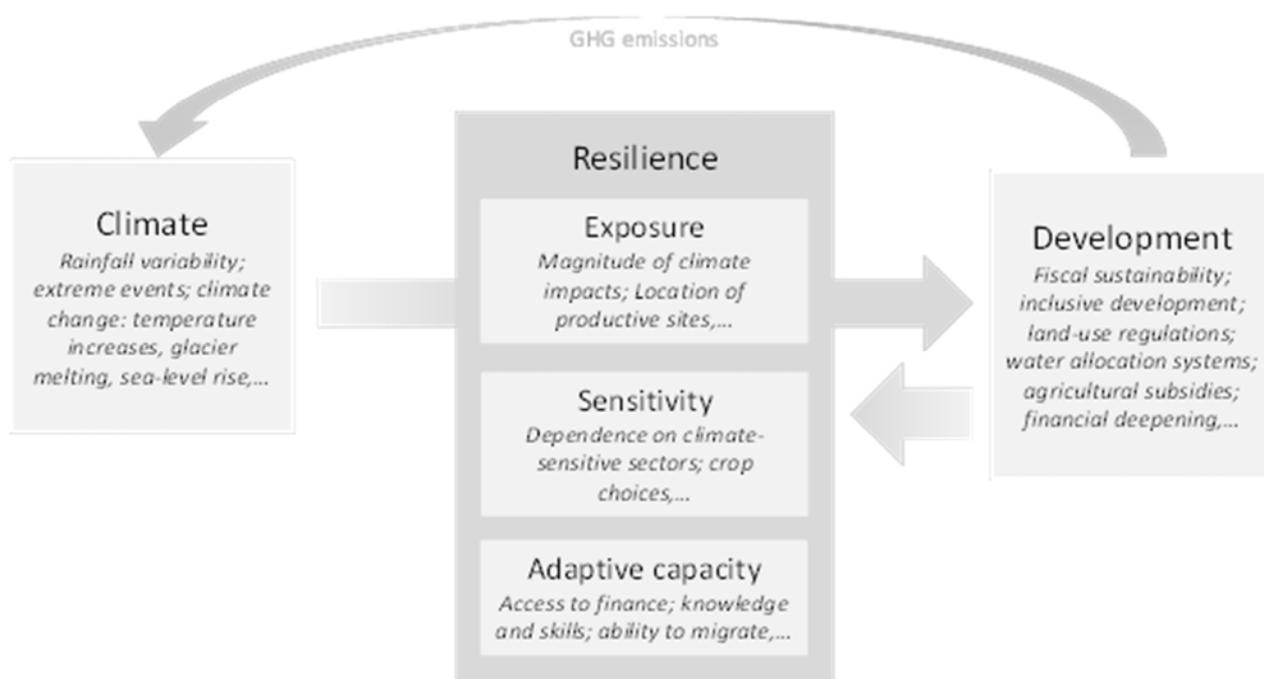
8. Climate change adds a new dimension to this relationship between development and resilience. Development as usual – and even development that strengthens resilience against current variability – might not be sufficient to prepare for future climate challenges. For example, gradual temperature increase and shifts in precipitation can reduce labour productivity and give rise to additional costs for climate-proofing infrastructure and productive activities. This can even lead to shifts in countries' comparative advantages. Disaster risk is likely to increase, as certain phenomena such as temperature extremes, heavy precipitation and extreme coastal high water levels become more frequent (IPCC, 2012). The parallel developments of economic and population growth and climate change can have significant consequences. For example, climate change and urbanisation are expected to triple the population exposed to coastal flooding in the 136 biggest port cities in the world by 2070 (Hallegatte et al., 2013). Most of these coastal cities will be located in today's developing world, mostly in Asia.

9. The links between climate, resilience and development interact through three broad channels: exposure, sensitivity and adaptive capacity (IPCC, 2007). These channels can be used to understand how development patterns can exacerbate or prevent negative effects of climate variability and change (see figure 1):

- *Exposure* depends on physical patterns, such as the magnitude, character and rate of climate change, and geographical patterns such as the location of human settlements and economic activity. Development planning can directly influence exposure through land-use planning, or decisions about where to locate infrastructure. Development planning will also affect exposure indirectly, for example through its influence on rates of rural-urban migration.

- *Sensitivity* is the degree to which people or the economy as a whole is affected by climate variability or change. Development planning can affect this through the prioritization of certain economic sectors, such as agriculture, or certain resources, such as climate-sensitive crops.
- *Adaptive capacity* is the ability or potential to respond successfully to climate variability and change. Development planning can affect this through its influence on underlying factors that contribute to adaptive capacity, such as income, health and education, and through investments in capacities that are specifically aimed at supporting climate resilience.

**Figure 1. Links between climate, resilience and development**



Source: (OECD, forthcoming, a)

## 2.2 Understanding the links in Colombia

10. The cost of climate change could be significant in Colombia. An aggregation of cost estimates from different studies indicates that climate change is likely to reach a cost of at least 1.9% of GDP per year in 2050 if no adaptation measures are taken (ECLAC, 2013a). This partial estimate only provides a subset of the potential costs, as major sectors and regions are not included. But Colombia has the opportunity to choose development patterns and adaptation activities that increase resilience and lower the costs of climate change. Following, the links between climate, resilience and development are analysed according to Colombia's exposure, sensitivity and adaptive capacity. Box 3 shows a mapping of vulnerability in Colombia, according to data about its exposure, sensitivity and adaptive capacity.

### *Exposure and sensitivity*

11. Colombia's geography and topography make it highly exposed to climate hazards. In the past, the economic losses caused by flooding have exceeded those of earthquakes, the second most expensive

natural hazard, by almost four times (Ministerio de Hacienda y Crédito Público, 2012). The last major flood, an event linked to the La Niña phase of the ENSO, lasted from October 2010 to April 2011 and affected more than 3 million people, or 7% of the population (ECLAC, 2012). Losses and damages amounted to about 2% of Colombia's GDP in 2010. Some provinces experienced damages of up to 15% of their annual GDP (ECLAC, 2012).

12. Climate change will expose Colombia to new risks. Average temperatures are projected to increase by around 2.4°C by 2070 and 3.2°C by 2100 (IDEAM, 2010). Annual precipitation is likely to shift further from the already drier Caribbean and the Andean regions towards the Pacific coast and Amazon regions. As a result, the Caribbean region may change from its current semi-humid to a semi-arid climate; and even become arid by the end of the 21st century. As temperature increases are likely to be more marked in the Andean region, a transition from a semi-humid to a semi-arid climate is expected for some areas. This might reduce the Andean ecosystem páramos that are important for freshwater storage and filtering, by 60%-70%. The Andean forest cover could be reduced by 40% by 2050, and Colombia's glaciers could disappear by 2040 (DNP et al., 2012). In addition to this, coastal zones will be exposed to gradual sea-level rise. Sea levels are projected to increase by 40-60cm by 2060 (IDEAM, 2001). The impact of climate change on year-to-year variability of precipitation is still uncertain, but disasters related to rainfall variability are projected to become more frequent due to climate change (IDEAM, 2010).

13. Climate risks and economic development coincide spatially to a large degree, thus jointly increasing exposure. Colombia's main economic centres are located in the Andean and coastal regions, often close to rivers and the coast. These areas are also particularly exposed to flooding, landslides, projected temperature increases and sea-level rise (DNP, 2012). Economic development has been identified as an important driver of disaster risk in the context of flooding. Drivers of exposure include the construction of houses, infrastructure and productive sites in vulnerable areas. Also, land-use change related to urban development and agriculture has reduced resilience by diminishing forest cover, diverting the course of rivers and damaging wetlands and other natural flood protection areas (SNPAD, 2010; ECLAC, 2012).

14. Exposure is also increasing due to the joint pressure of economic activities and climate change on ecosystems and natural resources. A significant share of economic activities in Colombia is carried out in vulnerable areas. For example, 85% of productive systems in the agricultural sector are located in areas that are vulnerable to desertification. In a context of potential water scarcity in the Caribbean and Andean regions, this could have important implications for climate resilience. The opening up of the agricultural frontier, mainly driven by an extension of inefficient livestock farming into formerly forested areas, has also affected ecosystems such as forests, wetlands and the Andean páramos. It is estimated that 24% of the Colombian páramos (4 640 km<sup>2</sup>) have already been transformed through agriculture, cattle raising and mining activities (OECD, forthcoming, c). This also reduces the adaptive capacity of ecosystems (Rodríguez Becerra et al., 2012).

15. Colombia's sensitivity to climate change will be influenced by its dependence on climate-sensitive activities for economic development, including the sectoral composition of its economy. Agriculture and fisheries are expected to be the most affected sectors (ECLAC, 2013a). Although Colombia generated only 6% of its GDP in the agricultural sector in 2011, agriculture is important for the economy and rural livelihoods in particular. Preliminary estimates suggest that climate impacts on the agricultural sector alone might lower overall GDP in 2050 by 2.5% compared to a baseline scenario without climate change (DNP, forthcoming).

16. Colombia's transport and energy infrastructure are vulnerable to climate change. Because transport networks are insufficient given Colombia's level of economic development, Colombia relies more heavily on the viability of existing transport routes (OECD, 2013b). Hydropower represents over

70% of the country's electricity generation capacity (IEA, 2012). Future climate change is likely to affect hydropower generation capacity by reducing water storage volumes (Ospina Noreña et al., 2011). Preliminary estimates foresee that resulting price increases might cost Colombia 0.7% of its GDP in 2050, assuming stable demand and infrastructure stock (ECLAC, 2013a).

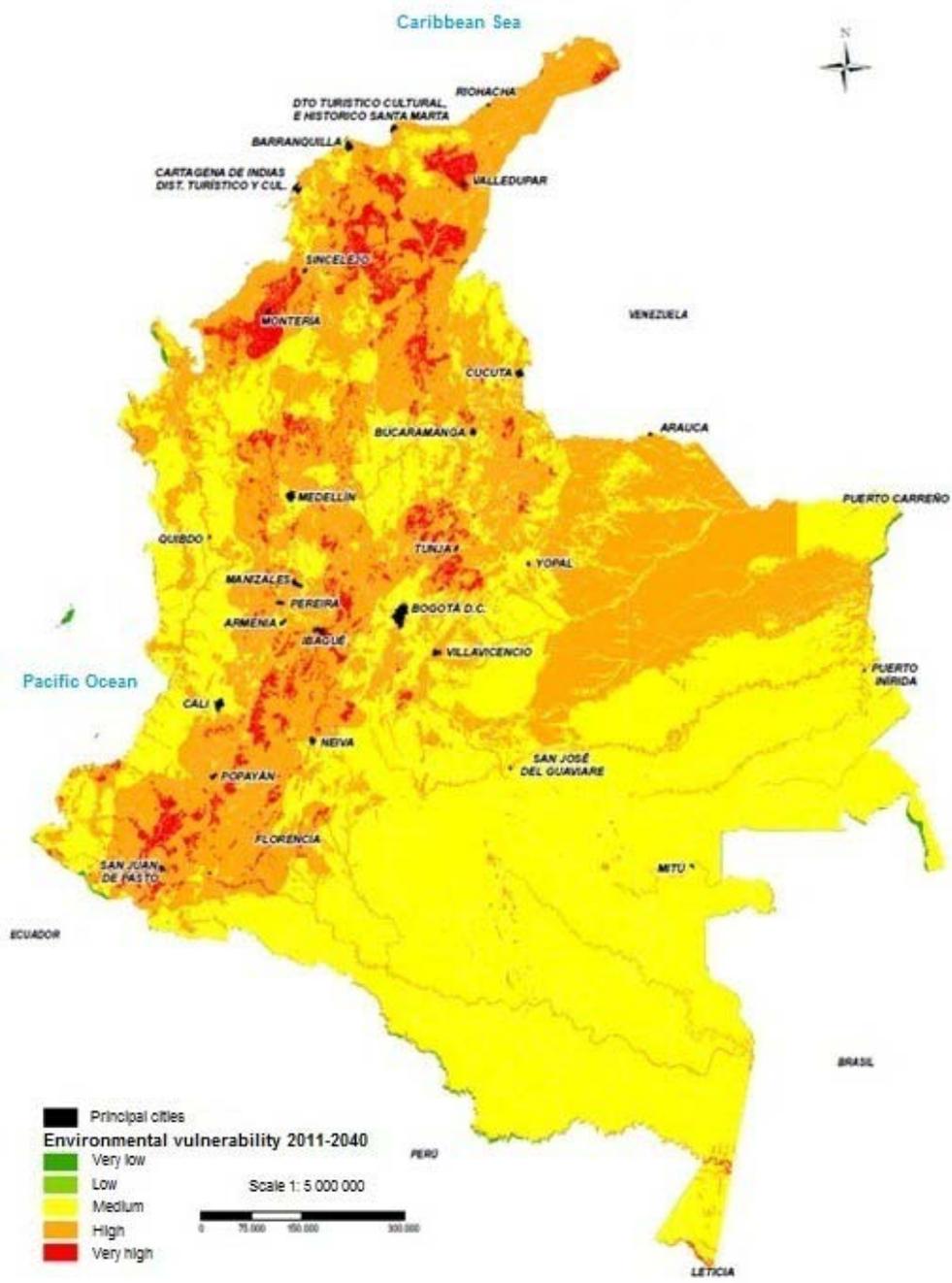
#### *Adaptive capacity*

17. The societal and economic capacity to adapt is determined by factors such as a society's ability to learn, reorganise, and mobilise social capital, and the economy's inherent flexibility to adjust. Determinants of adaptive capacity are closely linked to inclusive economic development, such as improved access to resources, poverty reduction, good education and infrastructure, and high levels of institutional capacity (IPCC, 2001). In Colombia, high income inequality and prevailing poverty present a challenge for building adaptive capacity, particularly in rural areas. As a general measure against income inequality, the OECD (2013b) has recommended increasing the effectiveness of the tax and transfer system. Themed "Prosperity for All", Colombia's National Development Plan 2010-2014 aims for inclusive economic development, social inclusion, and the convergence of regions with different resource levels (Government of Colombia, 2011). The government has also identified targeted adaptation measures for poor populations as a priority activity in the future (DNP et al., 2012).

18. Climate change in Colombia is expected to affect poor populations the most, potentially increasing the risk of extreme poverty (DNP et al., 2012). Impacts are expected to include reduced access to freshwater, negative impacts on health, and a reduction in agricultural productivity that will directly affect the rural poor and have repercussions on the urban poor due to increased food prices. Poor people will also be more exposed to climate change, as a disproportionately high number of them live in zones at risk from climate extremes. Lower levels of income, skills, and access to markets in poorer regions are illustrative of the lack of adaptive capacity of many poor households. The OECD (2013b) has suggested three main actions to boost productivity: promoting access to financial markets through better regulation and enhanced competition, encouraging private sector investment, and constructing more and better infrastructure. There is an opportunity for these measures to also improve the private sector's resilience to climate change, as long as incentives for investment do not encourage harmful activities and support is directed to important growth sectors and vulnerable populations alike.

**Box 3. Climate change vulnerability in 2011-2040 in Colombia**

Colombia’s Second National Communication to the UNFCCC mapped the country’s vulnerability to climate change based on data about exposure, sensitivity and adaptive capacity. The vulnerability map combines maps of potential impacts (based on precipitation variation, an index of environmental sensitivity and an index of relative affection by climate change) and data on the capacity of municipalities based on socio-economic information. The vulnerability mapping for 2011-2040 illustrates medium to very high levels of vulnerability in most of Colombia.



Source: Second National Communication to the UNFCCC (IDEAM, 2010), translated to English by the authors.

### 3. Enabling climate-resilient development

19. The Colombian government aims to mainstream climate change adaptation into national, sectoral and sub-national policies, programmes and projects. This section reviews the steps that the government has taken so far, as well as remaining challenges. The first sub-section gives an overview of adaptation planning. The following sub-sections analyse the institutional framework for climate resilience; work undertaken to increase the evidence base on the links between climate, development and resilience; efforts to secure sufficient financing for adaptation activities; and the role of development partners. The section concludes by highlighting lessons learned and possible next steps.

#### 3.1 *The policy framework for climate resilience in Colombia*

20. Colombia's decision to develop a national adaptation policy was triggered by severe flooding in 2010-2011. The events occurred shortly after the election of a new government and thus coincided with the formulation of the governmental programme for the following four years, the National Development Plan 2010-2014. Influenced by the experience of the floods, the plan explicitly recognises that climate change may constitute an obstacle to economic and social development, and that the patterns of Colombia's economic development will determine its vulnerability to the effects of climate change (Government of Colombia, 2011). Coping with climate change was introduced as one of the development plan's four key objectives, alongside consolidating peace, eliminating poverty and reducing the unemployment rate. This is particularly important because objectives and indicators included in national development plans are legally binding in Colombia. Climate change adaptation thus became subject to monitoring by the Office of the General Comptroller, which has the power to undertake a disciplinary investigation if objectives are not met.

21. The incorporation of adaptation in the National Development Plan 2010-2014 marked a significant shift in adaptation policy. Before this, adaptation had largely been confined to the environmental sector and was predominantly financed by development partners. Mitigation constituted the main focus of domestic climate policy. Adaptation activities aimed primarily at improving the evidence on the effects of climate change and at learning through pilot projects. Since 2010, Colombia has taken strong ownership of adaptation issues, and is extending the scope of adaptation interventions beyond the environmental sector.

22. The National Development Plan mandates that a National Adaptation Plan be developed, and that five sectors integrate the effects of climate change and adaptive measures into their planning documents by the end of 2014 (Government of Colombia, 2011). To implement this, the government designed an institutional system to facilitate the process of integrating climate change across sectors and levels of government (section 3.2). Simultaneously, research initiatives aim to inform sectoral and national adaptation plans (section 3.3). The National Adaptation Plan, which is currently under development, is intended to provide a policy framework for action, but will not give a detailed blueprint for implementation. As a first contribution to encouraging coherence in adaptation planning, the government has published a guidance document detailing the conceptual bases for adaptation (DNP et al., 2012).

23. Colombia's adaptation policy is intended to be sustainable over time, but there is no mechanism to guarantee that adaptation will continue to be considered in development policies and plans beyond 2014. The forthcoming National Adaptation Plan (planned for the end of 2014) is likely to encourage continuity, given that it receives sufficient institutional and legal strength to influence policy-making over time. For example, the plan is expected to give important inputs on priority policies and projects that could be included in the next national development plan. The National Adaptation Plan is conceived as a continuous process that consists of four phases: i) development of a conceptual framework for adaptation (published in 2012), ii) formulation of sectoral and sub-national adaptation plans (on-going), iii) implementation,

monitoring and evaluation of adaptation policies and measures (on-going), and iv) monitoring, reporting, and verification of progress, lessons learned and remaining weaknesses to inform possible readjustments (to be developed). Further, the institutional setup might facilitate dialogue and increase awareness about the implication of climate change in different policy areas, and thus sustain commitment to climate-resilient development over time. A mechanism for monitoring and evaluating climate resilience and adaptation policies and projects could encourage long-term commitment and policy learning once it is set up. Discussions are still on-going, but the mechanism is intended to be integrated into the broader national systems that monitor public investments and progress of the national development plan.

### **3.2 *Getting the institutions right***

24. The Colombian government has designed an institutional framework to address climate change adaptation and mitigation, called National Climate Change System (SISCLIMA). This was preceded by a high-level ministerial decision to implement an institutional strategy for climate change in 2011 (Conpes, 2011). The decree to create SISCLIMA had not been sanctioned by the President at the time of writing, partly because a new Environment Minister took office in 2013. Thus, this analysis is based on the draft decree as of 12 August 2013 and other institutional aspects that had already been implemented (President of Colombia, forthcoming). If adopted, SISCLIMA has the potential to improve policy coherence and create adaptation expertise across government. To be successful, it will need to clarify the scope of the mandates of different institutions and facilitate better co-ordination between institutions.

25. A key feature of Colombia's institutional strategy that has already been implemented is a shift in the responsibility for co-ordinating the national adaptation policy from the Environment Ministry to the National Planning Department. With this, adaptation moved from being perceived as an environmental issue to being perceived as an issue that is more central to economic development. The National Planning Department also co-ordinates the formulation of the national development plans, as well as some other cross-sectoral planning processes. As the responsibilities for co-ordinating climate and development policies reside in the same institution, climate-resilient development becomes more feasible. The National Planning Department will also play a key role in the new SISCLIMA. According to the draft decree, it will chair the main political decision-making body of SISCLIMA, the Inter-ministerial Climate Change Commission (see figure 2). This is likely to further strengthen the perception of climate change as an issue relevant to development.

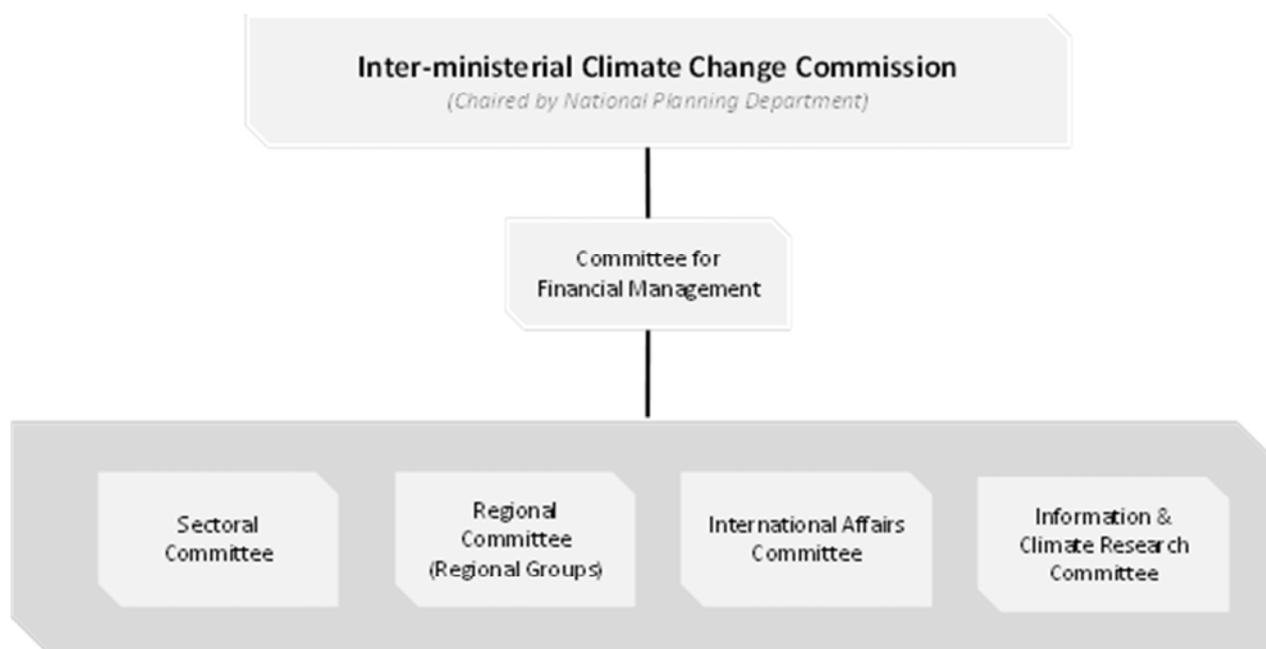
26. The National Planning Department has also formally taken the lead on developing the National Adaptation Plan. However, it co-ordinates closely with the Ministry for the Environment and Sustainable Development, the Institute for Hydrological, Meteorological and Environmental Studies (IDEAM), and the National Unit for Disaster Risk Management. This institutional arrangement aims to ensure technical expertise, and coherence with national planning processes. The Environment Ministry will also play an important role in SISCLIMA. It is foreseen as the technical secretariat to the main decision-making body, the Inter-ministerial Climate Change Commission. The IDEAM will be a member of the Commission, and also chair a dedicated committee for information and climate change research.

27. A primary objective of SISCLIMA is to engage institutions that have not traditionally worked on climate change adaptation. By encouraging dialogue and information exchange, SISCLIMA provides opportunities to develop a holistic view of the issues at stake, and to feed climate information back into development planning processes. Once operational, SISCLIMA's main decision-making body, the Inter-ministerial Climate Change Commission, will bring together fifteen ministries and entities involved in climate-relevant activities. This will include Finance, Health, Mining and Energy, Environment, Agriculture, and Housing, among others. Meetings of the Inter-ministerial Climate Change Commission will have to be attended by Ministers or Vice-Ministers to ensure high-level political engagement. The Commission will function according to simple majority vote, but it remains to be seen whether this rule

will be applied in practice or whether informally consensus will be the de facto decision-making rule. The Commission's functions include the establishment of compulsory guidelines for climate change policies, programmes and plans, evaluation and adjustment of policies when needed.

28. The SISCLIMA will include dedicated permanent Sectoral and Regional committees to foster co-operation among sectors and regions. A Committee for International Affairs aims at attracting and co-ordinating development partner engagement, and at promoting Colombia's role in the international climate negotiations. International engagement is expected to support domestic initiatives on climate resilience and encourage a sustained commitment beyond the next elections. A Committee for Information and Climate Research is intended to create a link between policy-makers and researchers, as well as build evidence on climate-resilient development and adaptation needs.

**Figure 2. The institutional design envisaged for SISCLIMA**



Source: Based on forthcoming draft Decree (President of Colombia, forthcoming) and National Planning Department presentation (DNP, 2012)

29. Colombia intends to mainstream adaptation activities into sectoral policies, programmes and projects and thus place it under the responsibility of the respective ministries. For this, the National Development Plan 2010-2014 has set the objective of achieving five sectoral adaptation strategies. The Sectoral Committee that is to be established under the SISCLIMA will aim to increase co-operation between sectoral activities on climate change adaptation. This will help to identify cross-sectoral proposals for adaptation activities, and to find coherent ways to implement them. In the current setup, moving from engaging sectoral actors to concrete planning and implementation remains a challenge. Political priorities on other sectoral policies can shift attention away from the need for climate-resilient development.

30. At the sub-national level, the Regional Committee will facilitate co-ordination through regional groups (*nodos regionales*) that co-ordinate adaptation activities in specific geographical areas. These regional groups are already operational and have engaged private sector actors in past meetings. Regional entities, including departments, regional environmental bodies (Autonomous Regional Corporations) and

municipalities have the option to develop adaptation plans. The National Development Plan 2010-2014 states that the Environment Ministry shall assist regional entities in developing these plans, should they require them.

31. However, progress at systematically integrating climate change adaptation into sub-national planning has been slow, mainly because of competing priorities and capacity constraints. The process of adaptation policy-making and planning thus has so far focused largely on the national level. A better integration with local-level processes including land-use plans, local economic development plans and watershed management policies, and a better articulation of priorities identified at the sub-national level may be necessary in the future to achieve climate-resilient development and address the needs of vulnerable populations.

32. At all levels of government, capacity constraints constitute a challenge to integrating climate resilience into development planning. High staff turnover in the public sector has led to a heavy reliance upon external contractors to do analytical work. Limited financial resources and a cap on the number of civil servants and consultants make it challenging to establish work on climate change adaptation even in vulnerable sectors. Ensuring sufficient capacity and building an institutional memory for climate change adaptation are therefore important areas for improvement. National government officials have started to train staff in local and regional entities to integrate climate resilience into their planning processes.

### **3.3 *Developing the evidence base***

33. The majority of work the Colombian government has undertaken to date has focused on understanding the links between climate change and development to help prioritise public policies for climate resilience. The government strongly relies on climate data and vulnerability analyses for their policy-making, and climate change research also aims at securing support from stakeholders who have not traditionally engaged in climate change adaptation. However, uncertainty is often characteristic for climate analysis, and policy-makers will need to improve their ability to make decisions under uncertainty.

34. The formulation of the National Adaptation Plan is informed by a major research project on the links between climate change, economic development and resilience. This study is co-ordinated by the National Planning Department in collaboration with other government institutions, and supported by several development partners. It aims at combining top-down modelling of climate change effects on the economic system with bottom-up approaches of detailed analysis of specific sectors or ecosystems. The objective is to include an analysis of adaptation measures and policies, together with a cost-benefit assessment of key adaptation measures. For this purpose, studies on the effects of climate change on the transport infrastructure, fisheries, forestry, and livestock sectors are currently being finalised. Research is also undertaken for particularly vulnerable ecosystems, species or activities, such as certain watersheds, species relevant for bio-commerce, or ecosystems that serve water regulation. A forthcoming report will estimate the economic costs of disasters in Colombia; its publication is expected in April 2014.

35. The study provides an opportunity to identify (and ultimately address) indirect economic impacts caused by the interaction between climate change and specific aspects of the economic and social system, such as the influence that limited access to credit for adaptation measures has on economic growth. Some preliminary estimates have already been published. These included an overview of estimates of the costs of climate change, effects on the health sector, and a methodology for modelling impacts in the agricultural sector (ECLAC, 2013a, 2013b, 2013c).

36. Climate information in Colombia has been collected for around 90 years, and regular measurements are available for the last 70 years. IDEAM is currently working on developing climate projections on the basis of three regional models with resolutions of 25km\*25km, 20km\*20km and

4km\*4km, the latter for the Andean region. The government further collects data on climate-related hazards and their impacts, and works on climate projections relevant for Colombia's coastal and marine ecosystems, including approximate estimations of future sea-level rise. IDEAM has issued regular reports on the state of the environment (1998, 2004 and 2010), and recent reports on the state of forests, water resources and air quality. The National Administrative Department of Statistics is responsible for collecting and analysing socio-economic information. It is also in charge of the National Environmental Accounts, which measures variations in the stock of natural assets. These are currently monitored for water, forests, energy and environmental protection expenditure.

37. Despite progress on downscaling climate models, challenges remain in generating information that can be used at the local level to perform hazard and vulnerability analyses. Information needed at local level, such as changes in the seasonal timing of precipitation, reliable estimates for inter-annual variability, or predictions of system or "state" level changes, are often not available (OECD, 2013c). Other challenges include improving the evidence base on the potential benefits of adaptation measures, increasing knowledge on how economic development might affect climate resilience, further analysing existing data and communicating results more effectively to make them directly relevant to policy-makers. A balance needs to be found between refining research models and results, and increasing the capacity to make decisions under uncertainty.

### **3.4 *Securing sufficient financing***

38. Colombia has currently mainstreamed adaptation expenses into its domestic budget. Government spending for adaptation takes place at different local, regional and national levels. Adaptation activities are to be covered through the regular budgets of each ministry, either as sectoral or cross-sectoral projects. Some ministries perceive that this creates a trade-off between adaptation and other investments. Significant investments were made after the floods in 2010-2011. This constituted an opportunity to better integrate climate resilience into infrastructure and housing designs, yet it has not been monitored whether reconstruction improves climate resilience. Colombia is currently developing a financing strategy for climate change adaptation and mitigation. This may lead to some adaptation finance being earmarked in the next national development plan. Currently, international co-operation continues to play an important role in financing adaptation research, planning and projects.

39. Monitoring public spending on climate resilience has proven challenging. Such spending takes place in many different parts of government and often constitutes an incremental financial contribution to larger projects, rather than a stand-alone adaptation measure. Colombia is going to take part in the Climate Finance Readiness Programme implemented by the United Nations Development Programme and the United Nations Environment Programme. This will include a Climate Public Expenditure Review that will analyse sources and destinations of climate-related financing in the government budget, as well as institutional systems to channel those. As one of the outcomes, the government expects to implement a system to monitor public climate investments.

40. To guide the strategic development of domestic and international sources of climate finance, the government has created a Committee for Financial Management as part of the institutional system SISCLIMA. According to the draft Decree, the Committee will be responsible for exploring financing options, developing a financing strategy and finding mechanisms to manage funds from different sources. The Committee will also facilitate discussions about appropriate mechanisms to mainstream climate change investments in the general national budget, and might provide opportunities to discuss trade-offs between climate resilience and other policy objectives.

41. The Committee is composed of the Ministries of Environment; External Relations; Finance; and Commerce, Industry and Tourism; the National Planning Department; the Presidential Agency for

International Co-operation; the Technical Secretaries of the Permanent Committees under SISCLIMA; three Colombian public financing institutions; and the national Adaptation Fund (an institution set up to finance reconstruction activities after the 2010-2011 floods). The Committee has already reached out to private financial institutions and businesses. The National Planning Department acts as a Technical Secretariat to the Committee, again providing a link to other planning processes. This broad stakeholder engagement is likely to contribute to a coherent financing strategy for climate change adaptation. The Committee is already operational and has met several times in 2013. Since its creation, it has defined priorities for the Climate Finance Readiness Programme and engaged in discussions with the financial sector, among others about capacity building needs to develop projects and design financial instruments for climate change projects. The Committee has also conducted a first review of available financing mechanisms at domestic and international level, and agreed to commission a study that shall identify barriers to access and effectively manage climate finance.

### **3.5 *The role of international co-operation***

42. Development co-operation has played an important role in establishing climate change adaptation as a long-term approach in Colombia. For example, an overview study on the economic impacts of climate change on Colombia is supported by several development co-operation agencies. This study provides important input that will help prioritising sectors and policies for adaptation activities. Several projects at national and local level have increased knowledge and lessons learned from linking adaptation and development. This included research and pilot initiatives on adapting to sea-level rise. A major project on integrating ecosystems and climate change adaptation, supported by the Global Environment Facility, served to develop climate change and vulnerability scenarios at national and sub-national levels. It also facilitated the introduction of climate change into national policy documents, including the National Development Plan 2010-2014.

43. More recently, the Climate and Development Knowledge Network (CDKN) has supported the coastal District of Cartagena de las Indias in mainstreaming climate change adaptation into their land-use and development planning. The United Nations Development Programme co-ordinates a project aimed at integrating climate resilience into development and land-use planning in the capital Bogotá and its surrounding regions. This serves, among others, to protect the high-mountain páramos ecosystems to secure freshwater supply to the capital region. Sectoral plans have also benefitted from development partner support. For example, the CDKN is helping the Transport Ministry develop its sectoral climate change adaptation plan. OECD tracking of Official Development Assistance (ODA) shows that in 2011, USD 0.76 m of ODA to Colombia was invested in projects that targeted adaptation as a principle objective, and USD 23.19 m in projects that had adaptation as one among other significant objectives (OECD, 2012). However, 80% of this finance came from contributions to projects with adaptation as a significant objective from one single development partner country.

44. Although the engagement of development co-operation agencies has proven essential to initiating the process of climate-resilient development, the Colombian government has strong ownership of the process. For example, the conceptual guidelines for adaptation, authored by government institutions, support the vision of integrating climate change across development planning (DNP et al., 2012). The Colombian government largely drives policy-making, but relies on technical and financial assistance from development co-operation agencies to support priority areas of its work. It is likely that subsequent stages, particularly the implementation of climate change adaptation measures, will require a more substantial commitment of domestic resources. The current mainstreaming approach is likely to support this, but the government will further need to develop sustainable financing mechanisms that channel domestic and external resources in alignment with the broader government agenda on climate-resilient development.

**Box 4. Moving towards climate-resilient development: Lessons learned**

- *Include climate resilience objectives in high-level planning documents:* Including climate resilience in high-level planning documents has maintained commitment to climate change adaptation over time, particularly when objectives are legally binding. Commitment beyond the short-term planning horizon of a national development plan may be fostered through long-term visions or legal requirements to consider climate change in sectoral proposals for the national development plan.
- *Create links between institutions responsible for climate change adaptation and development:* The engagement of the National Planning Department has been instrumental in promoting a climate resilience vision of development planning. It has also encouraged engagement across sectors by acting as an internal advocate for climate resilience. More private sector engagement is likely to be necessary in the future.
- *Create formal and informal co-ordination mechanisms:* The creation of co-ordination mechanisms has been paramount in adaptation planning in Colombia. Formal co-ordination mechanisms might be particularly important with ministries that have not traditionally engaged in adaptation activities or who have limited ownership of this topic. In this regard, Colombia could strengthen the status of environmental units within sectoral ministries, and their engagement in climate resilience policies.
- *Focus on structural vulnerabilities when climate information is uncertain:* Resilience is conditioned by climate change and socio-economic conditions. In many cases, strengthening the resilience of communities will require similar measures independent of the exact effects of climate change. Understanding such structural vulnerabilities can reduce decision paralysis caused by uncertainty.
- *Sub-national planning is likely to require support from regional or national level:* Sub-national climate resilience activities are at an early stage in Colombia, but it is likely that support will be required to develop the required capacity.
- *Analyse and keep track of spending:* Climate Public Expenditure Reviews can track investments in climate resilience, help assign resources more strategically, and set up mechanisms to monitor and evaluate the effectiveness of domestic and international climate finance.
- *Develop financing mechanisms that are sustainable in the long term:* Particularly for middle-income countries such as Colombia it is important that long-term financing strategies pay attention to leveraging both development finance and domestic resources. This needs to include a consideration of the private sector as an important source of finance for climate resilience.
- *Involve providers of development co-operation to support a country-led strategy:* Providers of development co-operation can play an important role in establishing a long-term vision for climate-resilient development. It is important that this process serves to build capacity within the partner government so that climate-resilient development is ultimately country-driven. An alignment of development partner assistance with the country strategy is paramount.

#### **4. Policy areas for building resilience**

45. This section looks at selected policy areas that are relevant to climate-resilient development. The first sub-section discusses the broader issue of what modifications to development and sectoral planning might be required to become resilient to climate change. The second sub-section focuses on the integration of climate change adaptation and disaster risk management policies and processes. Since Colombia's climate change adaptation policy has been promoted on the basis of a major flooding disaster in 2010-2011, the integration of the two areas is particularly important. The third section gives an overview of land-use and water management and suggests potential linkages to climate resilience. The end of each sub-section provides a summary of emerging lessons learned and recommendations.

#### 4.1 *Climate resilience and key growth sectors*

46. Development planning affects future vulnerability to climate change because it influences the exposure, sensitivity and adaptive capacity of people and ecosystems. Integrating climate resilience requires considering future climate change as one variable that determines the relative merits of different policy options. Thus, it can make these decisions about future vulnerability explicit. Sectoral planning in Colombia aims at both climate-proofing existing strategies and at modifying strategic directions within the sectors. Although activities are identified by a specific sectoral ministry, many of the proposed adaptation activities are inherently cross-sectoral.

47. Colombia is gradually mainstreaming climate resilience into sectoral planning. In prioritising adaptation activities, the links between economic development and climate resilience are likely to be particularly important for three types of sectors:

- Sectors that are highly sensitive to climate change;
- Sectors that have a negative impact on the climate resilience of ecosystems or communities;
- Sectors that are important for economic development because they make a significant contribution to GDP, are growing very quickly, or sustain a large group of poor populations.

48. In Colombia, these three types of sectors largely overlap, highlighting the importance of climate-resilient development. The projected activities in the five key growth sectors therefore provide a timely opportunity to make development more resilient to the effects of climate change. Table 1 lists the five key growth sectors prioritised in Colombia's National Development Plan 2010-2014 and the priority sectors for mainstreaming climate resilience that have been identified by the institutions working on the National Adaptation Plan. The National Development Plan 2010-2014 set the objective of developing sectoral adaptation strategies in each of those sectors. The priority sectors for adaptation were chosen primarily on the basis of their level of affection during the floods in 2010-2011.

**Table 1. Overview of key growth sectors and sectoral adaptation priorities**

	Key growth sector	Adaptation priority
Mining and Energy	x	<b>Only energy</b>
Transport infrastructure	x	x
Agriculture	x	x
Housing	x	x
Innovation	x	
Health		x

*Mining and energy*

49. Mining and energy have been assigned the highest priority among the five growth sectors identified in the National Development Plan 2010-2014, and absorb around 40% of total investment foreseen for the five growth sectors (Government of Colombia, 2011). Hydropower contributes more than 70% of Colombia's total electricity generation capacity (IEA, 2012). Mining, oil drilling and quarrying form a fast-growing sector and drive Colombia's GDP growth. Value added by the sector tripled between 2005 and 2011. In 2011, the sector accounted for about 8% of Colombia's current GDP and about 70% of its exports (OECD, 2013b).

50. The energy sector is expected to be negatively affected by climate change, particularly due to a high reliance upon hydropower (Ospina Noreña et al., 2011). Low storage capacity makes the system vulnerable to droughts – a phenomenon that is likely to increase in areas of the country where large parts of the population and economic activity are concentrated. Price increases associated with future droughts under a climate change scenario have been projected to cost Colombia 0.7% of its GDP in 2050 (ECLAC, 2013a). This scenario assumes stable demand and an unchanged infrastructure stock. Because demand is projected to increase in the coming decades, the costs may be higher if no adaptation activities are undertaken (UPME, 2010). Policies introduced in the mid-1990s to increase generation capacity favoured conventional technologies (hydropower, gas and coal). Future policies would, therefore, need to realise Colombia's renewable energy potential to avoid increasing greenhouse gas emissions (OECD, forthcoming, c).

51. The National Development Plan 2010-2014 recognises the importance of preparing the energy sector for future climate change. It requires the institution responsible for mining and energy planning UPME (*Unidad de Planeación Minero-Energética*) to take climate change into account in its plans for expanding production and also to create different demand scenarios for the energy and gas sectors. The planning authority is charged with co-ordinating the hydroelectric sector planning with a view of reducing the impacts of climate change. Finally, the Regulatory Commission for Energy and Gas is mandated to revise the regulation of the sector to include incentives that guarantee energy supply under scenarios of climate change. UPME has commissioned a vulnerability study for the energy sector that is expected to suggest measures and policies to reduce the potential negative effect of climate change on energy generation capacity. Results will be published in 2014 and inform the development of a sectoral adaptation plan for energy.

52. While there is little research on the vulnerability of mining operations to climate change globally, the mining sector was heavily affected by flooding in 2010-2011 (ECLAC, 2012). The sector might also affect climate resilience through its operations. The expansion of mining activities in Colombia over the last decade has raised concerns about its environmental impact (OECD, forthcoming, c). In the absence of appropriate safeguards, the mining sector could damage the resilience of ecosystems and communities (Contraloría General de la República, 2013; Rodríguez Becerra et al., 2012). The linkages between climate change and the mining sector have not yet been addressed, partially because addressing general environmental challenges associated with mining, such as mercury pollution, has currently been a priority.

*Agriculture*

53. The agricultural sector plays a key role in promoting inclusive growth. It contributed 7% to Colombia's GDP in 2012 and 10% of exports (World Bank, 2013; DANE, 2013b). Agriculture is Colombia's main export sector after petroleum oils, coal and gold (Hausmann et al., 2011). The sector employed 18% of the total workforce in 2011 (World Bank, 2013). Most jobs were located in Colombia's poorer rural areas where 70% of the population is unable to meet some of their basic needs (World Bank, 2013; UNDP, 2011). The Colombian government envisages a strategic positioning of the sectors due to a

projected rise in global demand for agricultural products, projected high commodity prices, and a perceived comparative advantage of Colombia's currently favourable climatic conditions and climatic diversity. Accordingly, the National Development Plan 2010-2014 sets out a programme to strengthen productivity in the sector.

54. However, climate change may reduce Colombia's comparative advantage. Up to 80% of crops and more than 60% of today's cultivation areas could be affected by climate change (Ramirez-Villegas et al., 2012). Agricultural production is projected to be on average 24% lower over the century, compared to a baseline scenario without climate change. This reflects a projected decline in productivity, which could reach 45% at the end of the century (ECLAC, 2013a). Similarly, livestock production could decrease by an average of 17% over the century (35% in 2100), and fisheries by an average of 16% (30% in 2100) (ECLAC, 2013a). Under a climate scenario where temperatures increase by 1.5-1.7°C and there is some decline in annual precipitation, productivity reductions in the agricultural sector alone could cause costs in the magnitude of 1% of national GDP in 2050, compared to a scenario without climate change (ECLAC, 2013a). This might have knock-on effects on other sectors. For example, the food processing industry is directly dependent on agricultural productivity, and output could decrease by around 16% over this century compared to a baseline scenario without climate change (ECLAC, 2013a).

55. The Colombian government is currently developing an adaptation strategy for the agricultural sector. The formulation of the strategy was informed by a series of workshops with different government agencies and stakeholders from the agricultural sector. It has not yet been decided whether the strategy will be granted a legal status that requires budget allocations for the activities proposed and is subject to national monitoring and evaluation procedures. This could however facilitate implementation, given that the strategy is contemplating activities that require resource commitments from a wider range of government institutions. The strategy is expected to be finalised in 2014.

#### *Transport infrastructure*

56. Colombia is lagging behind other countries in the region in terms of transport infrastructure development. Increased infrastructure investment is considered necessary to raise productivity and export potential (IMF, 2013). Accordingly, Colombia has made transport infrastructure development a growth sector in the National Development Plan 2010-2014. As it aims to catch up on infrastructure development, it may face trade-offs between fast and low-cost infrastructure development and the integration of climate projections and disaster risk management into infrastructure design.

57. Transport infrastructure in Colombia is sensitive to climate extremes and climate change. In the past, floods and landslides have caused significant damage to transport infrastructure. For example, transport infrastructure damage accounted for 38% of total damage during the 2010-2011 La Niña event and contributed to indirect effects on growth, for example by blocking access to markets (ECLAC, 2012). Climate change is projected to increase climate-related risk through extreme precipitation events that might damage infrastructure and cause the sedimentation of shipping routes in some regions. In other regions, reductions in rainfall might harm shipping because of low water levels. High temperatures could further damage road infrastructure, as could low ground-water levels that cause subsistence of the soil. Sea-level rise will be an additional threat. A 1m rise in sea levels has been projected to put almost half of coastal transportation routes at risk of temporal or permanent flooding (IDEAM, 2001).

58. The National Development Plan 2010-2014 mandates that the effects of climate change be considered in transport infrastructure planning. It calls for new "high-impact strategies" to make the infrastructure system more resilient in the medium and long term by tackling the most important routes that are regularly affected by climate-related events (Government of Colombia, 2011). The plan asks competent institutions to undertake concerted efforts and develop a new financial framework for climate-resilient

infrastructure. It further requires that the sector undertakes vulnerability studies and prioritises adaptation measures.

59. Further, the National Development Plan requires state and territorial entities, as well as concessionaries, to acquire insurance for primary transport infrastructure to cover the cost of damages related to natural hazards. With World Bank support, the government has developed a technical document that considers good practice in climate-resilient infrastructure development with respect to insurance in other countries. The government has subsequently strengthened legislative requirements to contract insurance and has already included changes in the contractual obligations of concessionaries. In addition to this, it will be important that infrastructure planning at all levels of government is closely integrated with land-use and development plans. This will encourage the consideration of broader developmental aspects of infrastructure, such as its role in disaster risk response, food security and market access.

### *Housing*

60. The construction sector contributed 6% to Colombia's GDP in 2011 and has been identified as one of the key sectors to drive growth in the coming years (OECD, 2013b; Government of Colombia, 2011). Housing was also the most affected sector during the 2010-2011 floods. The location of housing in areas at risk from flooding and landslides exacerbated to the costs of the floods (ECLAC, 2012). Urbanisation in Colombia is still fast paced and often exceeds the capacity of local administration to provide adequate services to the growing urban population. Rapid urbanisation may be exposing an increasing number of households to climate hazards, mainly floods and droughts, and contribute to environmental degradation (Rodríguez Becerra et al., 2012).

61. The National Development Plan 2010-2014 recognises the need for increased resilience in the housing sector. Among others, it calls for reducing the number of precariously located settlements within peripheral urban areas (Government of Colombia, 2011). The plan also includes the mandate to revise and strengthen the sectoral tools and incentives for the construction of infrastructure to manage rainwater in urban areas. The housing ministry is working towards a sectoral adaptation plan. Together with the National Planning Department, this includes developing policies on sustainable construction, sustainable cities and integrating risk management in water and sewage operation systems.

62. The housing sector illustrates some of the trade-offs and synergies between development and climate resilience. For example, a plan to provide 100 000 free housing units for poor populations has shifted attention away from the medium- and long-term goal of adapting the sector to climate change. In principle, this project might offer an opportunity to increase climate resilience as it provides an opportunity to relocate people in high-risk areas to safer areas. Another challenge for the housing sector is the scarcity of land in urban areas. This has contributed to an increase in housing prices by 40% between 2006 and 2011 (OECD, 2013b). Ambitious construction targets are intended to reduce house prices, but risk encouraging construction in areas that are exposed to the effects of climate change, such as floodplains.

### *Innovation*

63. As a fifth growth sector, the National Development Plan prioritised sectors that have a high potential for innovation. By supporting specific sectors and general innovation capacity, the government hopes to further diversify the economy and export portfolio. Among others, measures will target education and strategic skills development, incentives for investment in specific sectors and new options through the financial system, and the promotion of technological clusters and value chains (Government of Colombia, 2011).

64. Innovation will provide ways to expand economic activity in sectors where Colombia has a comparative advantage today and under future climate scenarios. The prioritisation of sectors and specific research projects could benefit from considering climate change as one selection criteria. For example, investment in non-agricultural sectors could be promoted in particular in regions where agricultural activities are highly vulnerable to the effects of climate change. Innovation can also help to cope with climate change. Adapting to climate change may require new agricultural techniques or crops, new procedures for regulation and planning, or alternative financial instruments. The National Development Plan highlights the need to undertake studies and analysis related to climate change adaptation. This underlines the importance that the government attaches to evidence-based policy-making.

#### **Box 5. Climate resilience and key growth sectors: Lessons learned**

- *Include clear mandates for sectoral action in the development plan:* The National Development Plan 2010-2014 mandated that the effects of climate change be taken into account in the agriculture and infrastructure sectors. These two sectors have so far made the most progress towards integrating climate change into their sectoral planning. The Plan also sets the goal that five sectoral strategies take the effects of climate change into account. However, the Environment Ministry is responsible for delivering this goal. For future development plans, it might be appropriate to assign responsibility to the sectoral ministries that are in charge of developing the strategy and of implementing adaptation activities.
- *Grant sectoral plans a legal status that encourages their implementation:* The legal status of sectoral adaptation plans has not yet been defined. However, their implementation will be most likely if plans formulate clear objectives and allocate resources to the activities prioritised.
- *Consider competing political priorities when planning:* Even though there is considerable overlap between the key growth sectors identified in the National Development Plan 2010-2014 and adaptation priorities in Colombia, short-term growth priorities that require substantial additional resources in a ministry can shift attention away from climate resilience. Building synergies with climate resilience is important when determining political priorities.
- *Strategically engage with providers of development support:* International co-operation has helped engage actors and advance studies and strategies in all sectors that today are particularly active in building climate resilience.
- *Negative impacts of economic growth on resilience:* To date, analysis and planning activities have largely focused on sectors that are vulnerable to climate change. Potentially negative effects of some growth sectors on climate resilience risk being overlooked. An analysis that focuses mainly on vulnerabilities may also miss some of the opportunities that may come with climate change, such as an expansion of agriculture into new areas.

## **4.2 Disaster risk management**

65. After the floods in 2010-2011, disaster risk management became a priority on the national policy agenda. This section examines the relevance of disaster risk management for climate-resilient development in Colombia. The OECD (forthcoming, a) has argued that climate change adaptation and disaster risk management need to be closely linked to take advantage of existing practices and experience and to avoid that policies and physical protection measures exacerbate future risk. The first sub-section looks at how disaster risk management, climate change adaptation, and development policies have been integrated in Colombia, and examines some remaining challenges. A second sub-section gives an overview of Colombia's efforts to minimise the costs of climate extremes by improving the fiscal management of natural disaster risk. The section concludes with a brief summary of lessons learned.

*Integrating disaster risk management and climate change adaptation*

66. Colombia has several decades of experience with disaster risk management. However, the government decided that reforms were needed after adaptation deficiencies became apparent during the floods in 2010-2011. In 2012, the World Bank published a comprehensive review of Colombia's disaster risk management policy (World Bank, 2012). This review identified four factors that had contributed significantly to disaster risk in the past:

- no comprehensive national disaster risk management policy;
- insufficient land-use and watershed management;
- insufficient consideration of disaster risk in sectoral plans and policies;
- limited incentives for civil society and the private sector to engage in risk prevention due to the absence of a clear policy framework and the dominant role of the state in post-disaster assistance.

67. On the basis of this assessment and the devastating impacts of the 2010-2011 flooding, the Colombian government created a new comprehensive policy framework for disaster risk management, expressed in a disaster risk management law in 2012 (Congreso de Colombia, 2012).

68. The new law includes important provisions on disaster risk reduction, in contrast to previous legislation that only covered disaster risk response. Notably, the law requires risk and risk management to be integrated into land-use planning and development plans at all levels of government. The shift towards more disaster risk reduction also has financial implications. As a first step, the law foresees the reform of the main disaster risk management financing tool, the National Fund for Disaster Risk Management, to give a greater emphasis to the creation of knowledge about disaster risk and risk reduction activities.

69. Disaster risk management was also included in the National Development Plan 2010-2014 and gained an improved institutional standing due to a reassignment of responsibilities. The changes made to disaster risk management policies after the floods in 2010-2011 were more ambitious than those made to climate change adaptation, as Colombia could rely on existing knowledge and established procedures for disaster risk management. To increase the institutional standing of disaster risk management, the main institution at the national level, the National Unit for Disaster Risk Management, was placed under the direct responsibility of the President's Office. A National System for Disaster Risk Management was created to bring together relevant government institutions together to better co-ordinate their policies. Colombia also made disaster risk management one of six priority areas for international co-operation (UNGRD, 2013).

70. The institutions responsible for disaster risk management and climate change adaptation policies (SISCLIMA) have not yet been formally linked. The National Unit for Disaster Risk Management is part of a Technical Committee charged with the formulation of the National Adaptation Plan and has been involved in the drafting of the conceptual bases of adaptation policies in Colombia (DNP et al., 2012). This engagement has encouraged a dialogue between the two fields, but joint action has not yet reached the projects and programmes at sub-national level. There, disaster risk management projects usually rely on historical records for decision-making. The integration of climate change into projects is further hampered by a perception among some stakeholders that climate change adaptation essentially means disaster risk management, and that disaster risk reduction measures will be sufficient to provide protection against future climate change.

71. Currently, disaster risk management has a better established legal basis than climate change adaptation. It will be important to ensure that this does not lead to a disregard of the long-term implications of climate change on development. As policies, plans and concrete projects are developed further, better co-ordination between climate change adaptation and disaster risk management may be required. This could be guided by the Bali Action Plan under the UNFCCC, which recommends establishing co-ordination mechanisms that link disaster risk management and adaptation at all levels of government, assessing the status of disaster risk management and adaptation efforts, and building on existing institutions and frameworks (UNISDR, 2008). Also, the joint consideration of no-regret measures under different climate scenarios might be a suitable starting point for establishing linkages between adaptation and disaster risk management.

#### *Fiscal management of climate extremes*

72. Colombia developed a “Financial Strategy to Reduce the Fiscal Vulnerability of the State against Natural Disasters” in 2012, based on the experience of considerable resource needs after the flooding in 2010-2011 (see box 6). The strategy aims to maintain fiscal stability and reduce the negative impacts of disasters. The measures intend to reduce contingent liabilities on the state and to facilitate access to finance in the case of a natural disaster. For this, three types of risk management strategies are proposed: i) risk reduction through preventive measures, ii) risk retention through reserves and contingent credit, and iii) risk transfer through insurance. In the empirical literature, this kind of risk layering and the arrangement of financing instruments before disasters strike (ex-ante) has been found to be a cost-effective way to deal with disaster risk (Cummins and Mahul, 2009). The strategy is led by the Finance Ministry. It focuses on current climate variability only; climate change is not discussed.

#### **Box 6. The importance of fiscal resilience to disasters**

Sufficient access to capital after extreme events has shown to be essential to limiting negative impacts on economic growth and loss of human life. So-called counter-cyclical spending, i.e. maintaining or increasing government spending despite declining revenues, can limit the long-term effects of disasters (Cavallo and Noy, 2010; Cuaresma et al., 2008; Hallegatte and Dumas, 2009). In contrast, financial constraints after disasters hamper investment in reconstruction and limit the options governments have to respond to them (Ranger et al., 2011). This can cause indirect costs and slow down economic growth for several years after a disaster (McDermott et al., 2013). As Colombia’s vulnerability to climate extremes is projected to increase, fiscal preparedness for disasters will become even more important.

Public investment in flood response in 2010-2011 was substantial. Total damages for the period 2010-2011 amounted to USD 6 bn, almost 2% of GDP (ECLAC, 2012). In 2011 and 2012 the government invested 0.9% and 0.7% of GDP, respectively, in flood response (CONFIS, 2011, 2012). This compares with total investment by the national government of 1.8% of GDP in 2011 and 2.9% of GDP in 2012. Financing needs were covered, among others, by an additional tax on high value real estate (0.1% of GDP), a levy on financial transactions, a loan from the World Bank, and reallocations within the current budget (CONFIS, 2011). The government had also considered selling 10% of shares of the largest petroleum company in Colombia to capitalise an Adaptation Fund for reconstruction purposes (CONFIS, 2012). This measure was not put in practice, but illustrates the urgent need for finance at the time.

73. Risk reduction activities are intended to reduce potential damages and subsequent liabilities on the state. New risk prevention policies are included in the new disaster risk management law in 2012 (Congreso de Colombia, 2012), but there is also a potential to include climate change adaptation measures. Key aspects of this strand include the development and implementation of risk management plans and prevention measures through land-use and watershed management plans. The strategy also recommends the inclusion of disaster risk in contracts awarded for infrastructure projects. Currently, most financial resources in disaster risk management are invested in risk management, recovery and financial protection

activities. Very little funding is provided to risk reduction and activities that generate knowledge about risks. However, by 2019 the government aims to allocate at least 20% of resources to the generation of knowledge about risks, 30% to risk reduction, and 50% to risk management. By 2025, and allocation of 30%, 30% and 40% to the respective activities is envisaged.

74. Risk retention mechanisms are the second element of the strategy. Three instruments are intended to maintain public reserves to cover an unexpected financial claim: a National Disaster Risk Management Fund, a contingent credit line with the World Bank, and an increase in budget flexibility. The National Disaster Risk Management Fund was created on the basis of an earlier Calamities Fund established in 1984. Under its new name and statute, the National Disaster Risk Management Fund finances i) knowledge generation about risk, ii) risk reduction, iii) risk management, iv) recovery, and v) financial protection activities. To ensure its financial sustainability, funding is allocated from the national budget. The state also channels private donations made for emergency relief and reconstruction through this fund. It is placed under the authority of the National Unit for Disaster Risk Management.

75. The contingent credit line “Catastrophe Deferred Drawdown Option” (Cat DDO) with the World Bank provides quick liquidity in case of a natural disaster. The advantages of a Cat DDO are that financial resources are made available immediately after a national emergency, and that financing terms are better than those of commercial loans. Colombia was the first country to ever contract a Cat DDO with the World Bank. The initial credit was USD 150 m, but the credit was increased after the La Niña events in 2010-2011 and currently amounts to USD 250 m. To be eligible for a Cat DDO, countries have to prove macroeconomic stability when the agreement is signed and whenever the credit is extended. They are also required to have a risk management programme in place, which is then regularly monitored by the World Bank. This is intended to enhance the cost-effectiveness of disaster risk management.

76. As a third risk retention measure, the strategy envisages an increase in the flexibility of allocations in the national budget. Budget flexibility can help redeploy spending in the face of climate-related disasters (Laframboise and Loko, 2012). Colombia used this mechanism to finance its emergency response to the floods in 2010-2011. However, current budget flexibility is limited. In 2010, 86% of the National Budget consisted of inflexible allocations. Major sources of inflexibility are debt repayment (27%), pensions (15%), and allocations to the sub-national level (16%).

77. The financial strategy further aims to transfer risk through public and private insurance, and via capital markets. As a first step, the government is working towards increasing the share of insured public goods, particularly real estate, priority transport infrastructure and assets used to provide public services. The Finance Ministry is currently evaluating options for collectively insuring government-owned real estate, primarily buildings dedicated to health and education. The legal framework for insuring infrastructure that is administered by public-private associations has been strengthened since the floods and recent infrastructure projects already take insurance into account. The Ministry is also planning to condense lessons learned in guidelines and capacity-building activities directed to sub-national entities that seek to insure their assets. In addition, the government is also exploring options to access additional capital through financial markets, for instance through catastrophe bonds.

78. Gaps remain in engaging the private sector, including through private insurance. According to the Federation of Insurance Companies in Colombia (FASECOLDA), only 7% of asset losses caused by the severe rainfalls in 2010-2012 were insured. The government and the private sector have yet to develop a strategy for increasing private sector insurance coverage. The agricultural sector has received most attention with regards to climate insurance, with government subsidies equivalent to 60-80% of the premiums. FASECOLDA has pointed out that despite this, insurance is still expensive for smallholders; and has called for a wider range of insurance models (Díaz, 2013). Private ownership of risk might be

encouraged by a better clarification of the respective roles and liabilities of the public and private sectors with respect to disasters and climate resilience.

79. The Financial Strategy will help reduce negative impacts both from current climate variability and climate change. While the potential implications of climate change are not considered in the current financial strategy, the individual instruments can be adjusted over time. Cost-effective adaptation includes strengthening the link between disaster risk management and climate change adaptation, but might also benefit from making risk transfer mechanisms conditional on risk prevention activities. In this context, FASECOLDA has stated that higher public investment in risk reduction could support private sector insurance provision (Rincón, 2013). To date, most insurance arrangements in developing countries have not directly linked risk response and risk reduction. Initiatives that have made the link have required public sector involvement or development partner support (Surminski and Oramas-Dorta, 2011). In any case, the potential impacts of climate change on climate extremes will require close monitoring, so that the sustainability of disaster risk management arrangements, including the availability of sufficient finance and the sustainability of insurance mechanisms, can be ensured.

#### **Box 7. Climate resilience and disaster risk management: Lessons learned**

- *Take advantage of “windows of opportunity”:* Disasters can provide an opportunity to not only strengthen disaster risk management policies, but also integrate aspects of climate resilience into policies and planning.
- *Learn from existing arrangements in disaster risk management:* Disaster risk management in Colombia has a stronger legal basis and institutional standing. To some extent, disaster risk management arrangements can serve as a “blueprint” for climate resilience legislation and institution-building.
- *Create institutional links between disaster risk management and climate change adaptation:* Institutional systems will better support climate resilience if they allow disaster and climate change risks to be jointly addressed, where appropriate. This may require creating links between the current institutional design in Colombia, which assumes that systems for disaster risk management and climate change will largely operate in parallel.
- *Protect the fiscal stability of the state by ensuring sufficient access to finance in the case of a disaster:* The “Financial Strategy to Reduce the Fiscal Vulnerability of the State against Natural Disasters” is likely to increase climate resilience, even though it does not address climate change explicitly. Over time, it will be important that changes in the frequency, intensity and geographical scope of extreme events are monitored and the Financial Strategy is adapted early enough to provide sufficient protection to such changes.
- *Engage the private sector:* A stronger engagement of the private sector might be necessary in the future, including private risk reduction activities and insurance. This may benefit from a better clarification of the respective roles and responsibilities of the state and the private sector.

### **4.3 Land-use and water management**

80. More than 70% of Colombia’s population and the country’s main economic centres are located in the Andean and coastal regions, with a high concentration along the shores of Colombia’s rivers. Many of these areas are also particularly exposed to flooding, landslides, projected temperature increases and sea-level rise (DNP, 2012). Climate impacts and economic development thus coincide spatially in certain parts of the country. Considering climate change in land-use and water management can therefore reduce the negative impacts of climate change on economic growth, by reducing the exposure and sensitivity to climate change.

81. This section first describes the context in which land-use and water management take place in Colombia, and subsequently discusses the integration of climate change adaptation into municipal and coastal land-use plans and water management. Such regulations are necessary, but not sufficient. They need to be viewed in the context of the underlying drivers of inappropriate land and water use, such as poverty and weak property rights. Regulation may therefore need to be combined with additional instruments to address these underlying issues.

*The context of land-use and water management in Colombia*

82. Economic growth is one of the main factors that drive land-use change. Thus, land-use and water management can be important instruments to prevent negative impacts of economic growth on climate resilience. In the past, economic development has affected climate resilience through deforestation, the conversion of wetlands and other ecosystems such as the páramos, and the diversion of rivers. This is widely thought to have exacerbated floods and landslides, rendered ecosystems more vulnerable to degradation and biodiversity loss, and made natural habitats more vulnerable to climate change (Government of Colombia, 2011; Restrepo and Alvarado, 2011; ECLAC, 2012; Ardila et al., 2013; Rodríguez Becerra et al., 2012). For example, the expansion of agricultural activities in the Andes has led to a decrease of high altitudinal forests by more than 30% in twenty years (Hincapié et al., 2002; Van der Hammen et al., 2002). This has contributed to an irreversible degradation of soil quality, and to a reduction of rainfall over the Páramos, a crucial ecosystem for securing water supply to the surrounding areas, including the capital Bogotá (Etter and Villa, 2000; Buytaerta et al., 2006).

83. Currently, there is a considerable underuse of land that is suitable for agricultural purposes and an overuse of land for livestock. As of 2004, only 30% of land suitable for agricultural crops was used for this purpose. At the same time, 36% of total land was used as pastureland, although only 17% is considered suitable for raising livestock (World Bank, 2004). This overuse of land for livestock contributes to deforestation, degradation and urban sprawl (Slunge, 2008). Urban sprawl has increased flood risk in several Colombian cities, among them Cali, as investments in drainage infrastructure lagged behind urban development (UNISDR, 2009).

84. Through natural disasters, sea-level rise or resource scarcity, climate change may affect patterns of internal migration, and thus further drive land-use change. Colombia already experiences high numbers of internally displaced people due to the internal armed conflict. Between 1999 and 2011 alone, more than 8% of Colombia's total population was displaced (OECD, 2013b). Migratory pressures due to climate change and migration associated with the internal armed conflict and unequal land distribution might mutually reinforce each other, leading to increased vulnerability to climate change (Slunge, 2008). This complex environment calls for land-use policies that contribute to social inclusion, employment, general environmental protection and climate resilience, in addition to planning instruments.

*Integration of climate projections into land-use plans*

85. Municipal land-use plans (*planes de ordenamiento territorial*, POTs) are at the core of land-use planning, within the framework set by national and regional regulations. They determine the permitted use of land in municipalities. This includes the delineation of urban areas, environmental protection zones and zones at hazard risk. They also promote plans for road development and other construction projects, thereby providing the basis for licensing for local housing and infrastructure projects. The national level establishes the legal framework and broad guidelines for land-use planning. It can impose restrictions on land use for reasons of national interest (e.g. by designating land as national parks) and reinforce national economic interests through infrastructure planning and mining licenses. The regional environmental bodies are responsible for watershed management plans. Separate management plans are elaborated for some strategic ecosystems, such as the Páramos or forests.

86. The POTs take a comprehensive approach to land-use planning that includes social, economic, cultural and environmental considerations. This corresponds well with the long-term nature and multiple dimensions of adaptation to climate change. The consideration of the effects of climate change in POTs is important for three reasons. First, POTs set the framework for economic development at the municipal level. Development is guided by municipal development plans that detail strategies, objectives, projects and financial allocations for local development. Municipal development plans are required to conform to the POTs, and they also have to contain an investment plan for the implementation of the land-use plans. Second, POTs require the analysis of long-term consequences of specific land uses and the integration of disaster risk and risk prevention measures. In addition, the POTs are required to prioritise environmental criteria in their decision-making processes and this component is controlled and authorised by the Regional Autonomous Corporations. Third, the POTs' time horizon of nine years provides a better framework for long-term planning than the shorter development plans that correspond to one local government term of three years.

87. Climate projections at local scale are usually subject to high uncertainty, which makes it difficult for municipalities to restrict land use based on this information. This relates particularly to trends in precipitation, while temperature increases, glacier retreatment and sea-level rise may be more easily considered in land-use planning. This uncertainty requires flexible approaches to land-use planning, but also improving the knowledge of potential risks, and the use of tools to make decisions under uncertainty.

88. In a review of the POTs in the context of mining practices, the Office of the General Comptroller states that there is currently a lack of effective and adequate land-use planning through this instrument. Despite the existing legal framework and control process by the Autonomous Regional Corporations (the regional environmental bodies), the review found that inappropriate land-use practices have led to environmental degradation, particularly of water, soil, biodiversity, air, and landscapes, and negatively affected the people who live in the areas concerned (Contraloría General de la República, 2013). While the Office of the General Comptroller cites a lack of adequate information about the land in question as the main reason for these deficiencies, interviews with policy-makers have also suggested structural and capacity challenges. For example, municipalities have to pay compensation to landowners if they severely restrict the potential use of their land, which constitutes a strong disincentive for imposing restrictions (Blanco, 2008). Municipal land-use management is further confronted with the challenges of the internal armed conflict and displacement, poverty and inequality, particularly in rural areas.

89. Land-use management is multi-layered and complex, and involves several inter-related planning procedures as well as land-use practices that go beyond the formal use of the land and are often difficult to regulate. Municipalities and Autonomous Regional Corporations already have to comply with a number of different planning requirements, including watershed management plans, municipal land-use plans, municipal plans for risk management, and municipal climate change adaptation plans, as well as development plans at local, municipal, district and departmental level. Interviews with public officials indicated that there is scope to better integrate and sequence these planning processes to avoid overwhelming local administrations. Land-use management also involves the particular way land is used. For instance, inefficient agricultural management, particularly related to livestock breeding, can degrade land. This makes it more vulnerable to climate change and incentivises farmers to convert new land for agricultural use. Programmes to encourage efficient agricultural and livestock management are therefore important components of a comprehensive approach to climate-resilient land-use management.

**Box 8. An example of climate-resilient land-use planning: The Bogotá region**

The capital region Bogotá-Cundinamarca is home to almost 10 million people, or 22% of Colombia's population and 41% of national industry, generating 32% of the national GDP (PRICC, 2013). Due to rapid urbanisation, the city's geographical area is estimated to occupy 26% more space in 2050 than today (Planning Secretariat Bogotá, 2013a). The region is prone to multiple hazards and climate change is projected to exacerbate their effects. This includes increased rainfall in areas that are already vulnerable to flooding and landslides, and less precipitation over the Chingaza massif that is in large part composed of the high-mountain ecosystem Páramos that is the current source of around 75% of Bogotá's water supply (Planning Secretariat Bogotá, 2013b).

Bogotá has integrated climate change as one of three strategic components in its district development plan. For the first time, this puts natural resource management, particularly water management, at the centre of development decisions. A climate change component aims to reduce the city's vulnerability to climate impacts and envisages promoting a co-ordinated approach to disaster risk management and climate change adaptation. Priorities include the management of the Páramos ecosystem and of informal settlements in risk zones. The focus is on preventive activities instead of disaster risk response. The city is planning to spend 2.1% of the total budget for the district development plan on climate resilience and risk management. Bogotá is currently updating its POT, among other reasons to integrate disaster risk management and climate change adaptation. This is an unusual procedure since the current POT would usually be in force until 2020. The Department of Cundinamarca has also included climate change adaptation into its development plan and set up a programme on disaster risk reduction and climate change adaptation. These initiatives have benefited from development partner support (PRICC, 2013).

90. With its two low-lying coasts, Colombia is highly vulnerable to sea-level rise. Sea-level rise has been observed at 3.5mm per year for the Caribbean Sea and 2.3mm per year for the Pacific Ocean (IDEAM, 2010). A rise of 40-60 cm is projected for 2060 (IDEAM, 2001). A scenario of a 1 m sea level rise by 2100 suggests that more than 1.4 million people could be affected by considerable economic impacts on coastal buildings, infrastructure, and agricultural land (INVEMAR, 2003; IDEAM, 2001). Early action on land-use planning might be justified because coastal development has strong elements of path dependence. As such, it is important to develop sustainable plans early to prevent "locking-in" vulnerability. It is also important to create stable expectations about which sites will be protected while remaining flexible about the way that protection is achieved (Hallegatte, 2009).

91. The National Policy for the Ocean and Coastal Areas of 2007 requires the government to monitor coastal vulnerability and identify adaptation actions. However, currently there is no requirement to consider sea-level rise in coastal land-use or development planning. There has also been a lack in legislation related to coastal management more generally. In May 2013, Presidential Decree No 1120 created ten Coastal Environmental Units. Their main function is to support the regulation of land in coastal areas, subject to the Environment Ministry's consent. So far, sea-level rise has been considered in a few pilot projects supported by international development partners, including an integrated planning project in the port city of Cartagena (CDKN, 2013). These can encourage other local and regional governments to take action.

*Integration into water management*

92. Water management has become increasingly prominent on the political agenda in Colombia, and there is also an increasing awareness of the implications climate change might have for this area. The "National Policy for Integrated Water Resource Management" for the period 2010-2022 recognises climate change and variability as a challenge to water resources management, both in terms of flood risk and of securing water supply (Ministerio de Ambiente, Vivienda y Desarrollo Territorial, 2010). It focusses upon the implications of changes in water supply and water demand in the hydropower and agricultural sectors, as well as for inland navigation and freshwater supply. The policy also foresees the design and implementation of climate change adaptation measures in ecosystems that are crucial for water regulation

and in the afore-mentioned sectors. It further calls for activities at the regional and local levels to reduce current disaster risk.

93. Watershed management influences flood risk and water quality and can prevent water shortages during dry periods, particularly during El Niño years. Climate change is expected to change the water cycle with a likely intensification of climate extremes, both intense rainfall and severe droughts. Projected water scarcity is expected to be most problematic in the Andean and Caribbean regions that are characterised by comparatively high population density, a high level of economic activity, and high current water demand for domestic and industrial uses (Pabón, 2010; DNP, 2012). This is likely to adversely affect industries, agriculture, ecosystem health, and electricity prices. Watershed management has to reconcile multiple water uses, including those for irrigation, electricity generation, households and industrial activities. It is thus a cross-cutting issue that requires the co-operation of multiple stakeholders.

94. Water resources management is conducted at the river basin level. Accordingly, Water Basin Designation and Management Plans (*planes de ordenación y manejo de cuencas*, POMCAs) are formulated under the leadership of the regional environmental bodies, the Autonomous Regional Corporations (Decree 1729 of 2002). In addition, the government is developing strategic water management plans for the macro-basins around its five largest rivers. The Autonomous Regional Corporations grant concessions for water use, depending on water availability for the specific water basins.

95. Challenges to watershed management are similar to those associated with the development, implementation and enforcement of the POTs. Constraints on skilled technical personnel and financial resources prevent many Autonomous Regional Corporations from effectively modelling water availability and measuring water quality, as well as from developing, implementing and enforcing the river basin plans. Their capacity varies considerably as their main source of finance comes from property tax transfers from municipalities, favouring urban regions. Also, the extent of transparency in decision-making and licensing, and their exposure to political pressures vary. More generally, the relationship between the POMCAs and other regulatory instruments, such as the POTs, is not well established, and co-ordination tends to be insufficient (Blanco, 2008). A similar lack of co-ordination has been noted by public officials with regard to the departmental development plans that are under the responsibility of the regional governments, while the POMCAs are formulated by the Autonomous Regional Corporations.

96. There is scope to improve the integration of climate projections into water management. The Autonomous Regional Corporations have the right to modify the initial allocation of concessions if supply in a water body is critically low. This allows them to react to climate variability. However, climate resilience might require a more anticipatory approach to water allocation to prevent future scarcity. Anticipatory action might also be required with regards to flood protection infrastructure and water storage basins that serve both to ensure supply for irrigation in dry years and to store excess water caused by intense precipitation. During the floods in 2010-2011, even newly built storage basins had insufficient capacity given the intensity of precipitation. Since the new disaster risk management law in 2012, all POMCAs have to incorporate disaster risk (Congreso de Colombia, 2012). The Environment Ministry and the IDEAM are currently developing guidance for regional bodies on this, but so far it does not encourage regional bodies to take account of climate projections. Several development co-operation projects in Colombia focus on adaptation in water management and support the formulation and support of sub-national adaptation plans. These will provide important lessons for the National Adaptation Plan.

**Box 9. Land-use and water management: Lessons learned**

- *Design land-use plans that promote climate resilience and green growth:* Land-use planning can provide synergies between climate resilience, mitigation and general environmental protection, thus ultimately creating opportunities for climate-resilient development and green growth.
- *Analyse the underlying causes of unsustainable land use and watershed management, and design policies to address them:* Land-use planning and watershed management will often need to be complemented with other policies aiming, for instance, at increasing agricultural productivity, providing alternative employment opportunities, or skills development.
- *Increase the capacity to make decisions under uncertainty:* Many local and regional level administrations are hesitant to integrate climate projections into their planning procedures because of data gaps and uncertainties. A strong statement in favour of incorporating climate change, combined with capacity building can help to overcome this. Legislation might be considered for specific regions or ecosystems, particular if climate change could lead to irreversible changes and high costs.
- *Learn from pilot projects:* Pilot projects to integrate climate projections into land-use and watershed management at sub-national level have been set up with the support of development co-operation providers. This has been useful for building capacities at the sub-national level, as well as generating lessons about what works. It will be important to integrate these lessons learned into future policies.

## 5. Conclusion

97. Colombia has taken the first steps towards integrating climate change into national development planning motivated by its vulnerability to climate conditions, and high-level political leadership that encouraged the agenda. This has resulted in changes to its institutional system and major planning documents, including the National Development Plan 2010-2014 and five forthcoming sectoral plans that will take account of climate projections. Although the process of mainstreaming climate change adaptation into national, sectoral and other planning procedures is still at an early stage, it has been a fast-developing area of policy-making and planning in the last few years. Looking ahead, it will be important for Colombia to sustain its commitment to climate-resilient development beyond the National Development Plan 2010-2014. This may be fostered by an incorporation of lessons learned to date and priorities for further action into subsequent national development plans.

98. As Colombia moves from planning to implementation, it will be important that sectoral plans are granted sufficient legal status and budgetary allocations to facilitate implementation. Sub-national planning for climate resilience has so far been lagging behind, as it is optional for sub-national entities to formulate adaptation plans. While this is intended to reduce demands on limited administrative capacities at the local level, it might be helpful to identify priorities for sub-national activities that can either be mainstreamed or addressed through targeted interventions, potentially with assistance from international development co-operation. As illustrative examples, this case study has discussed disaster risk management and land-use and water management as areas in which action at all levels of government might be essential to achieving climate-resilient development. Overall, planning and implementation will benefit from a flexible approach to policy-making that considers the uncertainty of climate impacts. A monitoring and evaluation system that encourages strengthening the link between lessons learned and subsequent policy design could support policy learning.

99. As Colombia has chosen a fully mainstreamed approach to climate resilience, ministries and sub-national governments will have to play an important role in formulating policies and plans with a view to preparing the country for the effects of climate change. This will require strong institutional capacity at all

levels of government, and a willingness to reconsider current ways of thinking and doing policy. The government will need to balance ambitious objectives for climate-resilient development with realistic expectations about existing capacities at all levels of government and in the private sector. Policies will benefit from a consideration of the role of the private sector in achieving climate resilience. In addition, strategies to build capacity at sub-national level and to leverage sufficient finance both from domestic and international sources will be necessary to sustain commitment over time.

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